# Deviation Firmware User's Manual

Version 2.0-Draft2

# Table of Contents

## 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 a 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 configurable; any mix of inputs, switches, channel data, or timers can be displayed, and configured per-model. Deviation also supports customizable themes with full control over the images, fonts, and colors.

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. New language support can be added by simply copying a translation file into the appropriate directory on the transmitter.

## Installation

Installation of Deviation is done just like upgrading the Walkera firmware.
Note that Deviation will NOT overwrite Walkera models stored on the Tx. While they cannot be accessed by Deviation, they will be safely preserved should the Walkera firmware ever need to be reinstalled.

First install the deviation-x.yy.dfu firmware using the Walkera 'DfuSe USB Upgrade' tool. You will need the 'Devention DfuSe USB Upgrade Tool'from Walkera: http://www.walkera.com/cn/soft_up/soft_file_1340783602848_null.zip. **Do NOT attempt to use the DfuSe tool from STMicroelectronics!** It is recommended to test that this tool works by upgrading to a different Walkera firmware. Several users have had compatibility issues with the DfuSe tool.

Plug the transmitter into the PC via USB, and turn on the transmitter while holding 'EXT' to enter programming mode.
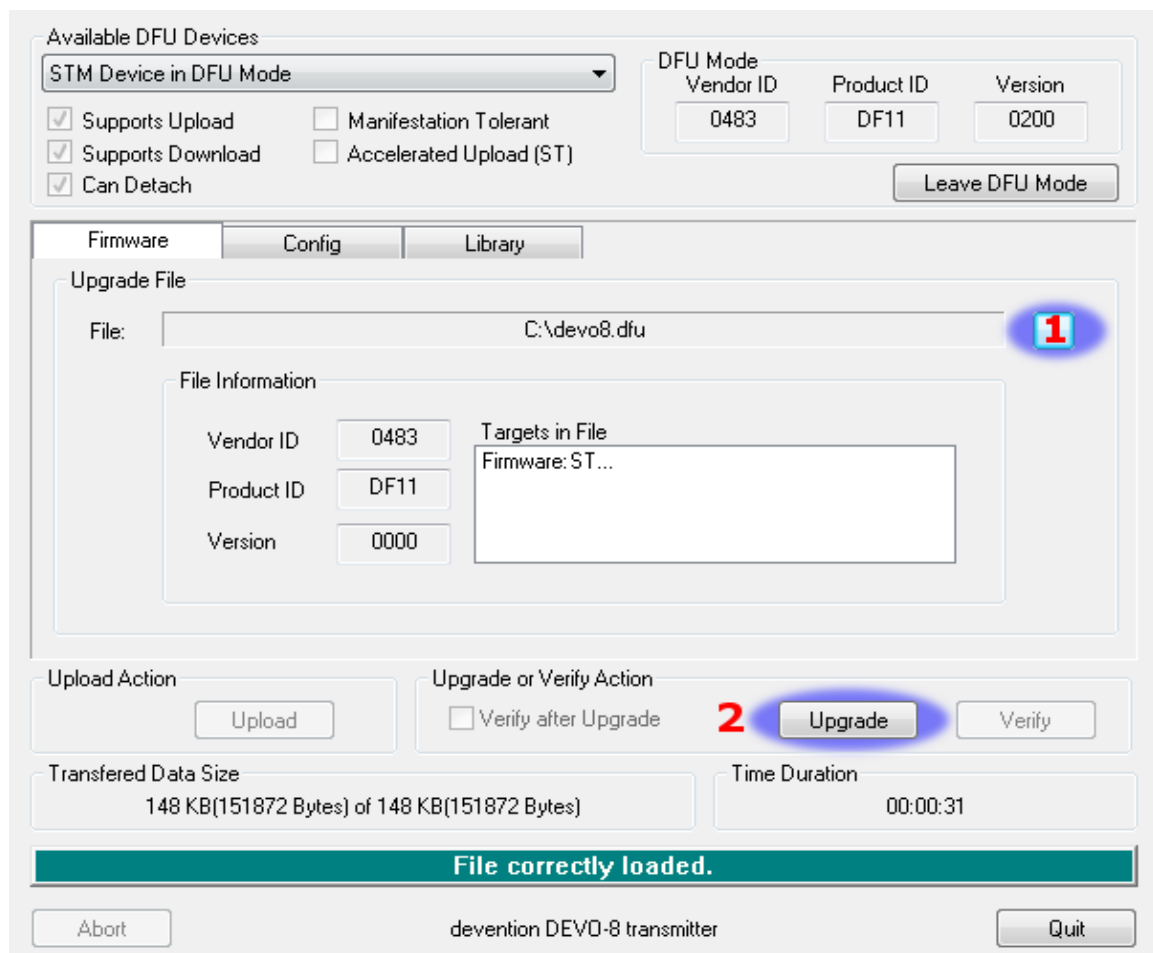


1) Press the '...' button and select the dfu file to install
2) Select 'Upgrade' to install the firmware. This will be greyed-out if your Tx is not detected. Do NOT use 'Upload' as this will do nothing other than destroy the dfu file on your PC.

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

If this is an upgrade from a previous Deviation release, it is strongly recommended to back-up the 'models' directory from the transmitter to ensure you don't lose any model configuration.  Next unzip the deviation-lib-x.yy.zip to the PC and copy all directories EXCEPT for the 'models' directory 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 this is an upgrade from the Walkera firmware, the PC should prompt to format the drive.  Format using default options.  Next unzip the deviation-lib-x.yy.zip to the Tx USB drive.

## 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 Tx.

The directory structure is as follows:

| \tx.ini | Transmitter config.  Includes trim settings, calibration data, and the last-used model number |
|---|---|
| \media\config.ini | 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 Tx theme |
| \media\*.fon | Font files |
| \models\default.ini | The default model, loaded whenever a model is cleared |
| \models\model*.ini | 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. |
| \modelico\*.bmp | All available model icons (must be 96x96 pixels) |
| \templates\*.ini | 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*.* | Language translation files.  These are UTF-8 text files containing the original English string and the respective translated string |

