

Deviation Firmware User's Manual

Version 0.1

Table of Contents

Overview.....	2
Emulator only:	4
Main Page Configuration.....	5
Mixer.....	6
Simple Template:	7
Expo & Dual-Rate Template:	7
Complex Template:.....	8
Channel configuration:.....	9
Trims:	9
Model Page:	10

Overview

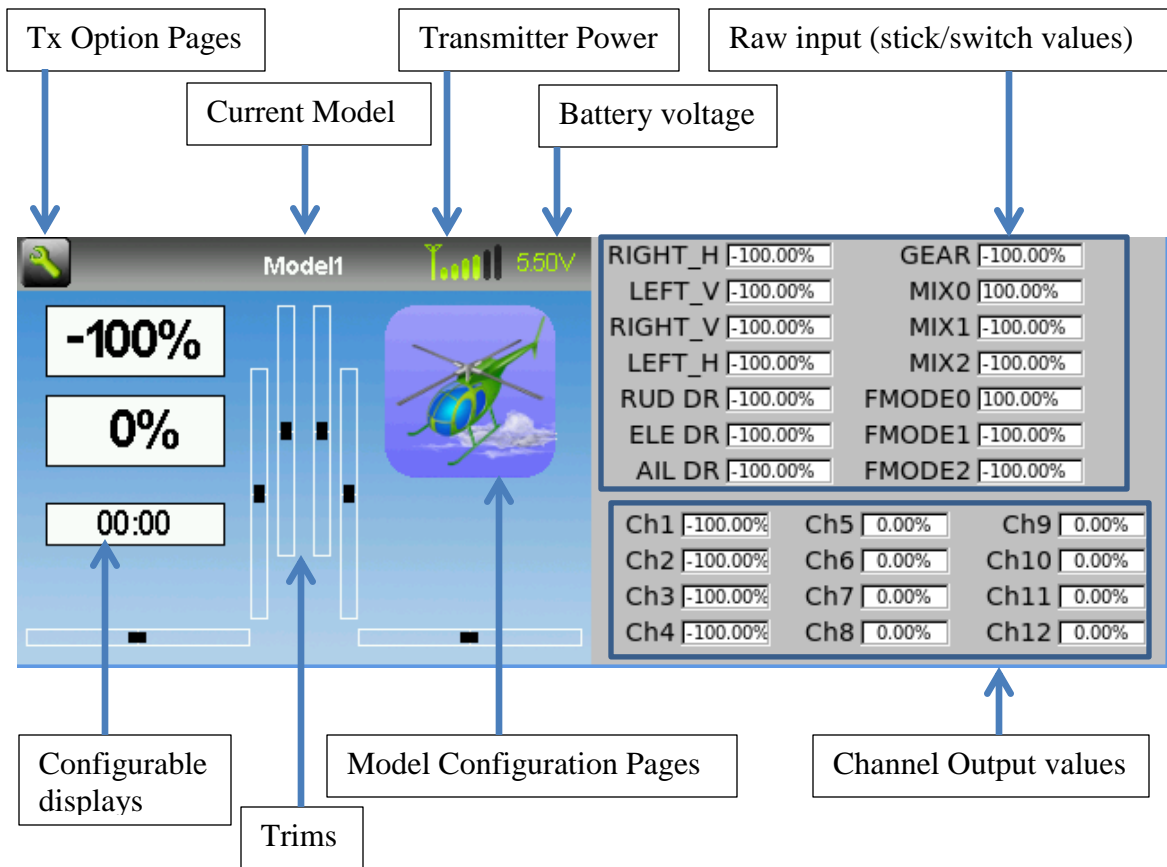
Deviation is a replacement firmware for the Walkera Devo© series transmitters. The primary goal is to add support for multiple protocols, opening the full potential of this platform.

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 filesystem 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 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 configurable; any mix of channel data, timers or telemetry can be displayed, and configured per-model.

Deviation can store up to 255 different models.



Tx Option Pages: Selecting this icon provides access to the main-page configuration screen; the Channel-Test screen; the frequency scanner; and USB mode

Current Model: Selecting the model-name provides access to the Load-Model screen for quick-model switching

Transmitter Power: This indicates the currently selected transmitter power. It is configured from the Model Configuration page

Battery Voltage: Either a numeric or graphical representation of current Tx battery state
Configurable Displays: These can be text-boxes contacting channel, timer, or telemetry data; bar graphs displaying channel data; or icons displaying specific states (e.g. gear, flaps,...)

