NJoy32 Family Controllers Configuration Utility

User guide

V. 2.19, 16.08.2023.

Table of content

Chapter 1. Overview

VKB Njoy32 device configuration tool is intended to make the following actions:

- setup joystick controls,
- joystick axes calibration,
- save and load joystick parameters,
- preparing controller to firmware upgrade.

VKB Njoy32 device configuration tool (configurator) is saved in *VKBDevCfg-C.exe* file. It does not need to be installed. To launch configurator you must just execute this file. Up-to-date configurator versions you can find at VKB site http://forum.vkb-sim.pro in Download page. This page contains actual versions of firmware, profiles and firmware upgrade tool saved in *Z-Bootloader.exe* file.

1.1. Hardware and software requirements

Configurator works with the following VKB devices:

- Gunfighter SCG,
- Gunfighter MCG,
- Gladiator series,
- Gladiator NXT series,
- Gladiator NXT EVO series,
- FSM, THQ, SEM modules with GNX HID controller,
- Mamba series,
- KingCobra series,
- pedals with TinyBox,
- ThrottleBox,
- BlackBox with any grips,
- Cobra-Z (Defender Cobra M5 USB Mk2 with Njoy32 controller).

Configurator works under Windows XP, Windows 7, Windows 10.

1.2. What`s new

1.2.1. V.2.7

- Relative axes description (see 3.4 on p. 35).
- Radiobutton button function (see 4.3.3 on p. 54).
- RelAxes – relative axis mode control button function (see 4.3.23 on p. 95).
- Ministick mode switch button function (see 4.3.14).
- Boolean – Boolean functions for buttons.
- Analog POV (see Chapter 6 on p. 114).

- New Axis to buttons subfunction.
- GTR/GTR2 pulse generators.
- Trimmer return (see “Trimmer Reset, Trimmer Return” on page 84)

1.2.2. V.2.8

- RT-trigger in Boolean functions.

1.2.3. V. 2.9

- MCG Pro folding trigger setup (see 3.7.2 on p. 44).
- New event for indication – Mouse active (see 2.4.11 on p. 28).
- MCG Pro folding trigger calibration (see MCG Pro folding trigger calibration on p. 46).

1.2.4. V.2.10

- Smooth trimmer reset (see Trimmer Reset, Trimmer Return on p. 84).
- Using clipboard for physical lines setting (see Line (input control) choice on p. 50).
- Two virtual buttons switch on diagonal HAT pressing (see 6.3.2 on p. 115).
- CMP function, Comparator in Boolean functions.
- JMP function, Jumper in Boolean functions.
- Using Drag-n-Drop for profile loading (see 9.4.2 on p. 138).

1.2.5. V.2.11

- BrakeV3 axes combining mode (see BrakeV3 on p. 39).
- Simplified setup of axes response to buttons converting (see 3.7.3 on p. 44).

1.2.6. V.2.14

- Network technologies (see. Chapter 12 on p. 153).
- Controller connection using Z-Link (see sect. 12.6 on p. 160.
- Alternative colors.
- Flash LED mode.
- Forced Limit for relative axes.
- New axes combining BrakeV modes (see sect. 3.5.4 on p. 37).
- New response curve configuring mode (see sect. 3.6 on p. 40).
- Dependent Button BD (see sect. 4.3.6 on p. 58).
- uStick ministick mode switch (see sect. 4.3.14 on p. 71).
- uPOV active POV switch (see sect. 4.3.15 on p. 73).
- Complementary button Switch CB (see sect. 4.3.16 on p. 74).
- Dynamically deadzone disable DZ Switch (see sect. 4.3.24 on p. 96).

- New features of Tempo function (see sect. 4.3.18 on p. 81).
- New auxiliary axes functions SWITCH 0, PAI INV, SPLIT Rev (see sect. 4.3.22 on p. 92).
- New ministick output types (see sect. 6.3 on p. 114).
- New ministick function, Shifter 6W (see sect. 6.3.5 on p. 116).

Edited:

- Button assignments report.

Excluded:

- Profile switch on-the-fly,
- Group button operations.

1.2.7. V.2.15

- Relative+Absolute virtual mouse mode. Instant cursor movement (see sect. 2.4.11 on p. 28).

1.2.8. V.2.16

- Extended firmware upgrade method ().
- Response curve selection (see sect. 3.6 on p. 40).
- ButtonS multi type (see sect. 4.3.4).
- uPOV Switch (see sect. uPOV Switch on p. 73).
- Void function for macro (see sect. Delay parameters on p. 134).
- New Boolean functions interface (see Chapter 7 on p. 118).

1.2.9. V.2.17

- Fixed joystick button name error.
- **Hub** checkbox for Booleans (see Chapter 7 on p. 118).

1.2.10. V.2.18

- Virtual controllers (see section 2.4.7 on p. 26).
- Custom axis response curves for virtual mouse (see sect. 2.4.11 on p. 28).
- PID control (see sect. 2.4.12 on p. 29).
- Set instant virtual mouse cursor position (see sect. 5.6.2 on p. 108).
- ButtonM – button under control of Modal Switch (see sect. 4.3.7 on p. 58).
- Modal Switch (see sect. 7.16 on p. 128).
- Custom multiplier values for encoder configured as trimmer (see sect. Trimmer on p. 67).
- **Set Value2** mode for REIAxes (see sect. SET Value 2 on p. 96).
- New methods for Sync function (see sect. 4.3.26 on p. 98).

1.2.11. V.2.19

- Additional ButtonD parameters (see section 4.3.6 on p. 58).

Chapter 2. Using configurator

2.1. Interface

After you launch *VKBDevCfg-C.exe* the main **VKBDeviceConfig** window will appear. The title bar contains configurator version (Fig. 2.1).

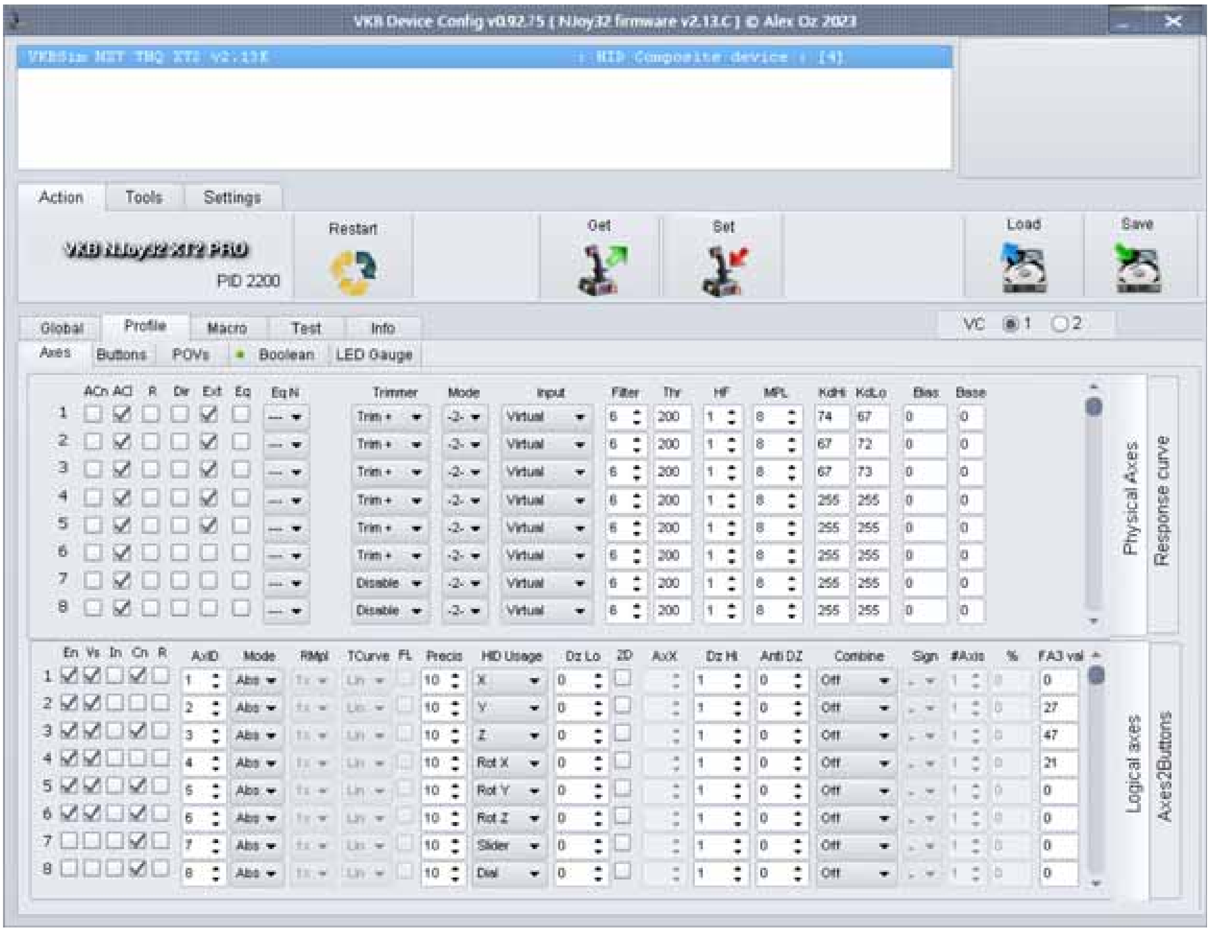


Fig. 2.1.

Connected VKB devices are listed in this window. To setup certain device you must select it in the list.

2.1.1. Device info

Info tab contains the following device data:

- product name,
- firmware version,
- device mode (pro/light),
- T-Link support ready (for pedals controller).

You can see an example of **Info** tab content on Fig. 2.2.

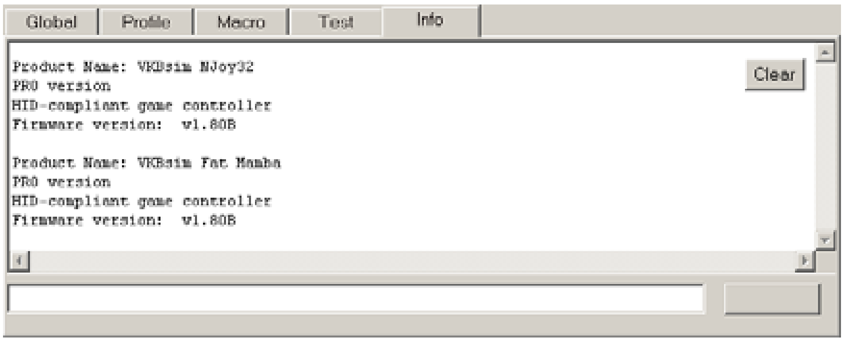


Fig. 2.2.

2.2. Firmware upgrade

2.2.1. Software activation

Using VKBDevCfg-C.exe

Execute the following actions to upgrade firmware.

1. Connect controller to the PC.
2. Run *VKBDevCfg-C.exe*, select joystick name in the list (fig. 2.1 on p. 19).

3. Press **Bootloader** button on **Tools** tab.

   You will see firmware upgrade utility window (fig. 2.3).