## Main Page
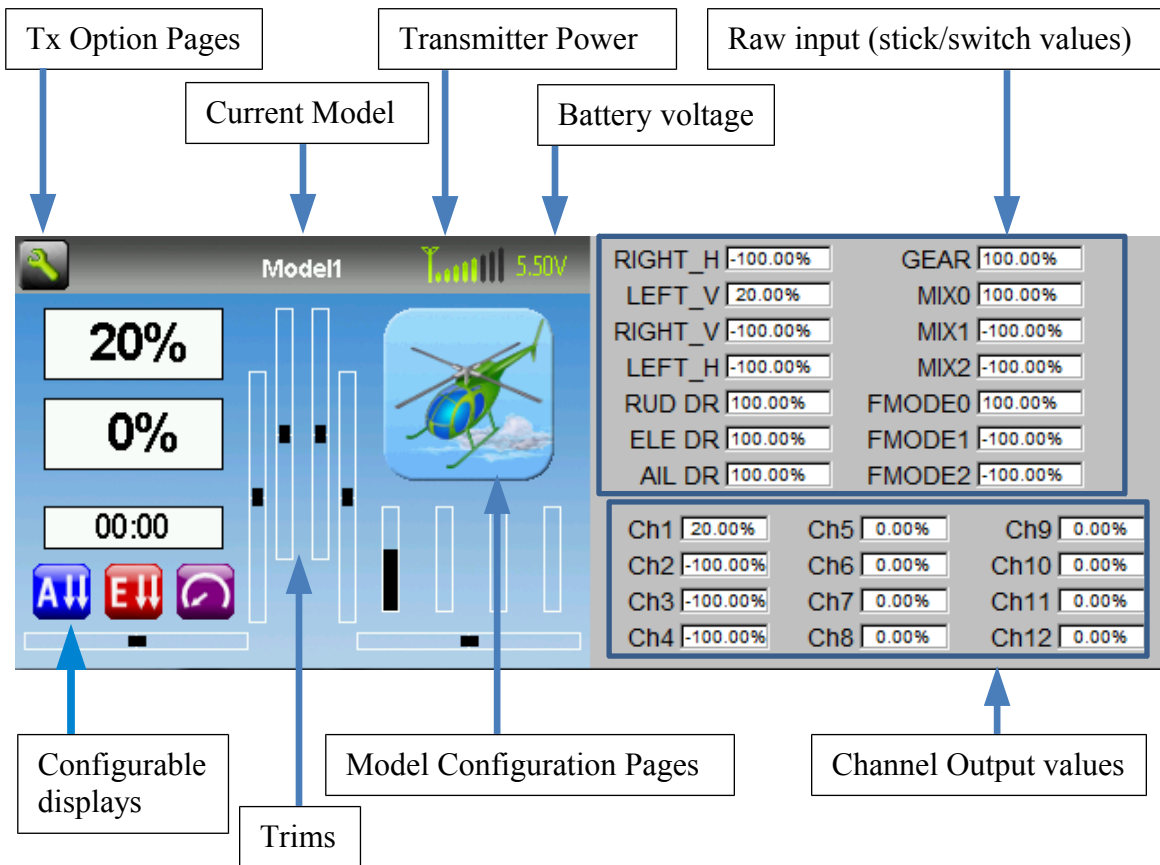


**Tx Option Pages**: Selecting this icon provides access to the main-page configuration screen; the Channel-Test screen; the frequency scanner; and USB mode

**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**: Numerical representation of current Tx battery state

**Configurable Displays**:  These can be text-boxes contacting input, channel, or timer 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 6trims

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

## Navigating

The transmitter menus can be navigated via touch-screen or with the physical buttons. With the touch screen, simply touching any button on the screen will immediately activate it.

When using the physical buttons, it is necessary to $1^{st}$ enter navigation mode before the buttons can be accessed.

On the main page, a long-press of the 'ENT' key will enter navigation mode.

On all other pages, pressing 'UP' or 'DN' will enter navigation mode

Once in navigation mode, the current widget will be highlighted, and UP/DN will select the next/previous widget.

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 gray spin-boxes, pressing ENT' will press the button

Pressing 'EXT' will exit navigation mode. If pressed when not in navigation mode, it will move back to the main screen

## *Menu Layout*
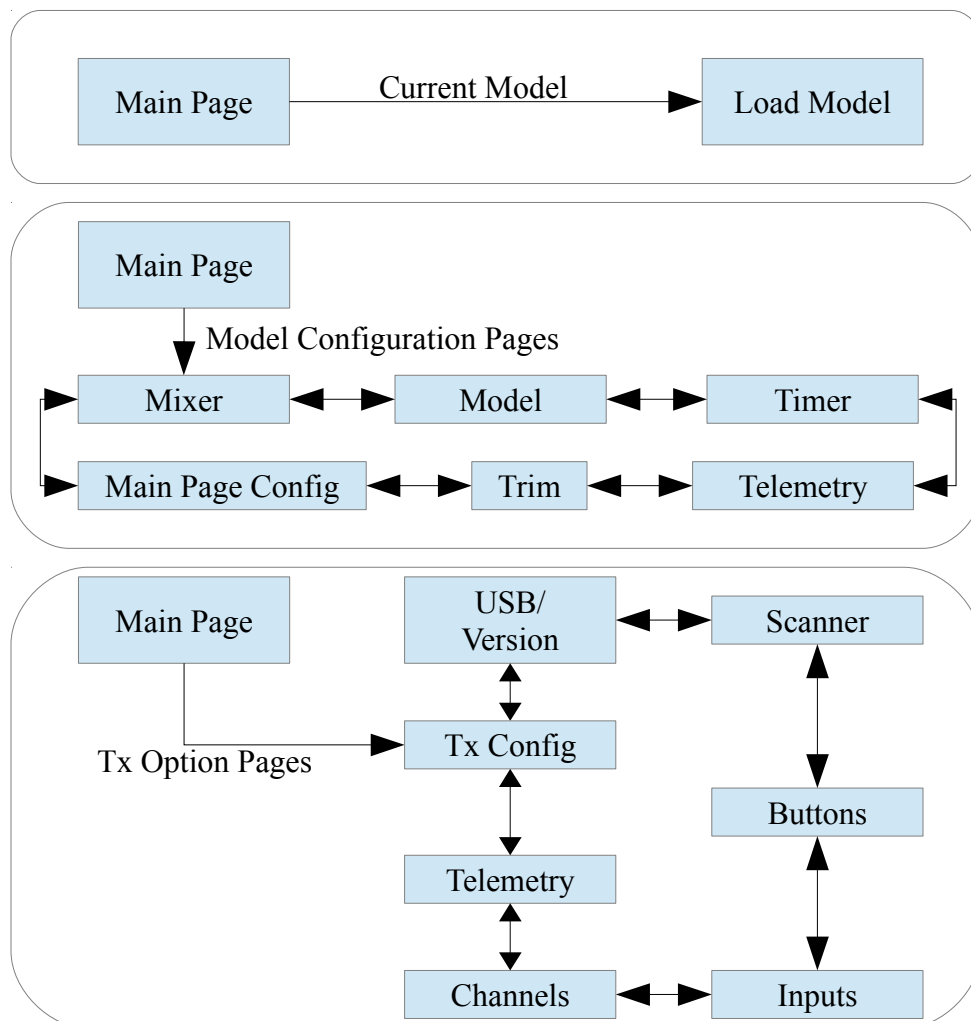
## *Emulator*

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-Horizontal 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 |

## Version Page

The Deviation release version can be accessed by selecting the Configuration icon from the main page, and moving left two pages.  If it is ever necessary to report bugs with the Deviation firmware, include the version string found here with your report.  It is also possible to enable USB from this page.  **Note that doing so should never be done while the model is bound, as USB will disrupt signal transmission!**

# Transmitter Configuration Page

The Configuration page defines various transmitter functions.