Trims: The trim display can be configured to show either 4 or 6 trims

Model Configuration Pages: Selecting the model icon provides access to the model configuration pages

Emulator only:

The emulator provides a side-screen displaying the current virtual-stick/switch states as well as the Channel output that would be received by the servos

The emulator controls are as follows:

q/a	Throttle (Mode 2)
Q/A	Left-Vertical trim
w/s	Rudder (Mode 2)
W/S	Left-Horizontal trim
e/d	Elevator(Mode 2)
E/D	Right-Vertical trim
r/f	Aileron (Mode 2)
R/F	Right-Horizonatl trim
z	Gear
x	Rudder Dual-Rate switch
c	Elevator Dual-Rate switch
v	Aileron Dual-Rate switch
b	Mix 0/1/2 switch
n	FMode 0/1/2 switch
\	Power off
Left-arrow	Left
Right-arrow	Right
Up-arrow	Up
Down-arrow	Down
Enter	Ent
Escape	Exit

Table 1: Emulator Controls

Main Page Configuration

The image displays two screenshots of the 'Main Page Config' screen, illustrating different configuration options. The top screenshot shows the 'Trims' and 'Bars' settings, while the bottom screenshot shows the 'Toggle' and 'Bar' settings. Both screenshots include navigation buttons: 'Return to main screen', 'Prev Page', and 'Next Page'. The 'EXIT' button is highlighted in green.

Top Screenshot Callouts:

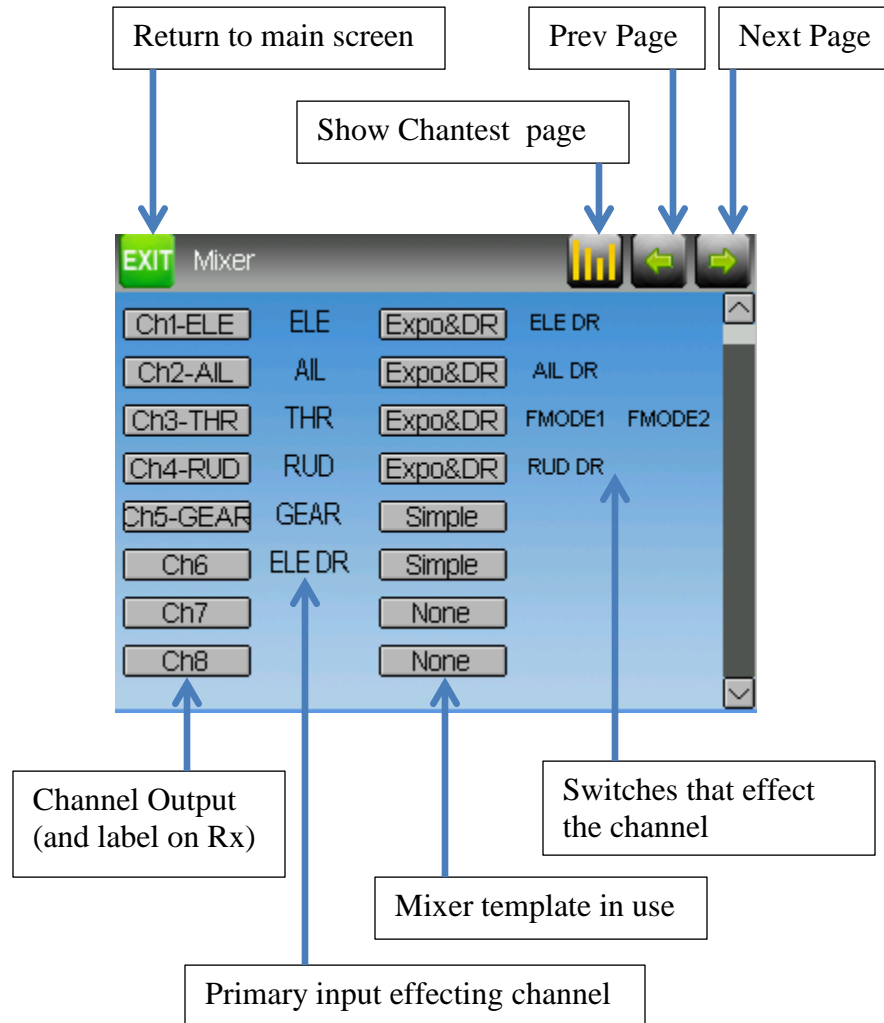
- Number of Trims/ Trim Position: Points to the 'Trims' dropdown menu (set to 6 Trims).
- Number of channel bar-graphs to show: Points to the 'Bars' dropdown menu (set to 4 Bars).
- Text box enable and contents: Points to the 'Box 1' through 'Box 8' dropdown menus.