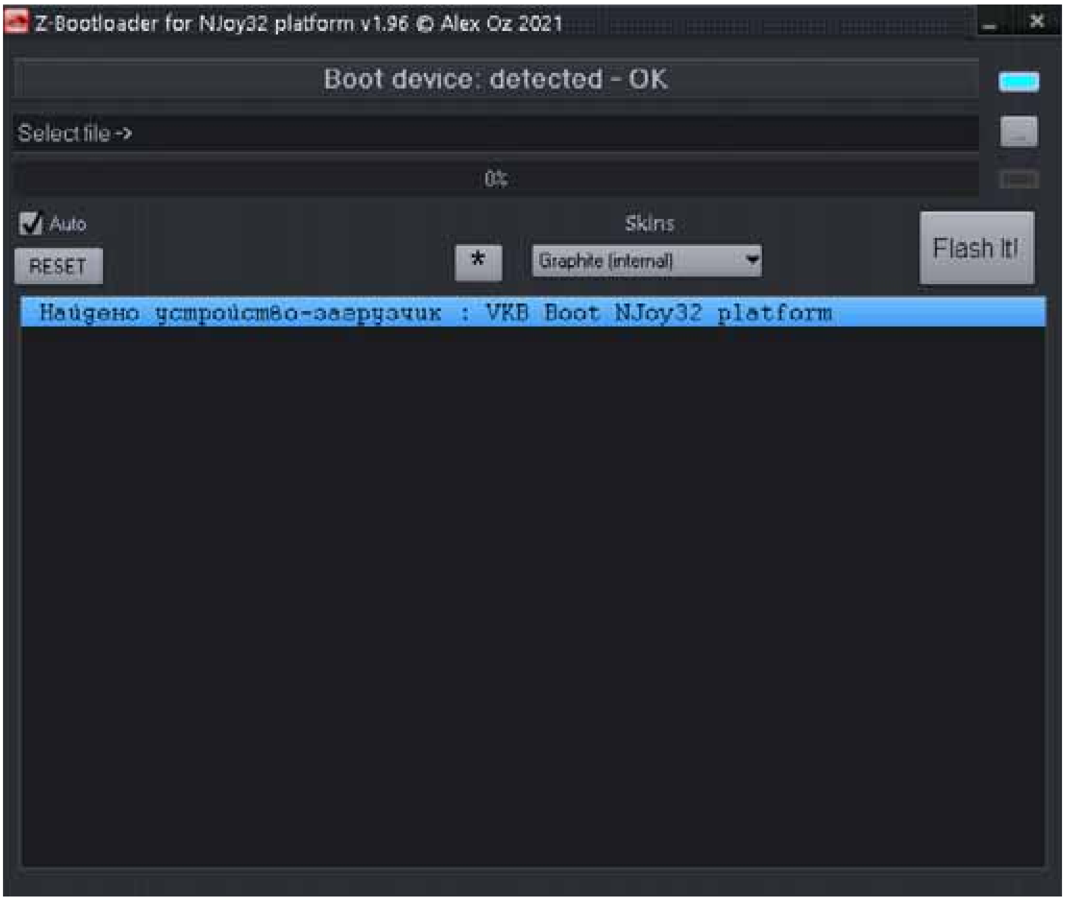
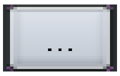


Fig. 2.3.



4. Press **Browse** button and select firmware file in standard Windows dialog.

   You will see its name in dialog.

5. Press **Flash It!** button.

   Some information messages will appear in utility window. After successful upgrade completion z-bootloader window will be closed automatically.

Some versions of firmware reset controller parameters to default values. If you have made custom settings of controller parameters save you profile to file. After firmware upgrade you can load your custom profile (see Chapter 9 on p. 137).

Direct launch Z-Bootloader

Launch Z-Bootloader.exe. You will see firmware upgrade utility window (fig. 2.4).

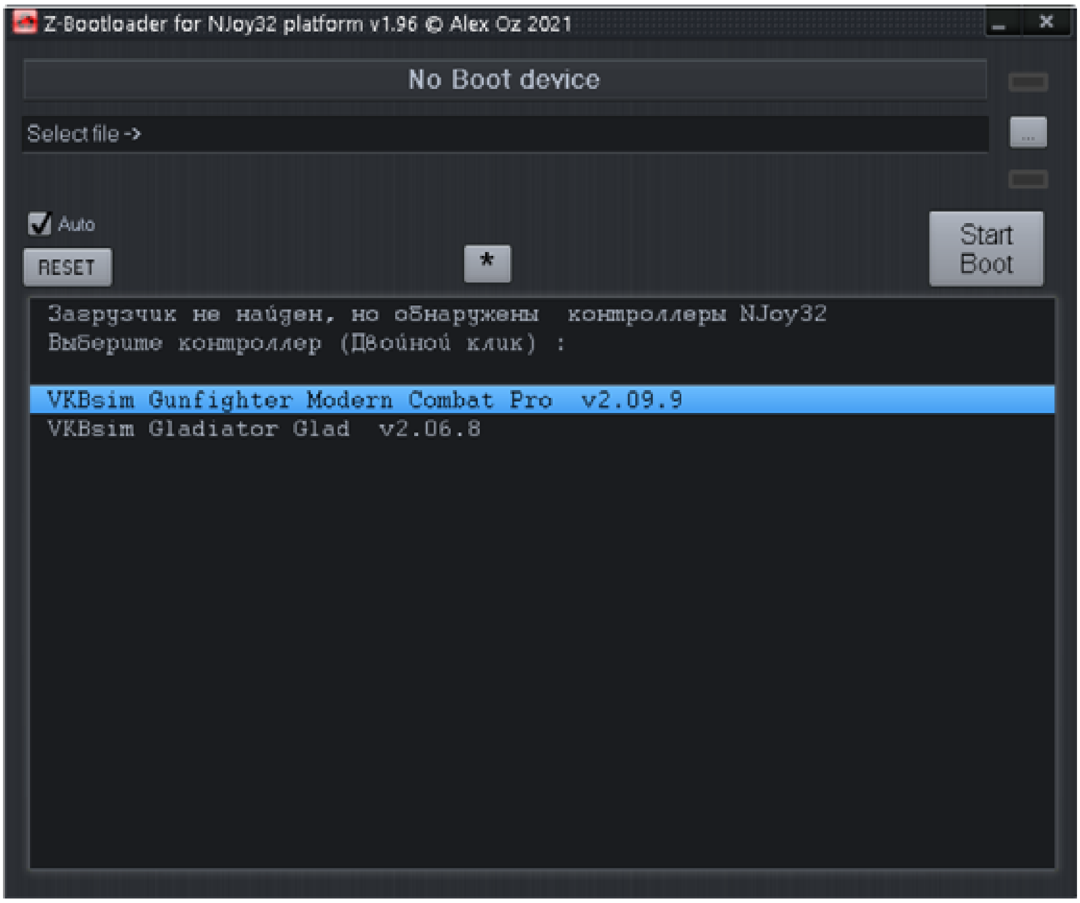


Fig. 2.4.

Doubleclick desired controller name to prepare it to firmware upgrade. Boot device will be detected (fig. 2.5).

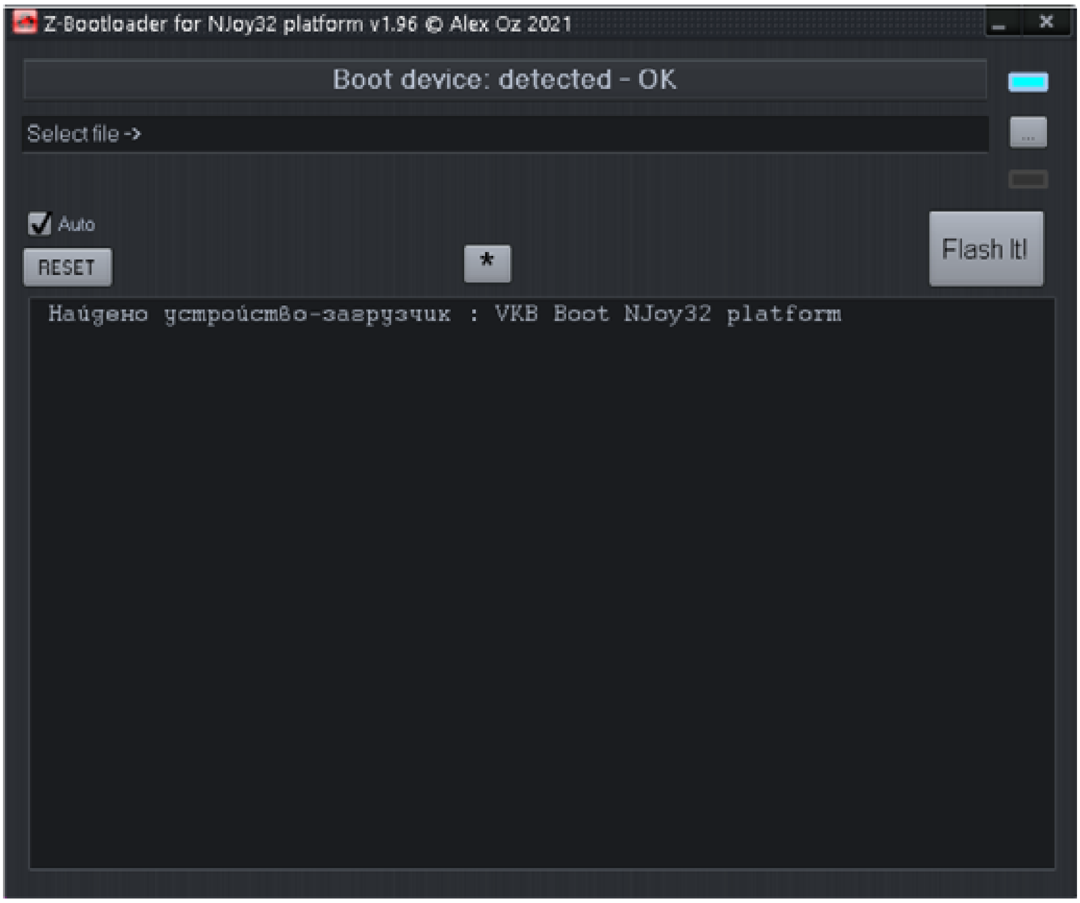


Fig. 2.5.

Further actions are similar to already explained.

2.2.2. Hardware activation

In some circumstances software activation could not start as described above. For example operation system did not recognize joystick. In this case you even will not see joystick name in the list of connected devices. To activate controller execute the following actions.

1. Disconnect joystick from the PC.
2. Run ZBootloader.exe. You will see that device is turned out (Fig. 2.6).

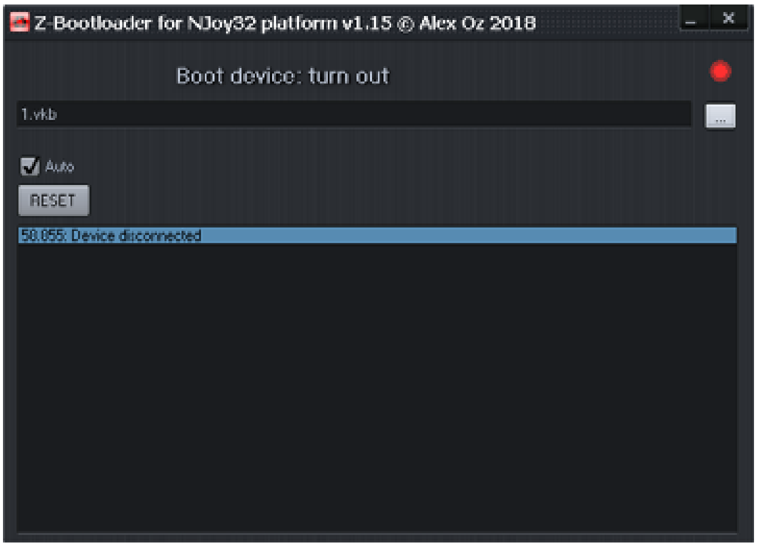
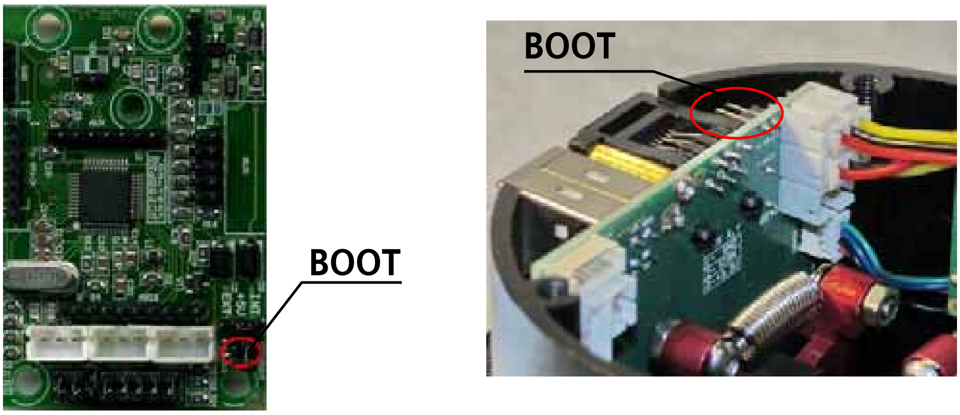


Fig. 2.6.

3. Short BOOT jumper on the controller plate (Fig. 2.7).



a) b)

Fig. 2.7.

> You can see BOOT jumper of Njoy32 1.1 (a) and VKB Mamba (b) controllers. Look for BOOT label on other controller PCBs.
> Press and hold down Eject and Start buttons of Gladiator joystick, press Boot button on BlackBox Mk2 cover to activate firmware upgrade.