## *General Settings*
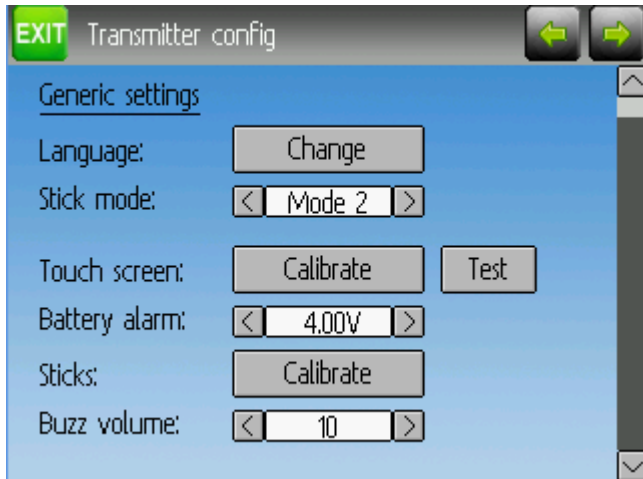


**Language**: Select an appropriate language for all text
**Stick mode**: Select one of Mode 1-4.
- Mode 1 is common in Europe.  Elevator and Rudder on left, Throttle and Aileron on right.
- Mode 2 is common in North America.  Throttle and Rudder on left, Elevator and Aileron on right.
- Mode 3 has Elevator and Aileron on left, Throttle and Rudder on right
- Mode 4 has Throttle and Aileron on left, Elevator and Rudder on right

**Touch screen**: Enter calibration or test mode
**Battery alarm**: Set battery voltage at which alarm will sound
**Sticks**: Calibrate the range of all analog sticks and dials
**Buzz volume**: Set buzzer volume

## *LCD/Telemetry Settings*



**Backlight**: Set screen brightness
**Dimmer time**: Set delay before screen dims
**Dimmer target**: Set screen brightness when dimmed
**Temperature**: Set units to display temperature for telemetry
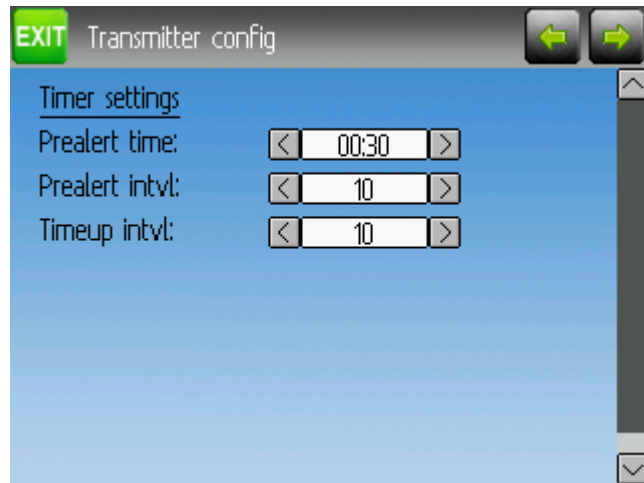**Length**: set units to display length for telemetry

## *Timer settings*

**Prealert time**: Time before timer reaches zero to start beeping
**Prealert intvl**: How often to beep before timer reaches zero
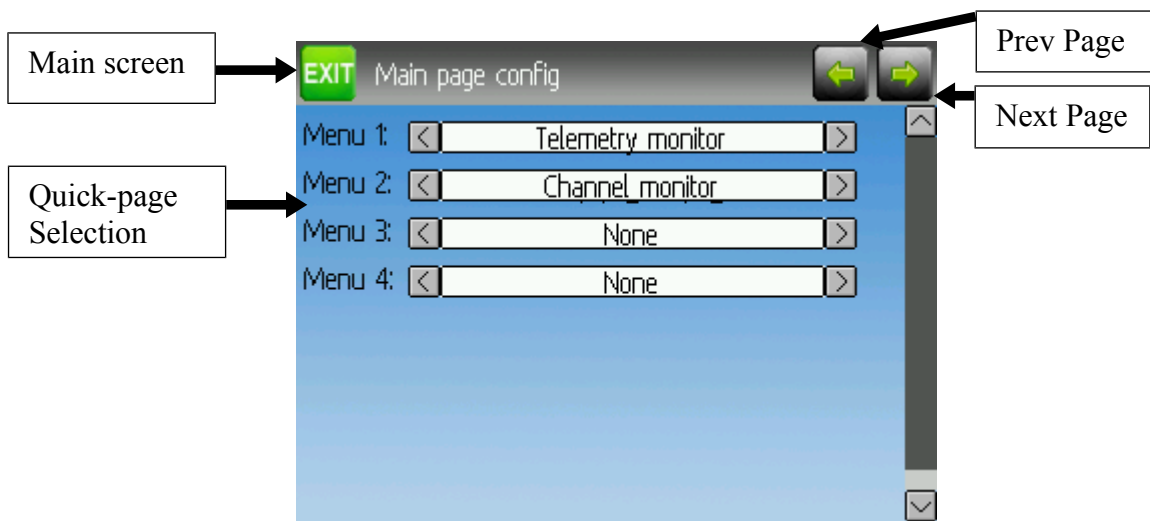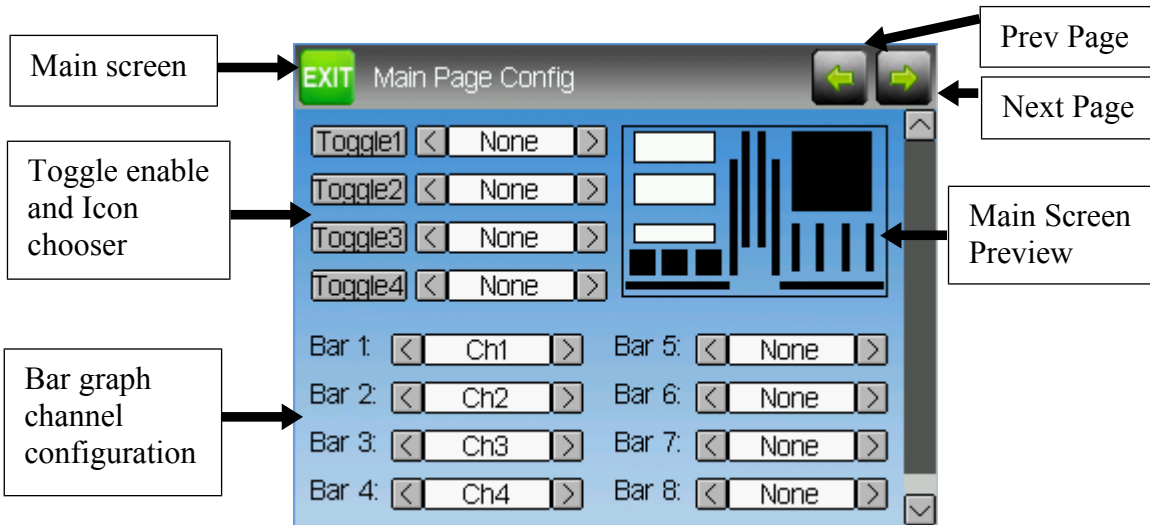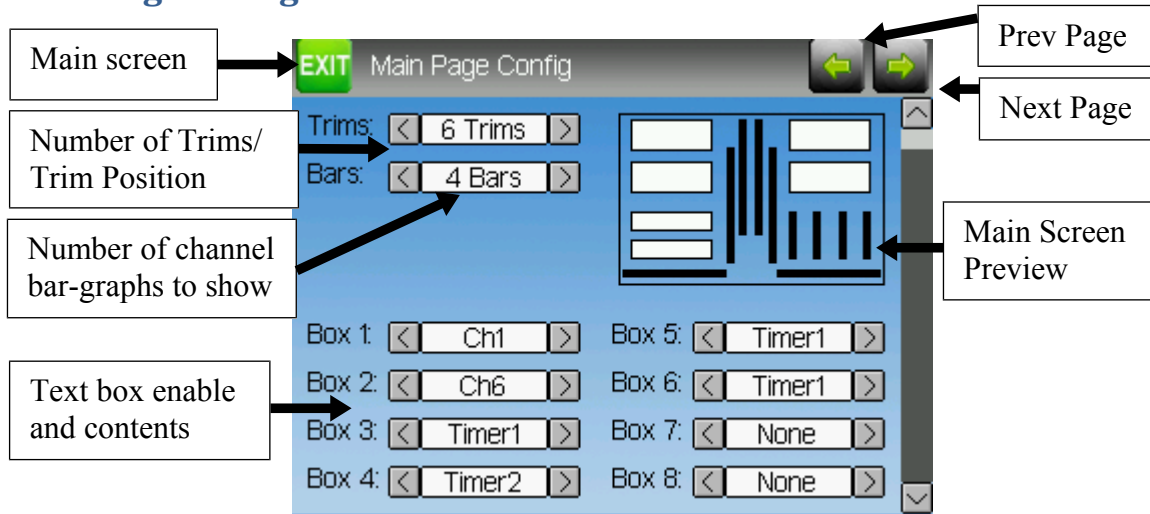**Timeup intvl**: How often to beep once timer has expired