Bottom Screenshot Callouts:

- Toggle enable and Icon chooser: Points to the 'Toggle1' through 'Toggle4' dropdown menus (all set to None).
- Bar graph channel configuration: Points to the 'Bar 1' through 'Bar 8' dropdown menus.

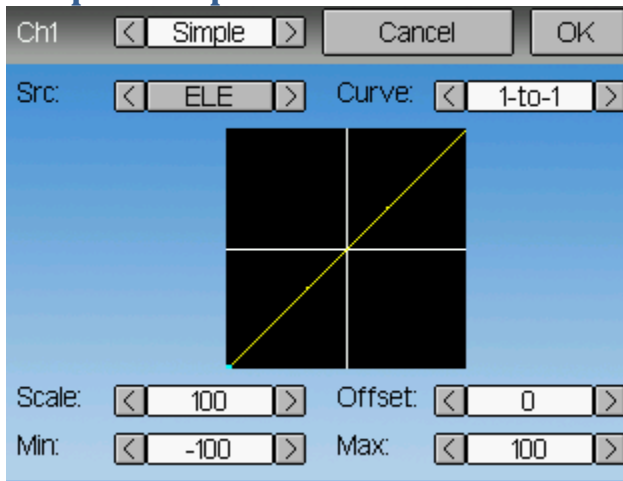
The Main Page Configuration page provides full control of the main-page layout. The number of boxes, their size and location, and their contents can all be controlled from here. Additionally bar-graphs, toggle-icons, and trims can be configured as well.

Mixer



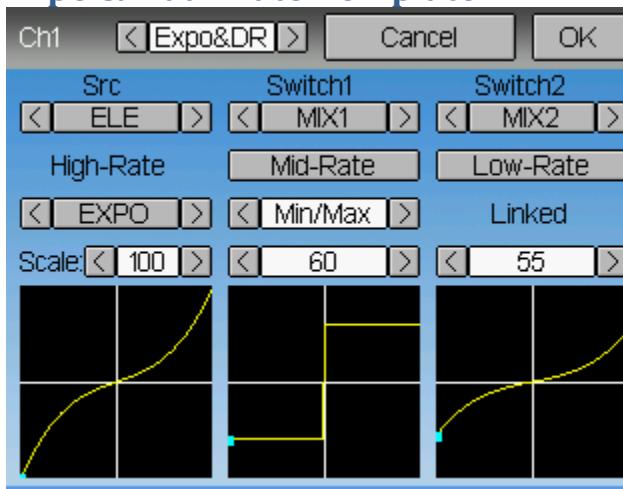
The Deviation mixer is modeled after the Er9x implementation. Each output channel is composed of a series of one or more mixers each of which consists of a single input, an activation switch, and a function/curve that modifies the mixer output. This is a very powerful capability, but it requires a lot of understanding to make full use of. In order to simplify implementation, there are 3 templates that have been defined to make defining channels easier.

Simple Template:



The simple template is the simplest manner of defining a channel. It allows defining a primary-input (stick, switch, or other channel), and applying a curve or function to that input. The result can also be scaled or have an alternate zero-offset. Selecting the 'Curve' spinbox or the graph will allow configuring the Curve in the case that a multi-point curve or Expo-rate are chosen.

Expo & Dual-Rate Template:



The Expo/Dual-Rate template is a more sophisticated template designed to allow use of toggle or 3-way switches to manipulate an input. The primary-input (stick, switch, or other channel), can have a different curve/function and scaling for each toggle-switch position.

Complex Template:

The image shows a software interface for configuring a 'Complex Template'. It includes a title bar with 'Ch1', 'Cancel', and 'OK' buttons. The main area contains several dropdown menus and input fields: 'Mixers:' (1), 'Page:' (1), 'Switch:' (None), 'Mux:' (replace), 'Src:' (GEAR), 'Curve:' (1-to-1), 'Scale:' (100), 'Offset:' (0), 'Min:' (-100), and 'Max:' (100). A central 2x2 grid is visible with a diagonal line from the bottom-left to the top-right.

The Complex template unlocks the full power of the mixer system. For a given channel, any number of mixers can be applied to affect the final result. Each mixer is applied based on whether the specified switch is active, and can either replace, add to, or multiply to the previous mixers for this channel. Using this system it should be possible to define an output channel as a combination of any number of inputs.