4. While BOOT jumper is shorten, connect joystick to the PC and then release jumper.
5. You will see that device is connected (Fig. 2.3 on p. 20). Further actions are the same as described in sect. 2.2.1 on p. 20.

2.3. Common parameters

2.3.1. Global variables

Open **Global – Common** tab to set global controller parameters. Table 2.1 on p. 24 contains control item descriptions.

Table. 2.1. Global controller parameters

Control name	Description
	Checkboxes
Cal	Calibrate status. Device axes calibration status. Checks automatically after calibration completion (see 3.8 on p. 45).
DF	Dinamic Filter. Switches dynamic axes response filter. You can assign filtration rate for each axis separately see 3.2 on p. 30.
Map	Logical button mapping. Allows physical button mapping to logical ones or keyboard.
Hide	Hides current device.
Eco	Allows to control virtual keyboard connection time.
W105	
	Fields
Tempo Time	Tempo function delay time (see 4.3.18 on p. 81).
T_Tgl	Time of toggle pulse. Toggle pulse width (see 4.3.10 on p. 62), milliseconds.
Time FA0, Time FA1, Time FA2, Time FA3	Axes fixation delay time (ms), see sect 4.3.21 on p. 89).
TimeDR	Double rate function (fixed rate axis response reduce) delay (ms), see sect 4.3.21 on p. 89.
D.Rate	Axis response reduction rate list.
T_Tgl	Time of toggle switch pulse. Toggle pulse width, milliseconds.
T_Enc	Time of encoder pulse. Encoder pulse width, milliseconds.
T_Gen	Time of generator pulse. Generator pulse width, milliseconds.
Trimmer Time	Trimmer reset duration, ms (see Trimmer Reset, Trimmer Return on p. 84).
Trimmer Mode	Axes trimming modes. **Time**. Trimming rate independently of its value applies to axis in a time selected from **Trim. Time** combo box. **Rate**. Trimmer to axes engagement depends of **Trim. Time** value and trimming rate.

Table. 2.1. Global controller parameters

Control name	Description
Trimmer Mix. Curve	Applied trimming curve type, S-shaped or linear.
Trimmer Auto Rate	TrAuto+/TrAuto- function fall and rise rate. 1:X values accelerate fall, X:1 ones slow down, see sect. Trimmer Reset, Trimmer Return on p. 84

It is recommended to set **T_Enc** value between 10 and 50 ms. If you use internal button mapper, set 10 - 20 ms. For external mappers use value not less than 20 ms.

2.4. Additional parameters

2.4.1. Control item number

#**POV** field allows to set Hat switch number up to 4.

If you do not use Hat view control, for example you use Natural Point Trackir, you can set this parameter equal to 0 and use Hat switch as four buttons.

#**But** field allows to set maximum button number. Maximum number is equal to 128. Do not forget about Windows DirectInput restrictions. You can see 32 buttons only using Windows applet. To see buttons above 32 use VKBjoytester tool.

2.4.2. Sampling rate

FPS combo box allows to choose controller polling sampling rate by USB (Gz).

2.4.3. Automatic calibration time

AClTime allows to set time of automatic joystick calibration. It is executed on every device connection. Automatic calibration measures extreme response values and fixes center position. Its result depends of initial axis position. Automatic calibration will be executed permanently if you choose **Always**. For other values it will be executed for chosen period only.

2.4.4. FA0 parameters

FA0 mode combobox allows to select FA0 (helicopter trimmer) mode (see sect. FA0 on p. 89). **Rls Time** (FA0 release time) combobox allows to set FA0 parameters activation in milliseconds.

2.4.5. Axis sensitivity reduce

Sometimes this is reasonable to reduce axis sensitivity. For example when you try to aim the enemy. **D.Rate** combo box allows to set reduce factor.

Set delay time (milliseconds) before sensitivity will be changed using **TimeDR** combo box. You must assign joystick button to control this function (see 4.3.21 on p. 89).

2.4.6. Controller restart delay

Every time you have changed controller parameters you must save new settings in its memory. On some computers sequential parameter saving causes error. You will see error message (Fig. 2.8).

Fig. 2.8.

This error is a result of specific interaction between Windows and USB devices. If you have such troubles try to set nonzero value in **SD** (Delay of Start Controller) field (Fig. 2.9).

Fig. 2.9.

2.4.7. Virtual controllers

VC, Virtual HID controllers – virtual controllers count. Windows cannot recognize more than 8 axis for single controller. If you have more than 8 axes, enable virtual controller and assign axes to it. Windows will see virtual controllers as physical.

2.4.8. View loaded profile name

You can use specific profiles for different programs. Those profile names can be indicated in configurator window. Create data set for this purpose. An example you can see in table 2.2.

Table. 2.2. Profile parameters

ID	Description	File name
1	Fat Mamba profile for BoS	Mamba_1556_BoS.cfg
2	Fat Mamba profile for CloD	Mamba_1556_BoB.cfg

Table. 2.2. Profile parameters

ID	Description	File name
3	Fat Mamba profile for “old” Il-2	Mamba_1556_Il-2.cfg

All parameters in this example are optional. Add the following lines to **[User]** section of *Zconfig.ini* configuration file (saved in the same folder with *VKBDevConfig.exe*):

[User]

Profile 1= Fat Mamba profile for BoS

Profile 2= Fat Mamba profile for CloD

Profile 3= Fat Mamba profile for “old” Il-2

To see profile name enter its ID into **Profile ID** field (Fig. 2.11).

Fig. 2.11.

Appendix I. on p. 163 contains detailed description of *Zconfig.ini* file.

2.4.9. Virtual devices

You can map joystick buttons to keystrokes, use buttons to control system functions or multimedia applications. Control items of **Keyboard** group allow you to control those functions.

Do not forget to check **MAP** to allow keyboard mapping.

Mode combo box options allow to choose virtual keyboard mode.

- **Off** – virtual keyboard disabled,
- **Classic** – standard keyboard; simultaneously pressed virtual keys allowed.
- **Modified** – simultaneously pressed virtual keys disabled; if you press some keys only the last pressed one will work. No combinations like <Ctrl+Z> are accessible.

If **Map** checked and any virtual keyboard mode chosen new virtual device *HID Keyboard Device* will appear in device list.

An example of **Standard** mode use ClasterFire triggers of Mamba family joysticks. If first trigger fires gun and the second cannon, than when you press both triggers you will fire all weapons. With **Modified** mode cannon only.

2.4.10. Virtual keyboard modifiers setting

The Battle of Stalingrad simulator series use nonstandard processing of keyboard modificators such as Shift, Ctrl etc. if they are mapped to joystick buttons. For example if you have mapped *Ctrl+A* combination to button, simulator randomly will process it right, i.e. *Ctrl+A*, or pure *A*. **Dly** parameter (milliseconds), resolves this issue. Value of 30 ms is recommended. Larger value can cause errors if you will press button with short intervals.

Check **F13**...**F24** to use corresponding functional keys.

Multimedia checkbox allows joystick buttons to control multimedia applications (see 5.9 on p. 110).

System checkbox allows joystick buttons to control system functions of operating system (see 5.11 on p. 112).

2.4.11. Virtual mouse

Joystick buttons and axes can be used to control virtual mouse. Use control items of **Mouse** group to set up virtual mouse.

Choose mouse type from **Mouse** combo box.

- **Off** – no virtual mouse.
- **Relative** – mouse cursor moves relatively to current cursor position.
- **Absolute** – mouse cursor moves from the center of the screen. It jumps to this point when you begin to move joystick axes or press buttons assigned to control mouse axes.
- **R+A**, Relative + Absolute – combine mode. You can move cursor to predefined screen point pressing button with assigned **Set Center Point** function (see 5.6.2 on p. 108). Use **X** and **Y** fields in **SP1**...**SP8** groups to set points coordinates.

Use **Width** and **Height** fields in **SCREEN** group to set screen size for Absolute and R+A modes.

Virtual mouse switch mode depends on **Active** combo box items.

- **On/Off** – To switch mouse on you must press assigned button (see 5.6.2 on p. 108).
- **Always On** – Virtual mouse is turned on permanently.

Be careful using virtual mouse always turned on. Wrong controller settings or even small axis jitter that is invisible while ordinary joystick use will cause spontaneous mouse cursor move. It may be very difficult to neutralize this move with physical mouse.

Curve counter allows to select custom response curve (see section 3.6 on p. 40) that will be applied to mouse axes.

Set **Width** and **Height** values (pixels) for **Absolute** mode.

If you use buttons for axes control, choose automatic cursor acceleration delay value from **Delay** combo box. Acceleration rate set using field with counter **Speed**. If you assign velocity rate for control button then cursor velocity will be constant, without acceleration.

If virtual mouse is activated, corresponding event is generated, that can be used for LED indication (see 11 on p. 143).

Set mouse axes parameters using control units on **Profile – POVs** tab (see sect. 6.3.4 on p. 116).

You can place virtual mouse cursor to up to 7 screen positions using assigned buttons (see section 5.6.2 on p. 108). Set X and Y coordinates in corresponding SP1 ... SP7 fields.

2.4.12. PID control

If you use several VKB devices having same VID&PID you may have some troubles. To avoid it change controller PID. Select Auto mode in USB PID group and set some bias value. By default GNX controller has 231d/2234 VID/PID. If bias =3, then PID becomes 2237. Check it using USBdeview.exe.

2.4.13. External tab

Controller has serial communication ports used for connection with external devices. Control items of **External** tab allow to set port modes (fig. 2.12).

Fig. 2.12.

SPI1 port mode combo box items allow to choose first port modes:

- **OFF** – not used,
- **S-but** – standard button registers connected.

Set register number in **RegN** field.

SPI2 port mode combo box items allow to choose second port modes:

- **OFF** – not used,
- **S-but** – standard button registers connected.
- **S-Led** – RGB LEDs connected.

See detailed description of network technologies in Chapter 12 on p. 153.

Chapter 3. Axes setup

3.1. Overview

Maximum axes number that single controller can process is eight. The following axis sensors can be used:

- digital D_MaRS sensor,
- A_MaRS sensor (similar to D_MaRS, Gladiator family, 4-wired),
- V_MaRS (virtual, Gladiator twist, Gunfighter X&Y),
- analog sensors, potentiometers,
- encoders,
- buttons.

Encoders and buttons are used for virtual axes.

Open **Profile – Axes** tab (Fig. 3.1) to configure axes.

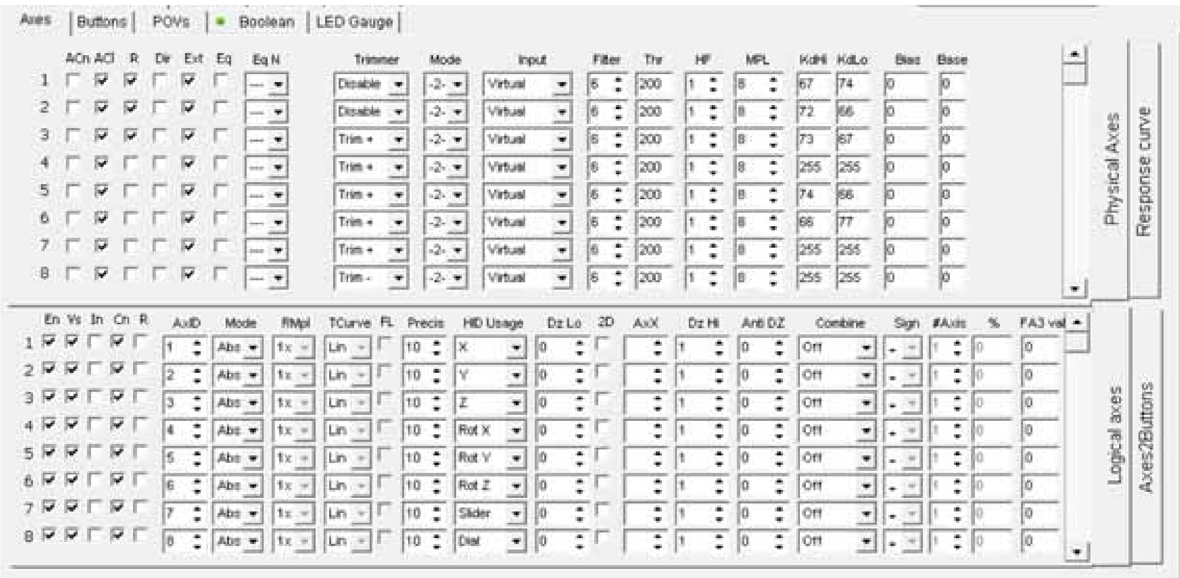


Fig. 3.1.