| EXIT Transmitter config | | | |
|---|---|---|---|
| Timer settings | | | |
| Prealert time: | < | 00:30 | > |
| Prealert intvl: | < | 10 | > |
| Timeup intvl: | < | 10 | > |

## Main Page Configuration

Main screen → **EXIT** Main Page Config

Prev Page

Next Page

Number of Trims/ Trim Position → Trims: ◁ 6 Trims ▷

Bars: ◁ 4 Bars ▷

Number of channel bar-graphs to show →

Main Screen Preview

Text box enable and contents →

Box 1: ◁ Ch1 ▷    Box 5: ◁ Timer1 ▷

Box 2: ◁ Ch6 ▷    Box 6: ◁ Timer1 ▷

Box 3: ◁ Timer1 ▷    Box 7: ◁ None ▷

Box 4: ◁ Timer2 ▷    Box 8: ◁ None ▷

---

Main screen → **EXIT** Main Page Config

Prev Page

Next Page

Toggle enable and Icon chooser →

Toggle1 ◁ None ▷

Toggle2 ◁ None ▷

Toggle3 ◁ None ▷

Toggle4 ◁ None ▷

Main Screen Preview

Bar graph channel configuration →

Bar 1: ◁ Ch1 ▷    Bar 5: ◁ None ▷

Bar 2: ◁ Ch2 ▷    Bar 6: ◁ None ▷

Bar 3: ◁ Ch3 ▷    Bar 7: ◁ None ▷

Bar 4: ◁ Ch4 ▷    Bar 8: ◁ None ▷

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Main screen → **EXIT** Main page config

Prev Page

Next Page

Quick-page Selection →

Menu 1: ◁ Telemetry monitor ▷

Menu 2: ◁ Channel_monitor ▷

Menu 3: ◁ None ▷

Menu 4: ◁ None ▷

The Main Page Configuration page provides customized control of the main-page layout. The display of boxes, bars, icons, and trims along with their contents can all be controlled from here.

### Preview

The preview box portrays an approximation of the current configuration, and can be used as a reference to see how changing options will effect the main screen.

### Trim Positions

There are 3 options for the Trim Positions:

- 4 outside: Only 4 trims are shown, and they will be placed at the screen edges

- 4 inside: Only 4 trims are shown, and they are placed at the middle of the screen

- 6 Trims: 6 trims are shown., all placed towards the inside

### Bar Graphs

Bar graphs are used to visualize the state of up to 8 output channels. There are 3 possible configurations:

- None: Bar graphs are disabled and will not be displayed

- 4 bars: Up to 4 bars will be displayed using one side of the screen

- 8 bars: up to 8 bars will be displayed using both sides of the screen

Bar-graphs will only be displayed if there is room for them. For '4 bars' mode, either boxes 3&4 or 7&8 need to be disabled. For '8 bars', four boxes: 3, 4, 7 and 8 all need to be disabled.

### Boxes

Boxes are used to display interesting text values Boxes 1, 2, 5, and 6 are large boxes with a big font. Boxes 3, 4, 7, and 8 are smaller and use a smaller font. Currently a box can display one of the timers, one of the output channels, or telemetry data.

### Toggle Icons

Toggle icons are used to display the state of an input or output channel. A toggle is either on (value > 0) or off (value <= 0). Each toggle can have a different icon shown when it is active. Up to 4 toggles can be displayed. If only 4 trims are shown, the 4 toggles will replace the area used by trims 5&6. If 6 trims are shown, only 3 toggles can be shown and they will be placed either in place of box 4 or box 8. The toggles will only be shown if there is room for them (no box or bar-graph is using that space).

### Quick-page Selection

Quick-pages allow quick access to other pages from the main page via Left/Right buttons. Up to four quick-pages can be configured.

## Mixer
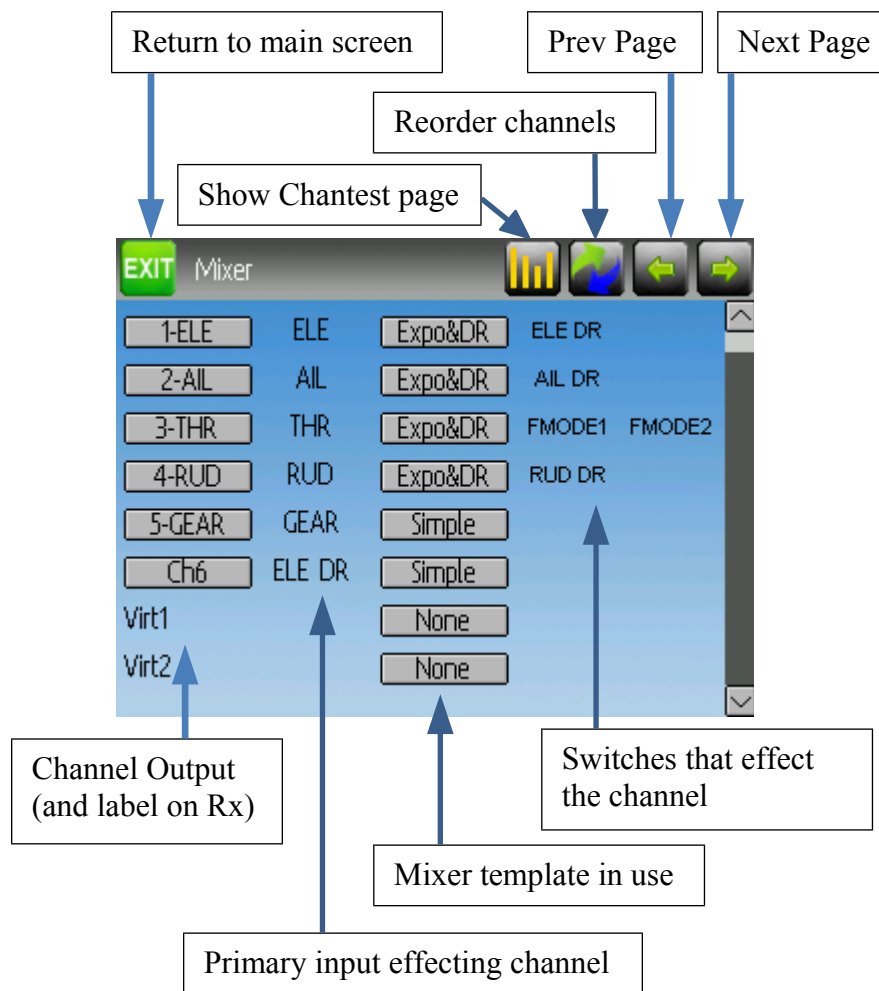


The Deviation mixer is modeled after the Er9x implementation. Each output channel is composed of a series of one or more mixers each of which consists of a single input, an activation switch, and a function/curve that modifies the mixer output. This is a very powerful capability, but it is requires a 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.