A given mixer can be considered to have the general form:

$$M(x) = \text{if}(\text{Switch}) \{ \text{Src} * \text{Curve} * \text{Scale} + \text{Offset} \} \text{ else } \{ 0 \}$$

The combination of mixers for a given output channel is defined by the Mux type:

For a 'Replace' mux:

$$C_x = \text{if}(\text{Switch}_n) \{ M_n \} \text{ else if } (\text{Switch}_{n-1}) \{ M_{n-1} \} \dots \text{ else if } (\text{Switch}_0) \{ M_0 \}$$

For a 'Multiply' mux:

$$C_x = \text{if}(\text{Switch}_n) \{ M_n \} \text{ else } \{ 1 \} * \text{if} (\text{Switch}_{n-1}) \{ M_{n-1} \} \text{ else } \{ 1 \} * \dots * \text{if} (\text{Switch}_0) \{ M_0 \} \text{ else } \{ 1 \}$$

For an 'Add' mux:

$$C_x = \text{if}(\text{Switch}_n) \{ M_n \} \text{ else } \{ 0 \} + \text{if} (\text{Switch}_{n-1}) \{ M_{n-1} \} \text{ else } \{ 0 \} + \dots + \text{if} (\text{Switch}_0) \{ M_0 \} \text{ else } \{ 0 \}$$

Channel configuration:

Ch1

Reverse: < Normal >

Failsafe: < Off >

Safety: < None > Value: < 0 >

Min: < -100 > Max: < 100 >

Subtrim: < 0.0 >

Cancel OK

The Channel configuration provides the ability to configure the final channel outputs. Capabilities such as channel reverse and failsafe-values are applied here. Also available are controls for end-points, subtrim, and a safety switch (which could be used to ensure that a motor cannot spin-up while working on a model)

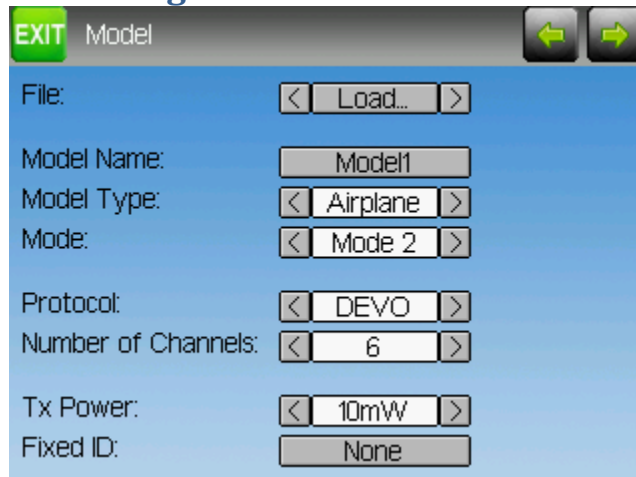
Trims:

EXIT Trim

Input	Trim Neg	Trim Pos	Trim Step
AIL	TRIM1-	TRIM1+	< 0.1 >
THR	TRIM2-	TRIM2+	< 0.1 >
ELE	TRIM3-	TRIM3+	< 0.1 >
None	None	None	< 0.1 >
None	None	None	< 0.1 >
None	None	None	< 0.1 >

The trim page allows assigning the trim buttons an trim step. Under normal circumstances it should not be necessary to modify the trim configuration, however in some cases it may be desirable to repurpose unused trims. The Trim-step defines how sensitive the trims are to input. The maximum number of trim steps is +/-100. So a step size of 0.1 will allow a full +/- 10% of trim adjustment on the servo.

Model Page:



EXIT Model

File: < Load... >

Model Name: Model1

Model Type: < Airplane >

Mode: < Mode 2 >

Protocol: < DEVO >

Number of Channels: < 6 >

Tx Power: < 10mW >

Fixed ID: < None >

The model page allows loading and copying models, as well as loading predefined model templates. It also provides configuration options for the current model, including the Model name; Helicopter/Airplane specific configurations; Transmit Protocol; Number of channels to send to the receiver; Transmit Power; and whether a FixedID is enabled.

Timer Page:



EXIT Timer

Timer 1: < stopwatch >

Switch: < None >

Timer 2: < countdown >

Switch: < None >

Start: < 00:10 >

The timer page defines the 2 available timers. Timers can count either up or down, and can be enabled either manually from the main screen or by an input trigger (stick or switch)