Every axis has a set of parameters, physical, logical etc.

3.2. Fhysical axis parameters

3.2.1. Parameter description

Physical Axes tab (Fig. 3.1) contains control items to configure physical parameters. See their description in Table 3.1.

Table. 3.1. Physical axis parameters

Control item	Parameter description
ACn	AutoCentering. Axis center is detected automatically with every controller start.
ACl	AutoCalibration. Axis is calibrated automatically with every controller start. Must be checked to allow user to calibrate it (see 3.8 on p. 45).
R	Physical data inversion. Physical axis rotation reverse.
Dir	Direction. Controls normal MaRS rotation direction. Is used to calibrate axis without center with angle range less than <175°.
Eq N	Response curve selection (see sect. 3.6 on p. 40).
Eq	Equalizer, Response curve. Enables response curve adjustment (see 3.6 on p. 40).
Ext	Axis to external device. Axis response can be transferred to external device. For example to use Joystick1 Rx axis to trim Joystick 2 X axis, check **Ext** for it (Rx).
Trimmer	Trimmer enable. Axis can be trimmed. Variants **Trim+** и **Trim–** specify trim direction. Select **Input** for virtual axis that is controlled by buttons (Trim, TrimAuto, see sect. 4.3.19 on p. 84) or encoders. This mode allows to control virtual mouse with this axis.
Mode	Trimming modes. Choose trimming mode from **Trimmer mode** combo box. **1 (Standard**:) trimmed axis center will be shifted, the whole range unchanged, i.e. when you move grip to one extreme position axis response will not reach its maximal value. When you move the grip to another side response value will reach maximal value while grip is not at the end of range. **2 (Modified)**: trimmed axis center will be shifted. Both parts of axis response range will be changed so extreme position of grip will correspond to extreme axis response.

Table. 3.1. Physical axis parameters

Control item	Parameter description
Input	Type of input. Axis sensor type: ▼ D_MaRS – Digital MaRS, ▼ Analog – potentiometer, ▼ Virtual – virtual axis, ▼ A_MaRS (Gladiator MaRS type), ▼ V_MaRS (Gladiator family yaw sensor). Wrong sensor type will cause axis malfunction!
Filter	Filter grade. Sensor filtering level for dynamic filtration. Default value for D_MaRS is equal to 5, for analog sensors – 6. If filter value = 0 than Manual filtering is used instead of dynamic.
Thr	Threshold of dynamic filter. Dynamic filter operation threshold. **DF** checkbox enables dynamic filter (see 2.3 on p. 23). You can set threshold level value in range from 0 to 255. Default value for D_MaRS is equal to 33, for analog sensors – 55. If **Trh**>0 than **MF** field value is used as upper dynamic filter value.
HF	H-Filter. Filter is named by Hruks (newView author), dynamically moving filter. Additional filtration for tremor compensation. It is advisably to use for analog axes especially with «noisy» potentiometer.
MPL	Multiplier. Binary multiplier for sensor response normalization. Value range is -15...+15. Default value for D_MaRS is 9, for analog sensors – 8.
KdHi	Coefficient of gain high. Factor specifying (together with **MPL**) upper level of axis response.Value range is 0...255. Default value for D_MaRS is 190, for analog sensors – 255.
KdLo	Coefficient of gain low. Factor specifying (together with **MPL**) lower level of axis response.Value range is 0...255. Default value for D_MaRS is 190, for analog sensors – 255.
Bias	Bias zero point. Specifies sensor initial position for automatic calibration at the controller start. Is used for manual calibration.
Base	Base quadrant. D_MaRS sensor base quadrant for automatic calibration at the controller start. Reference parameter.

3.2.2. Axis response filtering

High sensitivity of sensors and gimbal precision make hand tremor significant. Responce filtering allows to compensate this noise. Static or dynamic filtering can be used.

Static filtration
Uncheck **DF** to use static filtration (see 2.3 on p. 23). Use **Filter** field with counter to set filtering factor. Filtering factor for static filtering is constant in all gimbal moving range.

Dynamic filtration
Check **DF** to use dynamic filtration. Filtering factor for dynamic filtration depends of gimbal deviation. Upper factor value (filter threshold) is equal **Thr** field value.

By default it is equal to 18 for 8000 counts of one way sensor response value or ~0,2% of gimbal rotation. This means that for small deviations less than 0,2% of maximum angle filtering is maximal. If deviation exceeds specified value filtration rate very rapidly falls to minimal value. If difference between sensor response counts is less than **Trh** field value, filtration factor value will gradually grow to specified value.

Set **Thr** field value equal to 0 for specific axis to disable dynamic filtering for it. Static filtering will be used instead.

The more filtration grade you set, the more inert will be axis response. If you want maximal sharp response set **Thr**=0, **Filter**=1.

3.3. Logical axes

Use control items of **Logical Axes** tab (Fig. 3.1 on p. 30), to configure logical axes parameters. See parameters description in Table 3.2.

Table. 3.2. Logical axis parameters

Name	Description
En	Enabled, on/off axis. Enables axis. Axis parameters are calculated even if it is invisible (**Vs** unchecked). This mode you can use to convert axis rotation to button press sequence without axis response.
Vs	Visible in HID. Makes enabled axis visible. Thus to use any axis you must set it as enable and visible!

Table. 3.2. Logical axis parameters

Name	Description
In	Logical inversion of axis. Inverts axis rotation. Instead of physical inversion (see 3.2.1 on p. 30, **R** checkbox), that is applied to axis response at the beginning of output signal processing logical inversion is applied at the end. In most cases the result will be the same but sometimes inversion mode can be significant.
Cn	Axis with center. Locates lower deadzone position – in the middle of axis range for axis with center (checked) or by extreme positions (unchecked). MUST be checked for analog sensors.
R	Physical data inversion. Inverts physical layer axis response.
AxisID	ID of binded physical axis. Binds logical axes to physical ones. Single physical axis can be binded to several logical axes.
Mode	Absolute/Relative mode of axes input. Axis mode, absolute or relative (see 3.4 on p. 35).
RMpl	Relative mode multiplier. Multiplier for relative axis.
TCurve	Relative mode response curve type. Response curve type for relative axis.
FL	Forced limit. «WEP limit switch». For relative axis mode.
Precis	Precision of axis. Axis response digital capacity, bits.
HID Usage	HID axis name. It is NOT recommended to change default names. Wrong name can cause axis malfunction.
Dz Lo	Deadzone in center or bottom of axis. Size of deadzone in the center of response range (axis with center) or by lower limit (axis without center).
Dz Hi	Deadzone in top of axis. Size of two deadzones by upper and lower limits of response range (axis with center) or by upper limit (axis without center).
Combine	Type of combine Axis. Combining axes type (see 3.5 on p. 36).
Sign	Sign of combine axis. Axes combining direction (see 3.5 on p. 36).
#Axis	Number of the axis that forces on current one.
%	Maximum combining effect.
FA3 val.	Fixed value for FA3 mode. Fixed axis response value on button with FA3 function (see 4.3.21 on p. 89).

3.4. Relative axes

3.4.1. Overview

Response of common **absolute** axes corresponds to grip position. Usually absolute axes are used to control plane (roll, pitch, yaw, brakes), engine (RPM, throttle, radiators) etc. It is reasonable to use **relative** axes for ministicks. The rules for relative axes response are:

- Grip move direction determines response direction.
- Grip deviation value determines response speed. The more deviation the more speed.

When you release grip it returns to the center automatically under the force of springs, but response remains in the last point. You must use separate control unit (**RARst** button, see 4.3.23 on p. 95) to reset axis instantly or move grip to opposite side.

3.4.2. Relative axis parameters

Common parameters
Select **Rel** from combo box **Mode** on **Logical axes** tab. Select response multiplier from **Rmpl** combo box. **Lin** and **Sqr** variants of **Tcurve** combo box specify response curve type, linear or square-law. Use control units of **Response curve** tab (see 3.6 on p. 40) for fine tuning.

Forced limit configuration
If **FL** is checked, than when you quickly move the grip to its limit response value instantly will be set to maximum. As opposed to absolute axis response of relative one does not depend of stick position directly. Even if you moved it to extreme position very fast, response will grow with constant speed. Checking **FL** you can maximize it instantly. Configure FL using controls of **Global – Common** tab (Fig. 3.2).

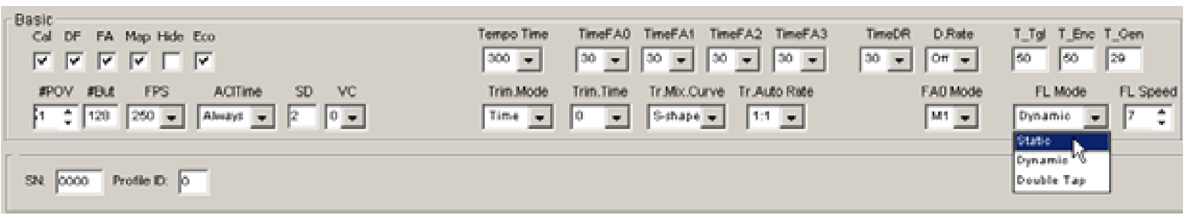


Fig. 3.2.

Static mode from **FL Mode** combo box ignores stick movement velocity, it works with any. If **Dynamic** mode selected, FL behavior depends of **FL Speed** value. If **FL Speed** = 0 FL works as in **Static** mode. If **FL Speed** > 0 instant jump to maximum occurs on quick stick movement. The greater **FL Speed** value selected, than faster stick must be moved. It is usable to put stick to the center and throw it aside. Smooth movement won't cause FL work. Use double stick jump to engage FL in **Double tap** mode.

3.5. Axes combining

3.5.1. Overview

Axes combining allows to «rotate» one axis using another one. There is a difference between this kind of axis control and using button (see 4.3.19 on p. 84) or encoder (see 4.3.11 on p. 65) as axis trimmer. Using buttons or encoders you must not create an axis to change response of existing one. When you combine axes you must have forcing axis, physical or virtual.

You can trim aircraft axes which can not be trimmed in reality. Cheat detected)))

3.5.2. Combi modes

Problem definition: how to trim axis #1 (roll) using axis #8? To resolve this problem do the following actions.

1. Open **Profile – Axes – Logical Axis** tab.
2. Choose **Combi1** item from **Combine** combo box for axis #1.
3. Enter number of forcing axis, 8 in this example, using **#Axis** counter.
4. Set maximum combining effect using **%** counter. This value determines trimmed axis center shift if forcing axis will be moved to its extreme position. 50% moves center to range limit. It is recommended to use 20-25%.
5. Set center shift direction choosing item + or - from **Sign** combo box (Fig. 3.3).

Fig. 3.3.

6. Press **Set** button to save settings to controller memory.
7. Check axes combining using VKBJoytester.

Fig. 3.4 shows axes #8 (pink) and #1 (black) response if axis #8 is rotated. Physically axis#1 is idle.

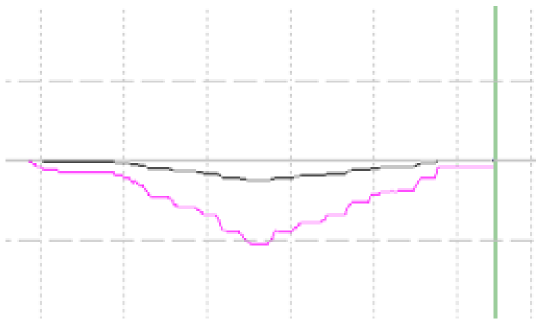


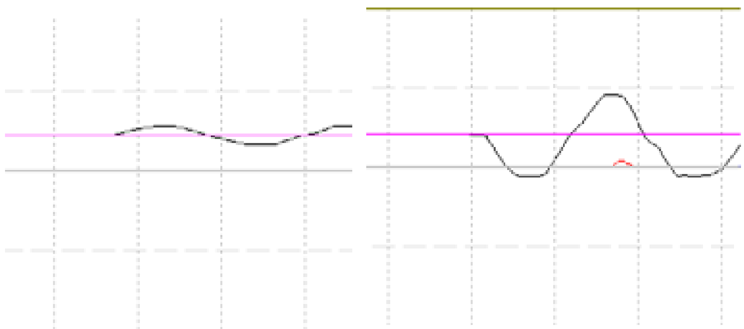
Fig. 3.4.