The number of channels available is dependent on the number of channels selected on the Model Page. Additionally there are 10 Virtual channels that can be used as an intermediate step for complex setups (see Error: Reference source not found for an example)

Channels can be reordered by pressing the Reorder Channels button.

## *Channel Reorder*

The Channel reorder page allows moving mixer definitions between channels as well as duplicating channel configurations. Note that the values displayed are the initial channel assignments. Whenever the page is loaded, the channels will be sequentially ordered representing the current state.
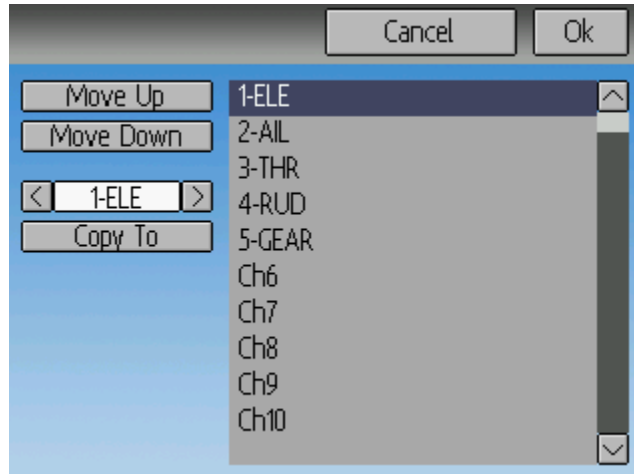
## *Simple Template*

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
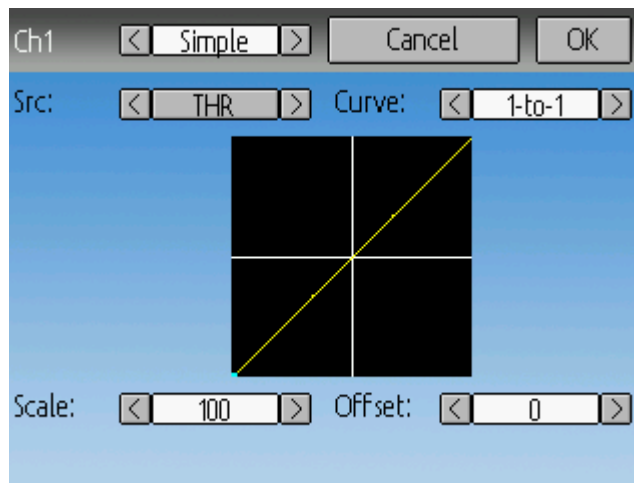
**Src**: The input source controlling this mixer
**Curve**: The function applied to the input to generate the output. See the Curve section for more info. Selecting the 'Curve' spin-box (or clicking the graph) will allow configuring the Curve in the case that a multi-point curve or Expo-rate are chosen.
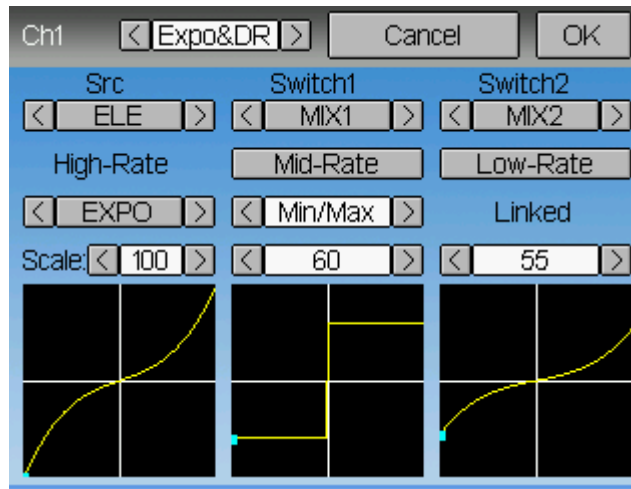**Scale**: A multiplicative scalar that is applied after the Curve to control the output range
**Offset**: an additive offset that is applied after the scaling.

## *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

Selecting a value for Switch1 or Switch2 will activate the corresponding section. Each section can either have a 'linked' curve (curve is the same as the 'High Rate' curve) in which case only the scalar can be modified, or alternatively can have an independent curve definition. Pressing the 'Mid-Rate' or 'Low Rate' button for a given switch will toggle between linked and independent curves.

**Src**: The input source controlling this mixer
**Curve**: The function applied to the input to generate the output. See the Curve section for more info. Selecting the 'Curve' spin-box (or clicking the graph) will allow configuring the Curve in the case that a multi-point curve or Expo-rate are chosen.
**Switch**: Specify a switch to enable Medium or Low rates.
**Scale**: A multiplicative scalar that is applied after the Curve to control the output range

## *Complex Template*

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.
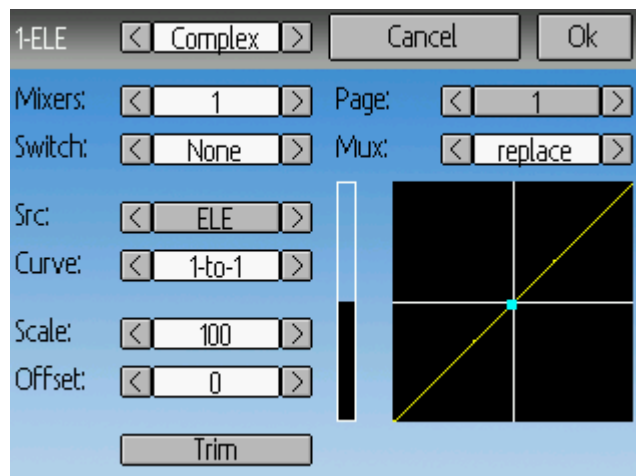
The Complex Mixer page has the following options:
**Mixers**: Specify the number of mixers for this channel
**Page**: Specify the current mixer page being edited. Pressing the spin-box will allow reordering the pages of the current channel.
**Switch**: Specify an optional switch which determines whether the current mixer is active.
**Mux**: Defines how the current mixer is applied to the previously defined mixers for this channel. Options are:
- **Replace**: If this mixer is active, all previous mixers are ignored
- **Add**: Add the value of this mixer to the previous mixers
- **Mult**: Multiply the value of this mixer with the previous mixers
- **Max**: The output will be the greater of the current mixer vs the previous mixers
- **Min**: The output will be the lesser of the current mixer vs the previous mixers

**Src**: The input source controlling this mixer

**Curve**: The function applied to the input to generate the output. See the Curve section for more info. Selecting the 'Curve' spin-box will allow configuring the Curve in the case that a multi-point curve or Expo-rate are chosen.
**Scale**: A multiplicative scalar that is applied after the Curve to control the output range
**Offset**: an additive offset that is applied after the scaling.
**Trim**: Selects whether or not any trims for the selected Source are applied to this mixer

Note that while the scale value is limited to 100%, the mixer may provide a value larger than 100% if an offset is set or if the trim value is non-zero.