3.5.3. Dir modes

Dir1 and **Dir2** items of **Combine** combo box allow to align centers of two combined axes. Combined axes work is shown on Fig. 3.5.

Fig. 3.5.

Dir1 and **Dir2** items differ by response sign (shift direction). Fig. 3.6 a) and b) show response directions for **Dir1** and **Dir2** items. Physically both combined axes were rotated in the same directions.



a) b)

Fig. 3.7.

3.5.4. BrakeV modes

BrakeV

This combining mode is used for toe brakes. Default mode for TinyBox controller is shown on Fig. 3.8.

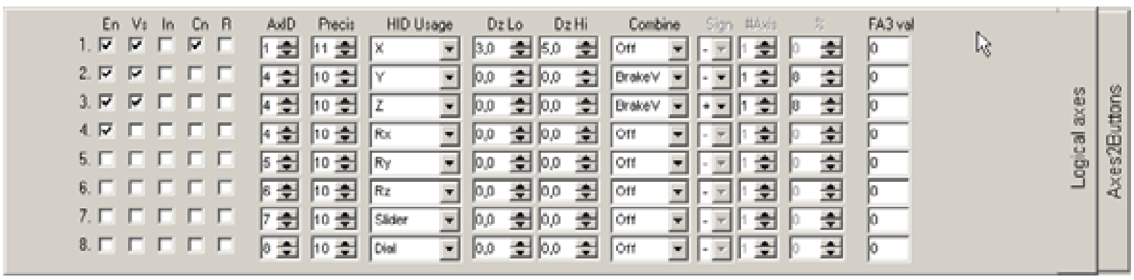


Fig. 3.8.

T-Rudder single axis is X, yaw. Virtual axis #4 is controlled by virtual button (use T-Link program to control this button). One of another joystick physical buttons is transferred to Tiny Box as virtual one. TrA+ function (see 4.3.19) is assigned to this button (Fig. 3.9).

Fig. 3.9.

Axes #2 and #3 have the same **AxID** as #4. So when you press button all three axes will response. Axis#4 is invisible (**Vs** is unchecked). Thus right and left brakes are realized (if you assign corresponding axes in simulator). Brake axes #2&#3 are combined with axis #1 (physical yaw axis) using **BrakeV** mode and 8% of range. If button is pressed both brakes work simultaneously. If you move rudder pedal, and its response will exceed 8% corresponding brake will be released immediately. Thus using single axis pedals you can control three axes.

See result in Fig. 3.13.

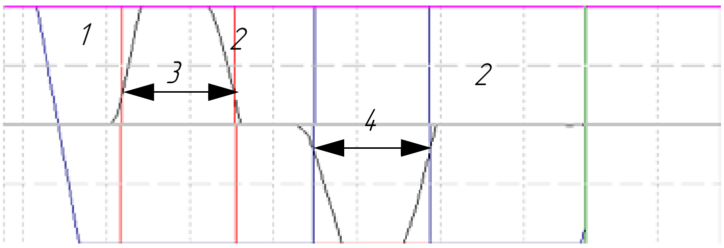


Fig. 3.10.

1 – response curves of both virtual brake axes (coincide).

2 – rudder axis response.

3 – first brake response alteration.

4 – second brake response alteration.

BrakeV1

Virtual brake axes combined with rudder with BrakeV1 mode. On rudder pedal moving differential brake of corresponding direction is engaged. It begins when rudder axis response exceeds value of **%** field (Fig. 3.11).

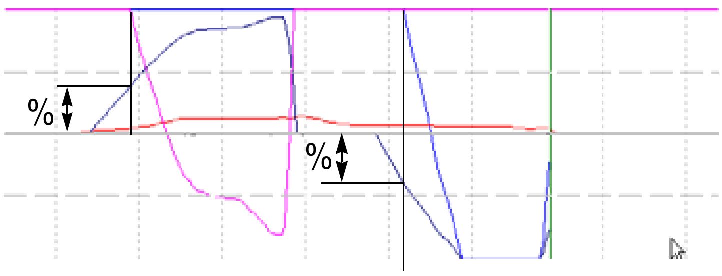


Fig. 3.11.

On brake button press both differential brakes work. On rudder moving idle axis will reach engaged then they will move together.

On brake button release both axes will be released. Idle to zero engaged to value depending on rudder pedal response value.

BrakeV2

BrakeV2 combining mode is similar to BrakeV. But on brake axis moving both virtual brake axes will be engaged with dead zone. Response of two different combining modes, BrakeV2 and BrakeV, use is shown on Fig. 3.12.

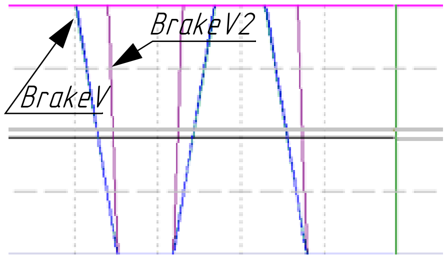


Fig. 3.12.

BrakeV3

Like in previous section when you press button all three virtual axes will response. Axis#4 is invisible (**Vs** is unchecked). If you move rudder pedal, and its response will exceed specified value (8%) corresponding brake axis response will not be released immediately. It will decrease according with rudder axis. See result in Fig. 3.13.

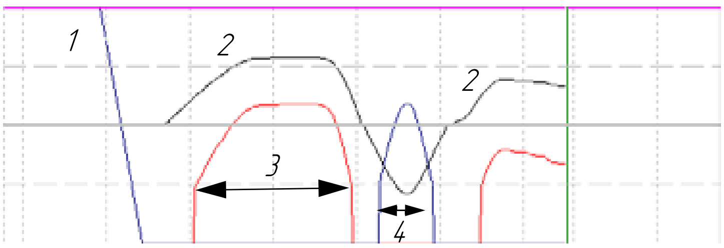


Fig. 3.13.

1 – response curves of both virtual brake axes (coincide).

2 – rudder axis response.

3 – first brake response alteration.

4 – second brake response alteration.

Average

Axis 1 (black) is combined with axis 2. **Average** mode, 30% (fig. 3.14).

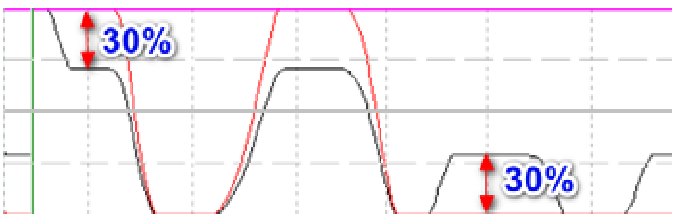


Fig. 3.14.

Axis 2 (response)=0. Axis1 maximum = 30%. Axis 2 moves to maximum, engaging Axis 1. Axis 2 = max. Axis 1 can move to minimum for 30% only.

3.6. Responce curves

Use control items of **Response curve** tab to customize axes response curves (Fig. 3.15). You can create eight different curves and apply them to any axes. For example, create curve for pedal brake axis and apply it to left and right brake axes.

Fig. 3.15.

Make the following actions to customize axis response curve. Check **EQ** to show equalizer. Select (click) desired axis. Click curve panel. **Curve wizard** dialog appears (Fig. 3.16).

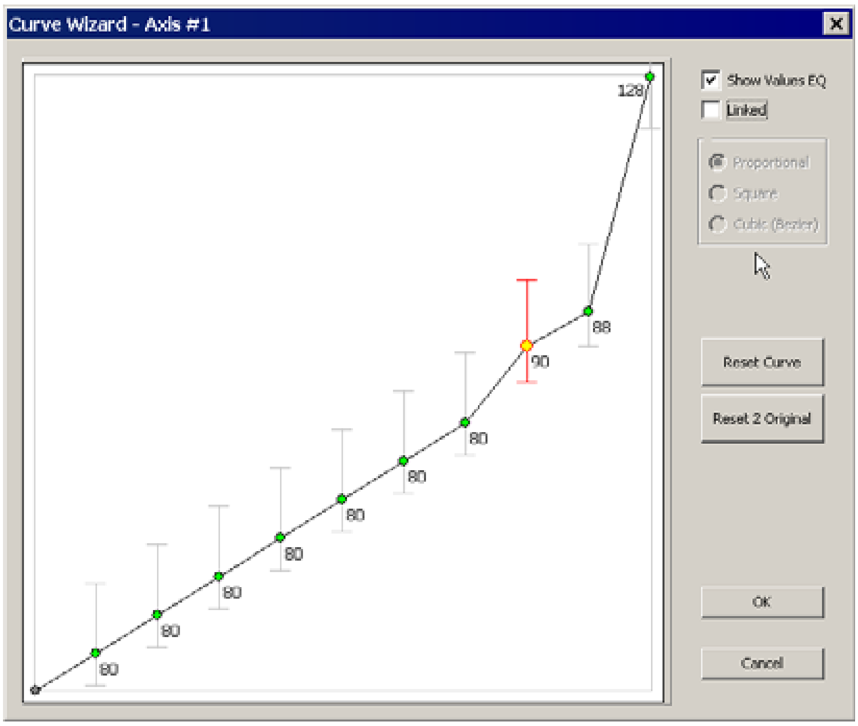


Fig. 3.16.

Check **Show Values EQ** to show equalizer values. Check **Linked** to link sliders (disabled in this example). **Proportional** item (enabled if **Linked** checked) allows to move sliders separately (Fig. 3.17).

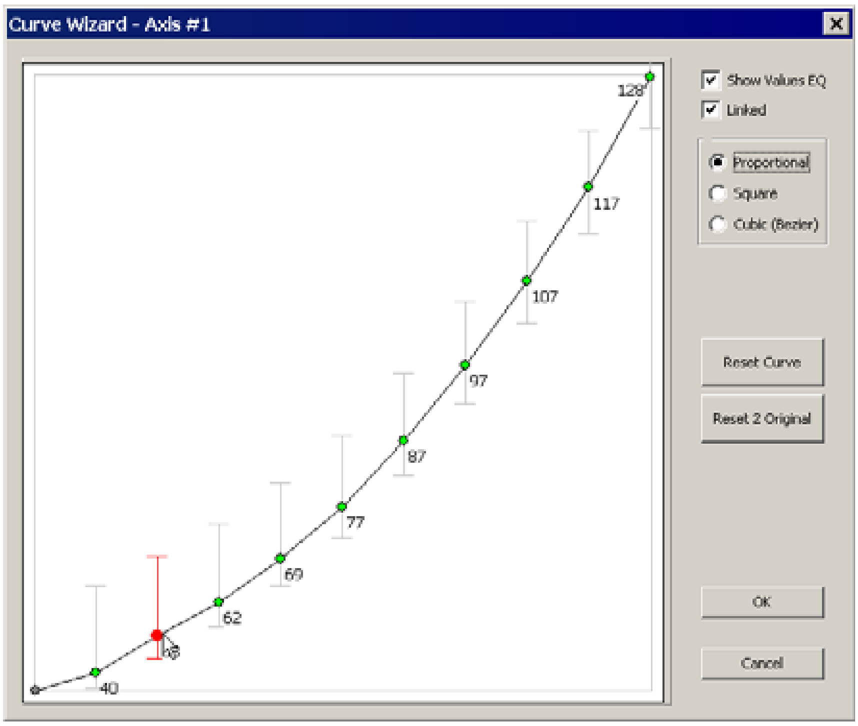


Fig. 3.17.

On **Square** item chosen middle slider enabled for moving. The rest will move after it, forming smooth curve (Fig. 3.18).

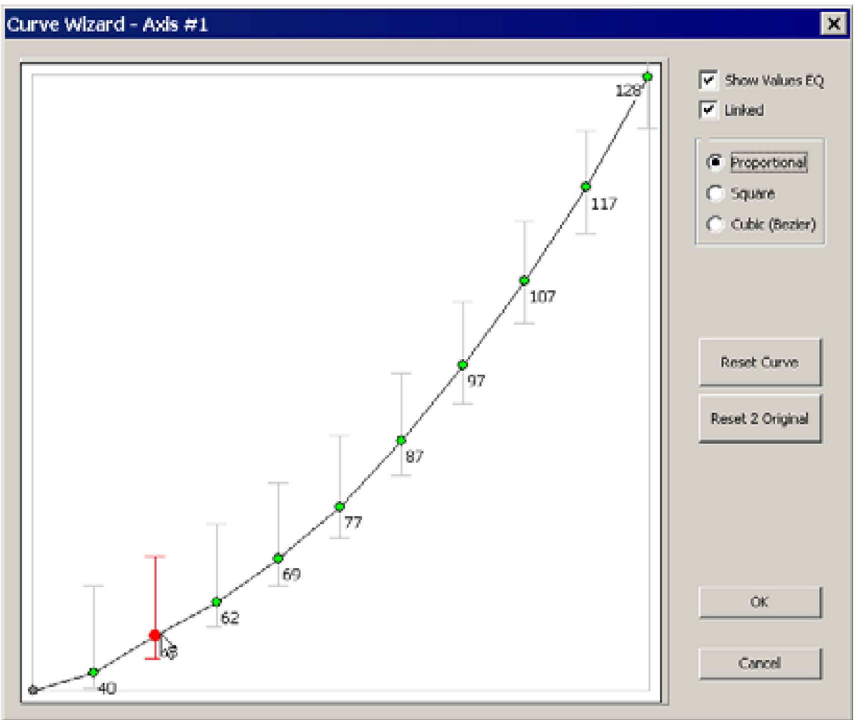


Fig. 3.18.

On **Cubic (Bezier)** item chosen sliders will form Bezier spline (Fig. 3.19).

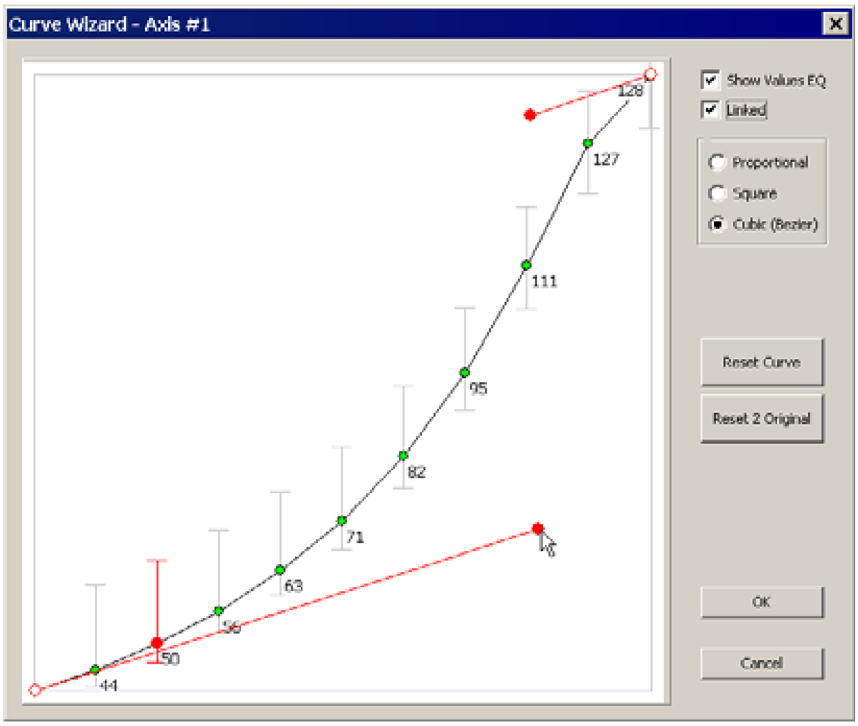


Fig. 3.19.

Press **Reset curve** to reset curve to default shape of straight line. Press **Reset 2 original** to return curve to previously configured shape.

Press **OK** button to complete configuring. Resulting response curve will be shown on the curve panel. Press **Cancel** to cancel results and close dialog.

To permanently apply customized curve to an axis check **Eq** for it (see 3.2.1 on p. 30) and select curve number.

To apply curve temporary use button with **CrV** function (see 4.3.20 on p. 87). Also you can use simplified axis response control with fixed response reducing rate.

- Choose reducing rate from **D.Rate** combo box (see 2.4.5 on p. 26),
- Assign **DR** function to a button (see DR on p. 91).

When you will press this button (aiming, for example) axis response will be decreased.

3.7. Axes2Buttons; axis rotation to button press sequence conversion

3.7.1. Common parameters

You can convert any axis rotation to the sequence of button pressings. The whole axis response range is divided to some zones. Every zone will have corresponding button. While you move the grip axis response varies. When it comes to one of the zones, corresponding button will be virtually pressed. Control items of **Axes2Buttons** tab (Fig. 3.20) allow to configure axes-to-buttons conversion.

Fig. 3.20.

Choose axis response range division type from **Type** combo box.

- **OFF** – no conversion.
- **Edges1** – single button press on bound zone cross.
- **Edges2** – pair of buttons from both sides of zone bound will be pressed with bound cross.
- **Zones** – button is pressed while axis response belongs to the zone.

Set zone number using counter **Num**. 0 an 1 allow to use trailers. Button will be pressed at extreme axis positions. If **Num** = 0, lower trailer will work, if **Num** = 1, than upper.

If you set **Num** = 1 for **Edges2** then **both** trailers, upper and lower will work. If you use this function for throttle axis, when you move throttle lever to zero position, button for ignition or fuel pump stop and so on will be virtually pressed. Maximal position of this lever will press WEP button.

Hysteresis combo box sets width of button actuation in percents of the whole response range. This parameter removes uncertainty of button work near boundary. If **Hysteresis** = 0, the button will be pressed exactly at the boundary. Set the first button number of sequence using **Vbut1** field. The following button numbers will increase to **Num** field value. For example four zones were created (**Num** = 4), **VBbut1** = 89 and **Zones** type was chosen. When you will rotate axis without center between extreme positions buttons 89, 90, 91, 92 will be pressed consequently. You can map keys to these buttons. If **Num** = 0 or 1 (trailers) in both cases will be pressed button with number equal to **VBut1** field value.

For throttle control axis you can stop engine automatically when throttle will be down. Set **Num** = 0 and assign button with stop engine function to **VBut1** field value. Be careful not to stop engine in flight when you throttle down diving your «Stuka».

3.7.2. MCG Pro folding trigger settings

MCG Pro folding trigger is a lever on axis with MARS sensor. It has two stable positions, folded forward (safe) and down directed (armed). If you press trigger firmly, physical button is activated. On trigger pass up to four virtual buttons can be activated too.

Check **Enable MCG PRO trigger** to enable virtual buttons. Check **Safe**, **Armed**, **Fire1**, **Fire2** to control specific virtual buttons. **Safe** button corresponds to folded position, **Armed** – down directed. **Fire1** and **Fire2** will be activated on trigger pass.

Assign **Safe** button line number using **But N** counter. Line numbers of other buttons will follow selected. Check **Pulse** to generate short pulse when button is virtually pressed and even stays in this position (**Safe** or **Armed**). Pulse duration is equal to **T_Tgl** parameter value (see 2.3.1 on p. 23).

Sliders **Fire1** and **Fire2** allow to set trigger position for corresponding buttons activation. Left limit of **Fire1** slider roughly corresponds to **Armed** position. Physical button will be activated near right limit. It is reasonable to distribute virtual buttons evenly by trigger pass. **Axis data** group control units allow to set up trigger axis similarly to other ones.

It is not recommended to change axis default settings.

3.7.3. MCG Pro Brake lever setup

MCG Pro Brake lever works as axis with contactless MARS sensor. Also virtual buttons can be assigned to its race. Controls shown in Fig. 3.21 allow to setup these buttons similarly but easier to usual Axis To Buttons function.

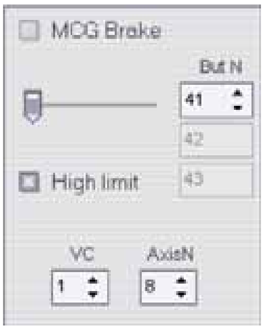


Fig. 3.21.

Check **MCG brake** to enable virtual buttons. Checkbox **High limit** allows to control virtual button corresponding to extreme lever position. Assign lever position for button using slider. Set number of controller physical button that will correspond to first button using **But N** counter. Buttons #3 will have sequent number.

VC counter allows to choose virtual controller of brake lever axis, by default **VC**=1. **AxisN** counter allows to choose brake lever axis number, by default **AxisN**=8.

You can set virtual buttons connected to other axes similarly.

3.8. Axis calibration

3.8.1. Autocalibration

Common parameters
Usually you can calibrate joystick axes automatically. Do the following actions.

1. Push **Start Calibr** button on **Tools** tab.

If zconfig.ini file contains *PartialCalibration=1* string, you will see **Partial Calibration Settings** dialog (Fig. 3.22).

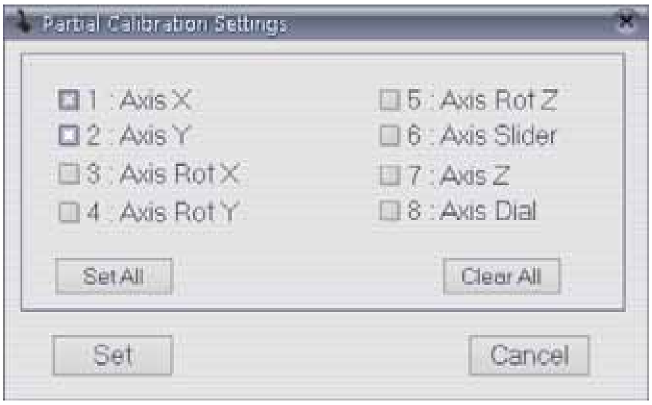


Fig. 3.22.

Check desired axes calibration and press **Set** button.

Lightning mode of LED indicator will be changed (See 11 on p. 143), if you have made this setting.

2. Rotate every calibrating axis between extreme positions.
3. Push **End Calibr** button.

If for some reason you want to cancel calibration without saving results, push **Cancel Calibr** button.

MCG Pro folding trigger calibration
MCG Pro folding trigger is an axis. Before you begin to calibrate it, fold it forward (safe position) then return to down directed (armed). To calibrate trigger, after you press **Start calibr** button fold it forward then rotate back and press firmly. That is all.

3.8.2. Manual calibration

Overview
In some cases the results of autocalibration may be insufficient. For example values of **KdHi** и **KdLo** may be equal to 255. Such values are too great and desensitize axis precision (best results are with values about 120 – 180). Or neutral grip position of axis with center does not correspond with the middle of the response range. In this

case it is recommended to perform manual calibration. To make this operation it is reasonable to use VKB Joytester program. Download it from VKB site http://ftp.vkb-sim.pro/Programms/VKB_JoyTester.zip. Unpack downloaded archive in the same folder with other VKB utilities.

Joytester interface

Run *VKB_JoyTester.exe* file. The window of this utility is shown in Fig. 3.23.