A given mixer can be considered to have the general form:
M(x) = if(*Switch*) { *Src * Curve * Scale + Offset*} else {0} + *Trim*

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

For a 'Replace' mux:
$Cx$ = if(Switch$_n$) {$M_n$} else if (Switch$_{n-1}$) {$M_{n-1}$} … else if (Switch$_0$) {$M_0$}

For a 'Multiply' mux:
$Cx$ = if(Switch$_n$) {$M_n$} else {1} * if (Switch$_{n-1}$) {$M_{n-1}$} else {1} * … *
if (Switch$_0$) { $M_0$} else {1}

For an 'Add' mux:
$Cx$ = if(Switch$_n$) {$M_n$} else {0} + if (Switch$_{n-1}$) {$M_{n-1}$} else {0} + … +
if (Switch$_0$) { $M_0$} else {0}

For a 'Max' mux:
$Cx$ = MAX(if(Switch$_n$) {$M_n$} else {0}, if (Switch$_{n-1}$) {$M_{n-1}$} else {0}, …,
if (Switch$_0$) { $M_0$} else {0})

For a 'Min' mux:
$Cx$ = MIN(if(Switch$_n$) {$M_n$} else {0}, if (Switch$_{n-1}$) {$M_{n-1}$} else {0}, …,
if (Switch$_0$) { $M_0$} else {0})

## Reordering Mixers

Since the ordering of mixers is important to the output, it is possible to reorder and/or copy mixers in order to facilitate building complex rules. This page is accessed by pressing the 'Page' spin-box on the complex mixer page.
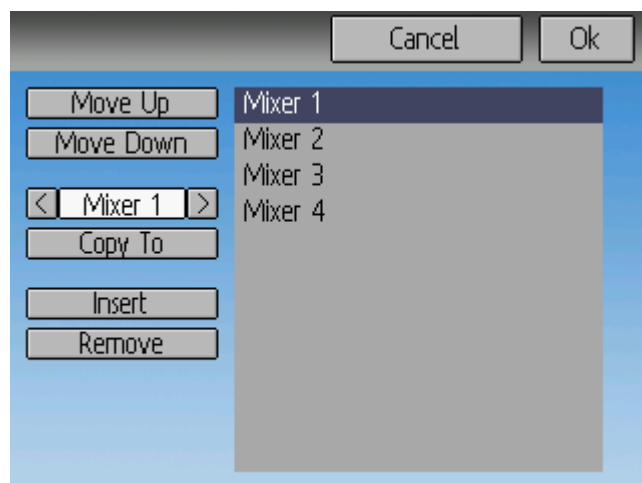
Select the respective mixer and use the up/down buttons to move the order of the selected mixer.  Note that the mixer name represents its position when the reorder dialog was opened.  If the dialog is closed and reopened, all mixers will be shown as numbered sequentially.

The reorder page can add new mixers or delete existing ones using the 'Insert' and 'Remove' buttons respectively.  A mixer can also be copied to an existing mixer (overwriting it in the process) by using the 'Copy To' functionality

## *Available Curves*

The following curve functions are supported:
**1-to-1**: Output is equal to the input (not editable).
**Fixed**: Output is constant regardless of input (not editable).
**Min/Max**: Output is -100 if input is < 0 and 100 if input is >= 0 (not editable)
**Zero/Max**: Output is 0 if input is < 0 and 100 if input is >= 0 (not editable)
**>0**: Output is 0 if input is < 0 and matches the input when >= 0 (not editable)
**<0**: Output matches the input when < 0 and is 0 if input is >= 0 (not editable)
**ABSVAL**: Output is the absolute-value of the input (not editable)
**EXPO**: Apply exponential curve to the input for non-linear response (editable)
**Deadband**: Output will not respond to input values near zero (editable)
**Multi-point**: Curve is based on 3 to 13user-defined points

## *Curve Editing*

The Curve Editor is accessed by pressing a graph or by pressing the curve spin-box when it is selectable.  Some curve types may not be edited (any of the curves preceding the 'Expo' curve), and the curve-box will not be selectable if one of these curves is currently active.
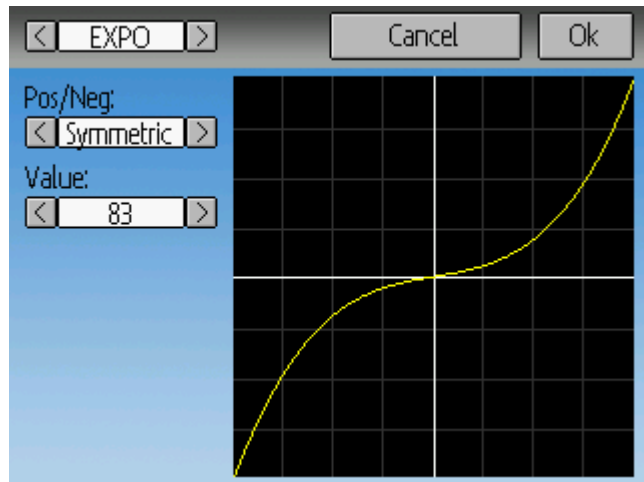


The Curve editor page will be difference depending on which curve is selected.  It is not possible to change the curve type from the curve editor (except when a multi-point curve is selected)
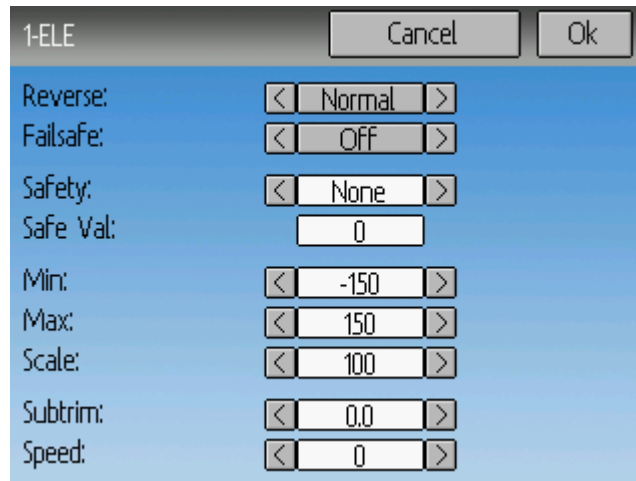
For the Expo curve, the controls allow independently configuring the shape of the curve for values greater-than or less-than zero.

For the Deadband curve, the controls allow independently configuring the deadband width for values greater-than or less-than zero.

For the Multi-point curves, Each point can be individually set.  Points are set by choosing the point number and then choosing a value.  Touching the graph will allow quickly setting the value to the touched y-coordinate.