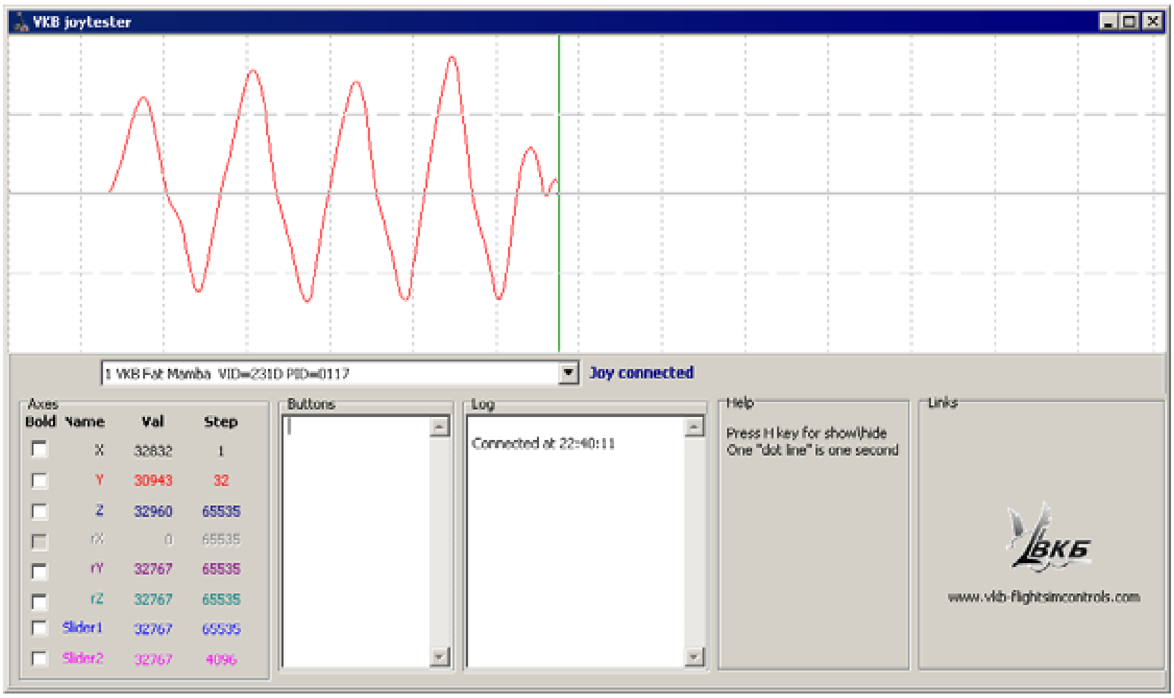


Fig. 3.23.

Select joystick name in **Joy connected** combo box. The most window area occupies axes response diagram. When you move grip, you will see graphic response and its digital value. Check **Bold** to draw axis response with bold line.

When you push buttons you see their numbers in **Buttons** field.

If special function (i.e. Shift or Fix Axes etc.) assigned to the button, you will not see its number.

Axis center correction

If an axis has centerpoint, then when you release it response value of this axis must be equal to 32767 (one half from 65535, maximal value). Inaccuracy in some digits or even tens are acceptable. But if it is too big and centerline of the axis does not match with graph center line, you must correct calibration. **Bias** parameter allows to compensate magnet and MARS positions for digital axis or potentiometer centering for analog one. Try to change **Bias** value about 100 – 150 units with + or - sign and press **Set** button on **Action** tab. Centerline position will be changed. Select such **Bias** value that when the grip stays in the center position response value is

about 32767. Do not forget to push **Set** button every time you have changed **Bias** value.

Axis response range correction

Setup axis response range so in pedals extreme positions response value will be equal to 0 and 65535. **KdHi** and **KdLo** values must be in range 100... 180. This will provide optimal dynamic range.

Move axis between extreme positions. If response value is greater then 0 or less then 65535 or, on the contrary, the pedal is not in the extreme position but response value already is equal to 0 or 65537, you must correct the range.

Change **KdHi** value, press **Set** button, move the grip and check how axis response value in the extreme position has been changed. Select such **KdHi** value that when the grip is in extreme position response has extreme value too. If you change **KdHi** value but can not reach a goal (value is out of range 100... 180), try to change **MPL** value and repeat setup. Then you must setup the other range limit with the same manner, changing **KdLo** value.

While you setup response range, centerpoint can be moved. In this case setup it again.

Calibrate all axes (if it is needed) in the same manner. Calibration results can be saved to file (see 9.3 on p. 138).

Chapter 4. Physical buttons

4.1. Overview

When we describe joystick we use common term *Button*. Really it can be any device that can close two contacts. For example it can be tact switch, toggle switch, HAT switch, rotary switch, encoder etc. Every pair of button contacts is represented as single *line*. So simple button occupies one line, toggle switch On-Off-On – two lines, 4-way HAT – 4. Njoy32 controller can process up to 128 lines.

Speaking about joystick controls we must distinguish *input*, that is button, HAT etc. and *output* – the result of physical controls conversion, that is virtual axes, generators, trimmers, modifiers and even simple buttons too.

Control items of **Profile** – **Buttons** tab (Fig. 4.1) allow to set up joystick buttons.

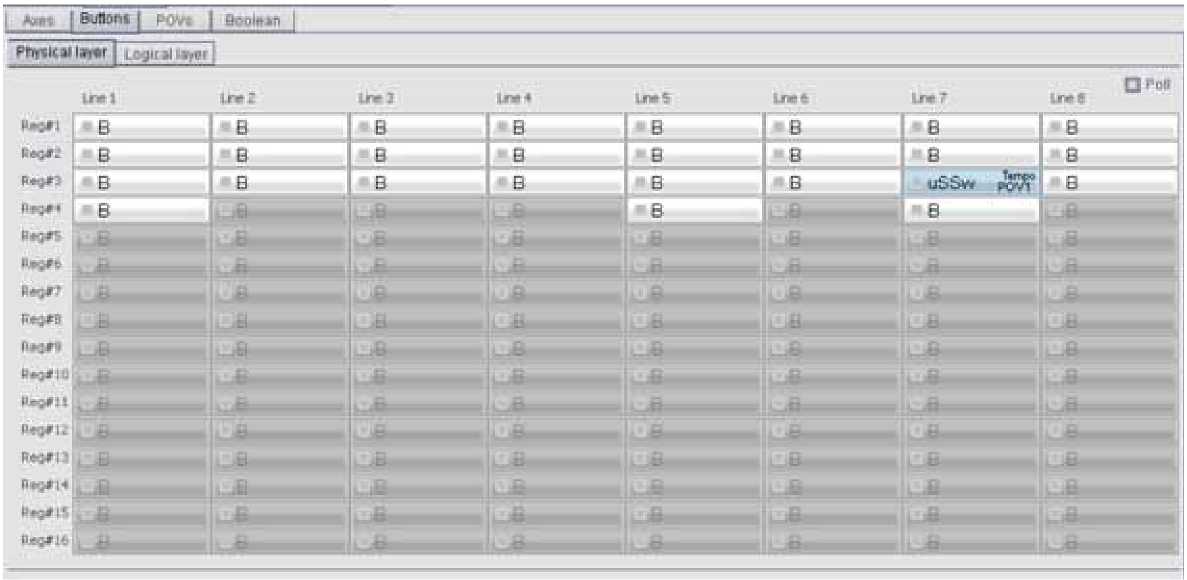


Fig. 4.1.

Every eight lines are grouped to registers, *Reg#1...Reg#16*. Lines have consequent numbers.

4.2. Physical button functions

Regardless of contact maker physical realization of its line can execute the following functions.

- Button – simple button,
- Button alternative – button with fixation,
- Radiobutton – button one of group,
- ButtonS – button under control of subshifts ##1-6,
- ButtonX – button under control of subshift #7,
- ButtonD – button under control of subshift #7,

- ButtonM – button under control of Modal Switch,
- Shift – button modifier,
- SubShift – subshift, additional button modifier,
- Toggle – toggle switch,
- Encoder – encoder,
- Cyclic Switch – cyclic switch,
- POV switch – HAT switch,
- uStick switch – POV mode switch,
- uPov switch – POV mode switch,
- Switch CB – POV mode switch,
- Generator – generator,
- Tempo – several-function button; output depends of pressing time and type,
- Trimmer – axis trimmer,
- Curves – dynamic axis response curve switch,
- Fix_Axes – axes modifier,
- AuxAxes – axes mapping,
- RelAxes – relative axis mode control,
- DZ switch – expulsion button from the processing,
- RPB – button replicator,
- Sync – toggle synchronizer,
- NoF – no function.

4.2.1. Button mapping wizard dialog

Control items of **Button mapping wizard** dialog (Fig. 4.2) allow to assign any function to chosen physical button line.

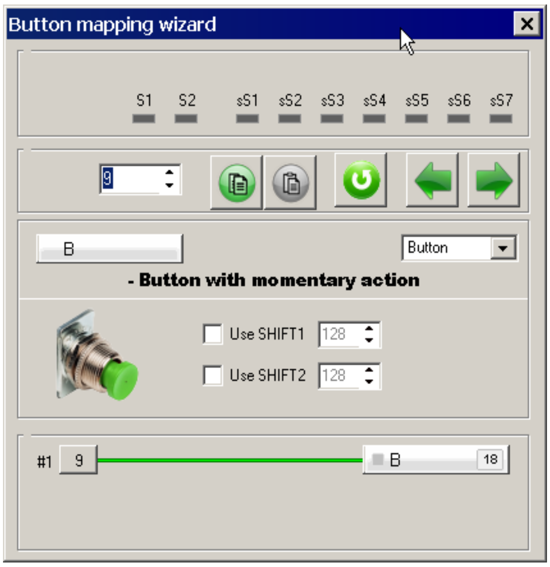


Fig. 4.2.

This dialog appears after left mouse button click on button cell.

Line (input control) choice

Parts of the string in **Physical layer** group show current line number, its register number and position in the register. Fig. 4.2 shows that current line is #9. It belongs to the first line of the second register.

Counter value shows line number too and allows to go to another button to set it up. **Next** and **Previous** buttons allow to go to corresponding lines. When you go to next button settings for current one will be fixed. Thus to go to distinct button you can close **Button mapping wizard** dialog and click desired button cell directly or use controls of this dialog.

Cancel buttons disables any current settings changes. For example you set button#9 as Shift and pressed **Next** button to setup next line. Current assignment for button #9 (*Shift*) will be fixed. Then you return to button #9 and choose *BA* function. Press **Cancel** button to restore previous (*Shift*) function.

Copy cell button allows to copy current line parameter set to clipboard.

Paste cell button allows to apply parameter set from clipboard to current line.

Output function choice

Choose output function for current line from combo box. Additional control items for this function will appear in dialog. Some functions, for example, simple button, allow alternatively using with Shift modifier. For those functions checkboxes *Use Shift 1* и *Use Shift 2* will be enabled.

You can use two independent modifiers *Shift 1* and *Shift 2.*

If for example *Use Shift 1* is checked, you can select the second line number that will be pressed if you press physical button simultaneously with Shift.

Example. Current button line number is 9. For shifted button you can choose 28.

Assigning additional line be careful. This number must NOT be the same with existing physical button line. But you CAN assign such (occupied) number. If this button line number was reassigned too. For example, gun trigger occupies physical line number 17. If you want to use it with «beautiful» number reassign it to 1.

Free line choice

To make sure that desired line number is free, double click line number counter with left mouse button. Dialog **Virtual layer** (Fig. 4.3) will appear. Red colored numbers are occupied, black – free. To choose number click it.

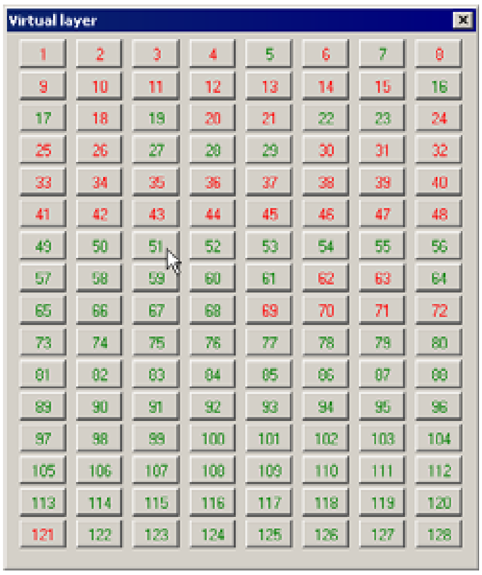


Fig. 4.3.

Logical (output) function choice

Almost all functions have subfunctons. Additional control items allow to customize parameters. Click current function field to see these controls (1 , Fig. 4.4).