## *Channel configuration*

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, scaling, sub-trim, and a safety switch (which could be used to ensure that a motor cannot spin-up while working on a model)

| 1-ELE | | Cancel | Ok |
|---|---|---|---|
| Reverse: | | Normal | |
| Failsafe: | | Off | |
| Safety: | | None | |
| Safe Val: | | 0 | |
| Min: | | -150 | |
| Max: | | 150 | |
| Scale: | | 100 | |
| Subtrim: | | 0.0 | |
| Speed: | | 0 | |

**Reverse**: Reverse the direction of servo rotation

**Failsafe**: Specifies a value that the Rx should use when it loses signal from the transmitter. Not all receivers support this capability.

**Safety**: Specifies a switch that will override all mixers and force the channel output to 'Value' when flipped.

**Min/Max**: These values define the minimum and maximum values that the transmitter will ever send to the receiver (after all scaling and trims are applied). If a calculated value is outside the min/max range, it will be clipped to either the min or max value as appropriate.
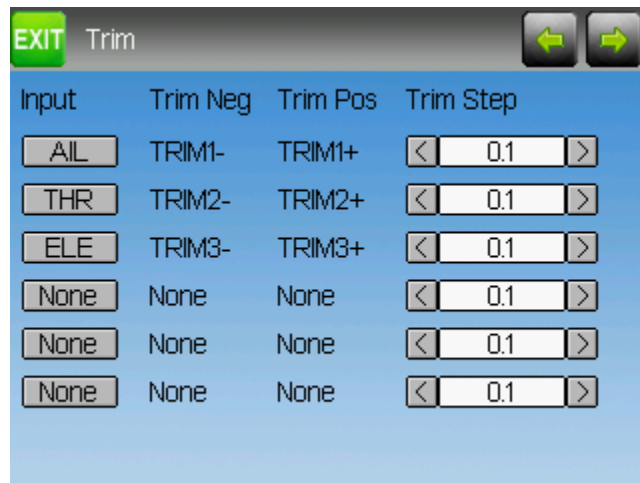
**Scale**: This is a final scalar to adjust the servo throw.

**Sub-trim**: Adjust servo zero position

**Speed**: Adjust maximum servo speed. Zero is disabled (fastest), 1 is slowest, 100 is fastest rate.

## Trims and Virtual Inputs

The trim page allows assigning the trim buttons and trim step, as well as configuring buttons to work as virtual inputs.

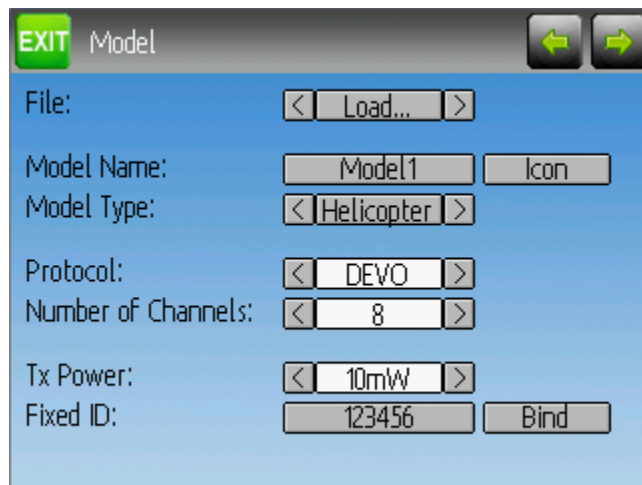If the 'Input' field is set to an input stick, then the trim is applied as part of the mixer, and will operate as a typical trim control. If the 'Input' field is set as a channel or virtual-channel output, the value is applied directly to the channel output. In this case, the selected 'Pos' and 'Neg' buttons can operate as a virtual stick to control an output channel.

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

The model page provides various model configuration options.

**File**: The File spin-box allows loading a new model, copying the existing model to a new location, resetting the current model to the default (all configuration is lost), and loading templates (see Error: Reference source not found)

**Model Name**: Set the model's name

**Model Icon**: Choose the model's icon

**Model Type**: Set the model type. Some models (e.g. helicopter) have additional configuration options that can be accessed by clicking the Model type.

**Protocol**: Set the type of Rx being used. Note that some protocols have additional options that can be accessed by pressing the Protocol spin-box when it is active.

**Number of channels**: Sets the number of channels to transmit.

**Tx Power**: Specify the radio output power when applicable.

**Fixed ID**: The Fixed ID sets a unique code to ensure that the Tx will only bind to a specific model. This is useful to ensure that the Tx is not accidentally bound to the wrong model.

**Bind**: Depending on the protocol and Fixed-ID setting, the Tx may bind with the model on start-up, or may need to be manually bound once.

| Protocol | Fixed ID = None | Fixed ID set |
|---|---|---|
| Devo | Bind on start-up | Manually bind with button |
| WK2801 | Bind on start-up | Manually bind with button |
| WK2601 | Bind on start-up | Bind on start-up |
| WK2401 | Bind on start-up | Bind on start-up |
| DSM2 | Manually bind with button | Manually bind with button |
| J6Pro | Manually bind with button | Manually bind with button |
| Flysky | Bind on start-up | Manually bind with button |
| Hubsan4 | Bind on start-up | Bind on start-up |
| PPM | No binding | No binding |

## *Protocol Options*

Some protocols have customization values available.

## Protocol: WK2601

**Chan mode**: Sets how channels are processed:

- 5+1: AIL, ELE, THR, RUD, GYRO (ch 7) are proportional. Gear (ch 5) is binary. Ch 6 is disabled

- Heli: AIL, ELE, THR, RUD, GYRO are proportional. Gear (ch 5) is binary. COL (ch 6) is linked to Thr. If Ch6 >= 0, the Rx will apply a 3D curve to the Thr. If Ch6 < 0, the Rx will apply normal curves to the Thr. The value of Ch6 defines the ratio of COL to THR.

- 6+1: AIL, ELE, THR, RUD, COL (ch 6), GYRO (ch 7) are proportional. Gear (ch 5) is binary. This mode is highly experimental.

**COL Inv**: Invert COL servo

**COL Limit**: Set maximum range of COL servo

## *Predefined Templates*

The Deviation firmware supports user-customizable predefined templates. By Selecting 'Template...' From the Model page, it is possible to select one of these options

Additional templates can be added via USB to the '\template' directory. A template does not completely replace your existing model, but instead only a portion of it. The currently supported templates will replace the mixer and trim definitions, but will not affect the display layout. In the future Deviation will support templates that only affect the display layout without affecting the mixers as well.
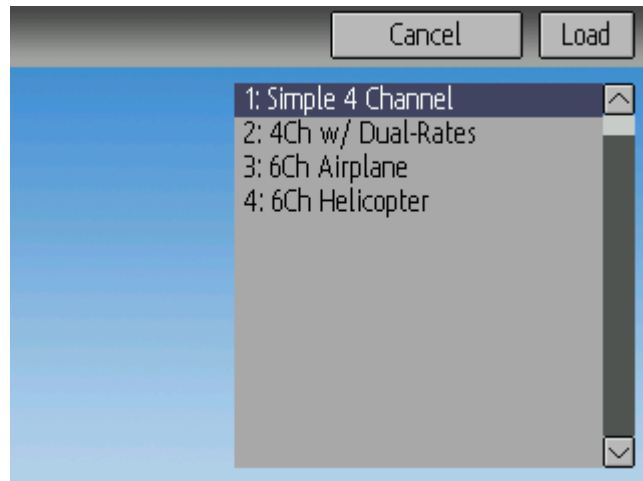
## Timer Page

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)

## Telemetry Configuration Page

The telemetry configuration page allows specifying alarms when specific telemetry events occur.



**Telemetry**: Specify the telemetry input to use for alarm control.  This can be a temperature probe, voltage probe, or RPM probe.
**Equality**: Can be '>=' or '<=' indicating whether a value above or below the target causes an alarm.
**Target**: The target value for the alarm

## Helicopter Setup

Deviation has several configuration options to make setting up a helicopter easier. These settings are primarily for enabling 6-channel CCPM helicopters. 4-channel helicopters do not need to follow these instructions.

The easiest way to configure a helicopter is to select '6 Ch Helicopter' from the 'Template' section of the model page. This will provide a good starting point for configuring a helicopter. However, the following documents step-by-step instructions for configuring a helicopter from scratch to explain what the template is doing.

### *Step 1: Type and Swash*

Select 'Helicopter' as the model-type on the Model Page.
Next click on 'Helicopter' on the Model page to open the Helicopter Options page:
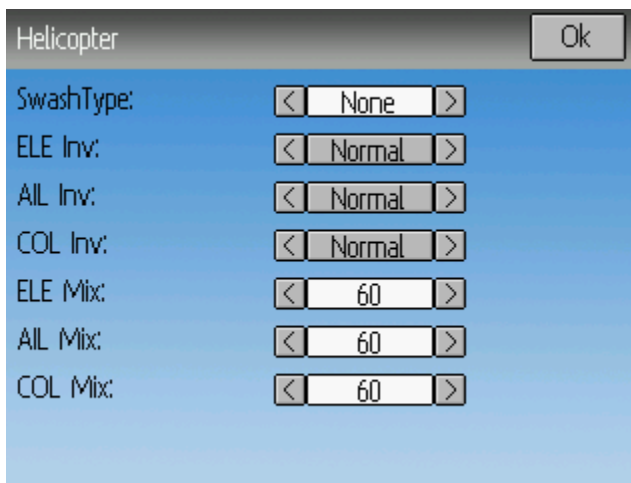


The Swash type can be one of:
- **None**: Use for most flybarless helicopters
- **120**: The most common setup for flybar helicopters. 3 servos in 120 degree configuration
- **120x**: The same as 120 but with the 'aileron' and 'elevator' servos swapped
- **140**: An alternative, less-used configuration
- **90**: Servos at 90 degrees apart

The ELE Inv, AIL Inv, and COL Inv options let you invert the direction of each primary input during the Cyclic mixing

The ELE Mix, AIL Mix, and COL Mix control the relative percentage of each primary input during Cyclic mixing. Note that the values are normalized to a sum of 180. So there is no difference between a setting of 60/60/60 and 100/100/100.

Make sure you have at least 6 channels selected on the Model page.

## Step 2: Cyclic Setup

Next go to the Mixer page, and set the following channels to the corresponding template (there are no configuration options for the Cyclic templates)

- Channel 1 (or 'ELE' channel) to 'Cyclic1'
- Channel 2 (or 'AIL' channel) to 'Cyclic2'
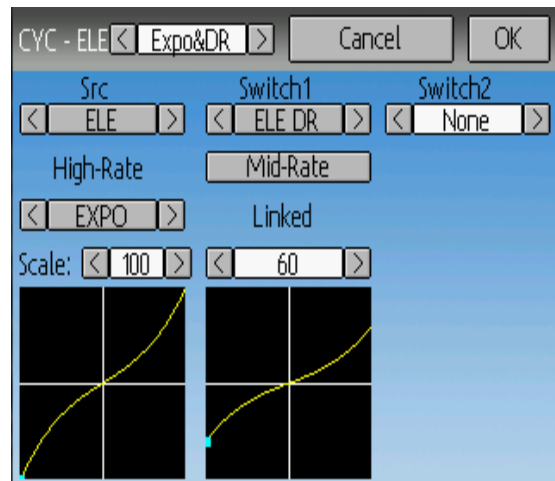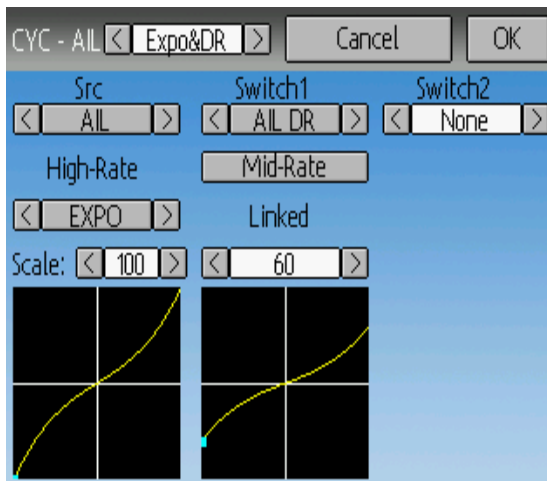- Channel 5 to 'Cyclic 3'

## Step 3: Mixer Setup

Once any channel has been set to a Cyclic template, the mixer page will show new virtual channels:



## Step 4: Aileron, Elevator, and Rudder Mixing

The following documents the Dual-rate settings for Aileron, Elevator, and Rudder



The settings for all 3 are nearly identical (only the channel and switches are different). The above images show the Aileron and Elevator settings (Rudder is not shown).

|  | Aileron | Elevator | Rudder |
|---|---|---|---|
| Channel | CYC-AIL | CYC-ELE | Ch3 |
| Template | Expo&DR | | |
| Src | AIL | ELE | RUD |
| Switch1 | AIL DR | ELE DR | RUD DR |
| Switch2 | None | | |
| Mid-Rate | Linked | | |
| Curve | Expo – 45% | | |
| Scale(Src) | 100% | | |
| Scale(Switch1) | 60% | | |

This configuration enables low-rates with the dual-rate switches separately for elevator and aileron channels, with some expo.  The low rates have the same curve as the high-rates, but with 60% throw.

## Step 5: Pitch Mixing

The pitch is setup to enable 3D with Fmode1 and Fmode2.  In this example, there is no difference between usingFMODE1 and FMODE2.



The Pitch is setup as follows:

| Template = Expo&DR | | |
|---|---|---|
| **Src** | **Switch1** | **Switch2** |
| THR | FMODE1 | FMODE2 |
| 5pt: -30, -15, 0, 50, 100 | 1-to-1 | 1-to-1 |
| Scale=100% | Scale=100% | Scale=100% |

## Step 6: Throttle Setup

The throttle uses a Complex mixer in order to support the throttle-hold. When THOLD is enabled, the throttle will cut to zero, but the Collective will continue to function.

| Page | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| # Mixers | 1 | | | |
| Switch | None | FMODE1 | FMODE2 | GEAR |
| Src | THR | | | |
| Curve | 5pt: -100,-20,30,70,90 | 5pt: 80, 70, 60, 70, 100 | 5pt: 100, 90, 80, 90, 100 | Fixed |
| Scale | 100 | | | -100 |
| Offset | 0 | | | |
| Trim | Enabled | | | |