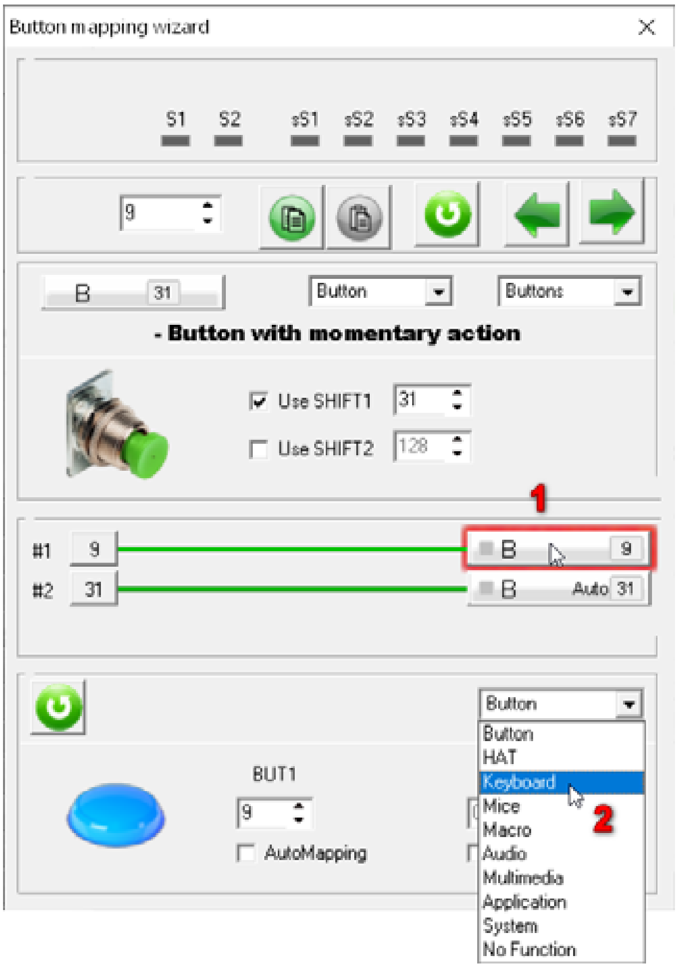


Fig. 4.4.

Subfunction names are listed in combo box (2 , Fig. 4.4).

Another way to get subfunction list is shown on Fig. 4.5).

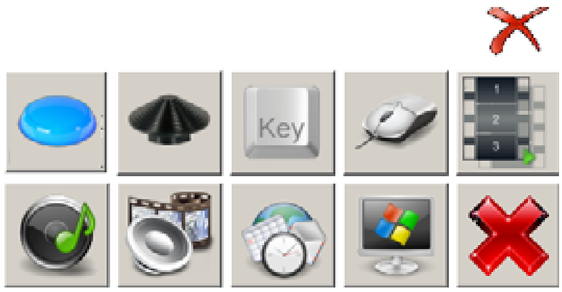


Fig. 4.5.

Detailed description of logical functions you can find in Chapter 5 on p. 101.

4.2.2. Line number check

To see line number of any joystick control check **Poll** on **Physical layer** tab. After that if you press button, HAT, rotate encoder etc. cell of its line will flash. If **Button mapping wizard** dialog is opened you can check pressing too. If you press corresponding button it will be indicated.

4.3. Button customization

4.3.1. Button

Simple button

Description

When you press button by default output logical line number will correspond with physical one. To reassign logical number click current function name field (1 on Fig. 4.4 on p. 51). Additional control items will appear. **BUT1** field contains logical (output) line number. To remap button uncheck **Automapping**. **BUT1** counter will be enabled. Set desired output number (Fig. 4.6).

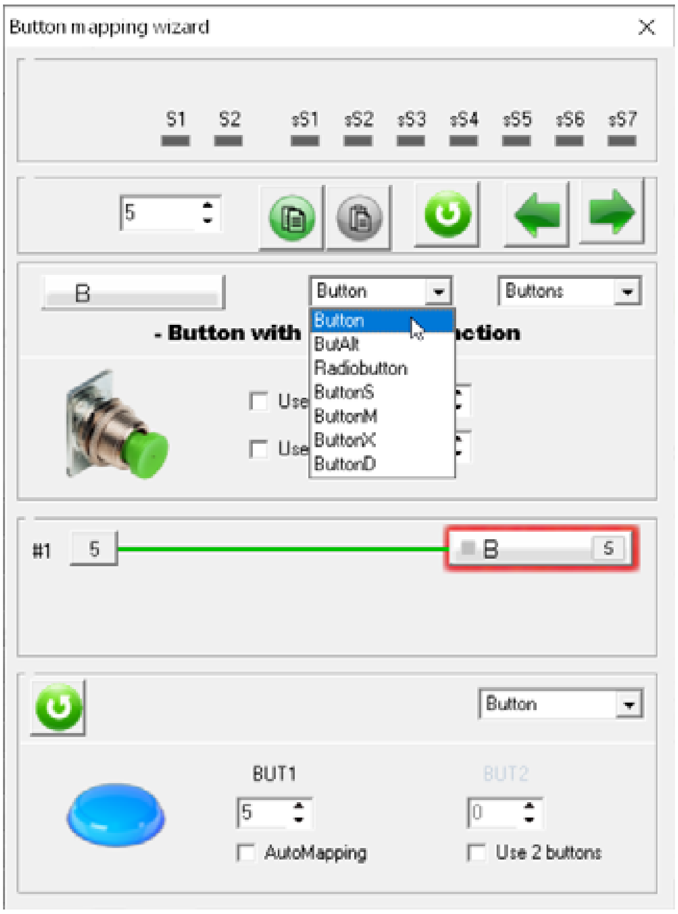


Fig. 4.6.

When remapping will be useful? Let's assume the current button number is greater than 32. Some games does not recognize button numbers upon this value. You can map your button to key or remap to line of available range.

Check **Use 2 buttons** to «press» two logical buttons simultaneously with physical one and set second line number using counter **BUT2**. See Fig. 4.6. When you press button with number 9 (Toggle switch Batt on the left side of Fat Black Mamba case) buttons 10 and 11 will work.

Modifier *Shift* can be used with simple button.

Physical button pressing can be indicated using LEDs (see 11.2 on p. 147).

Example.

Line 32 is shown on Fig. 4.7.

Fig. 4.7.

It is used as simple button (sign **B**). If you press trigger with Shift1 line 56 will work. For Shift 2 it will be line 64.

Restrictions:
NJoy32 controller can process up to 128 physical buttons.

4.3.2. ButAlt

Button with fixation

Description
After you press and release button (input) BA will stay depressed (on hold) until you will press it again (output). You can assign another logical number for BA. Button mapping wizard for ButAlt is shown on fig. 4.8.

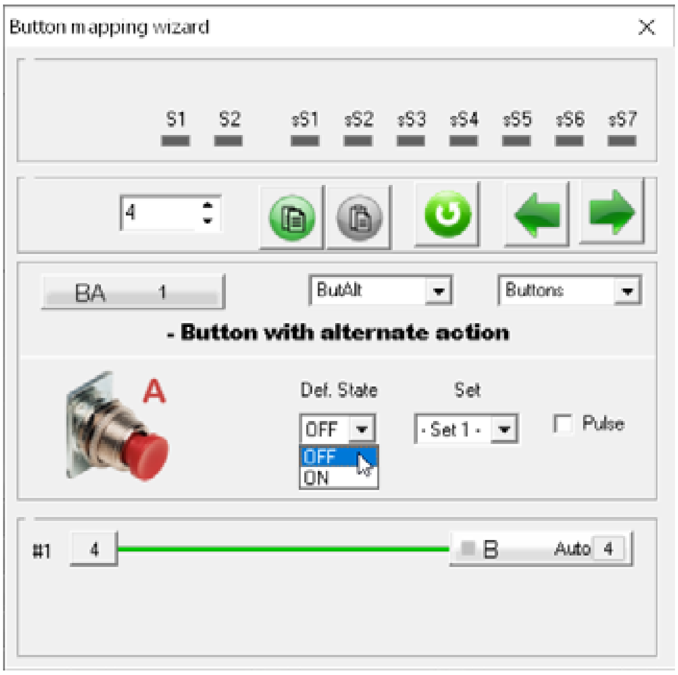


Fig. 4.8.

Select default button state from corresponding combobox. Checked **Pulse** check-box makes ButAlt work similarly to Toggle switch (see sect. 4.3.10 on p. 62). Thus button press will cause pulse with duration equal to **T_Tgl** value. Set combobox variants are applicable if **Pulse** is checked. ButAlt default state can be synchronized using button with Sync function similarly to Toggle switches (see 4.3.10 on p. 62).

Restrictions:

Shift function not allowed.

4.3.3. RadioButton

Radio button, Selector

Description
Several buttons belong to a group. One (only one) of them is always pressed.

Button mapping wizard dialog for Radiobutton function is shown on Fig. 4.9.

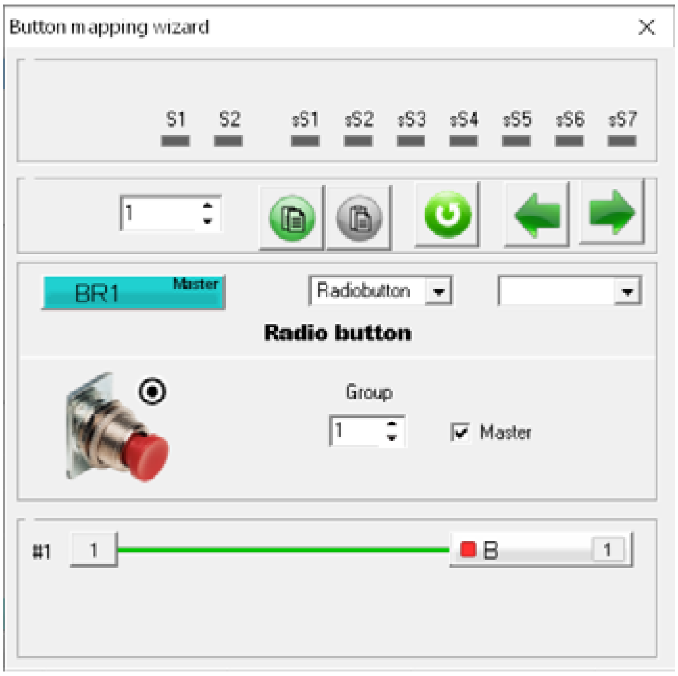


Fig. 4.9.

Set number of the group for this button, using **Group** counter. If no group with this number exists, it will be created. Check **Master** to use this button as default. It will be «pressed» automatically on joystick start. If there are several master buttons in a group, only last assigned will be work as master.

You can assign logical functions to Radiobutton (see Logical (output) function choice on p. 51).

Example

Gladiator family joysticks have only one trigger. You can create a group of buttons, that will directly assign specific weapon to trigger. The first button allows machine-gun, the second – gun and the third, Master, i.e. default button, safety lock.

Assign weapon #1 toggle. Open **Physical Layer** tab, click desired cell, for example #48. Assign **RadioButton** function to it in group #1. Assign weapon #2 toggle for cell #49.

Assign safety lock for cell #50 in the same group and check **Master** in **Button Master wizard** dialog. Set logical function No function for this cell on **Logical layer** tab. By default your weapons will be locked.

4.3.4. ButtonS

Button controlled by subshifts 1...6

Description

Button controlled by SubSHIFT #1...6.

ButtonS is controlled by subshift. Set index of subshift that will control this button using **SubSHIFT #** counter and logical line number using counter **V. Button** (Fig. 4.10). By default it is physical one +1.

Logical line functions are the same with simple button.

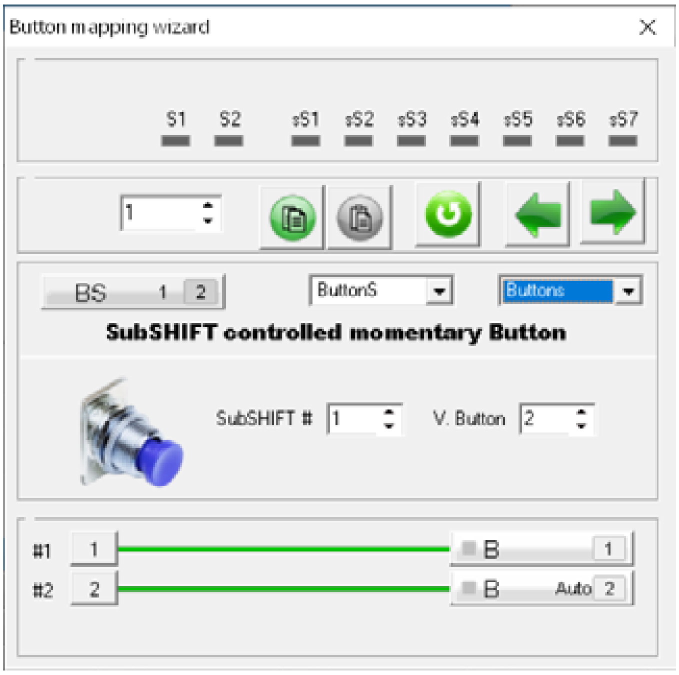


Fig. 4.10.

4.3.5. ButtonX

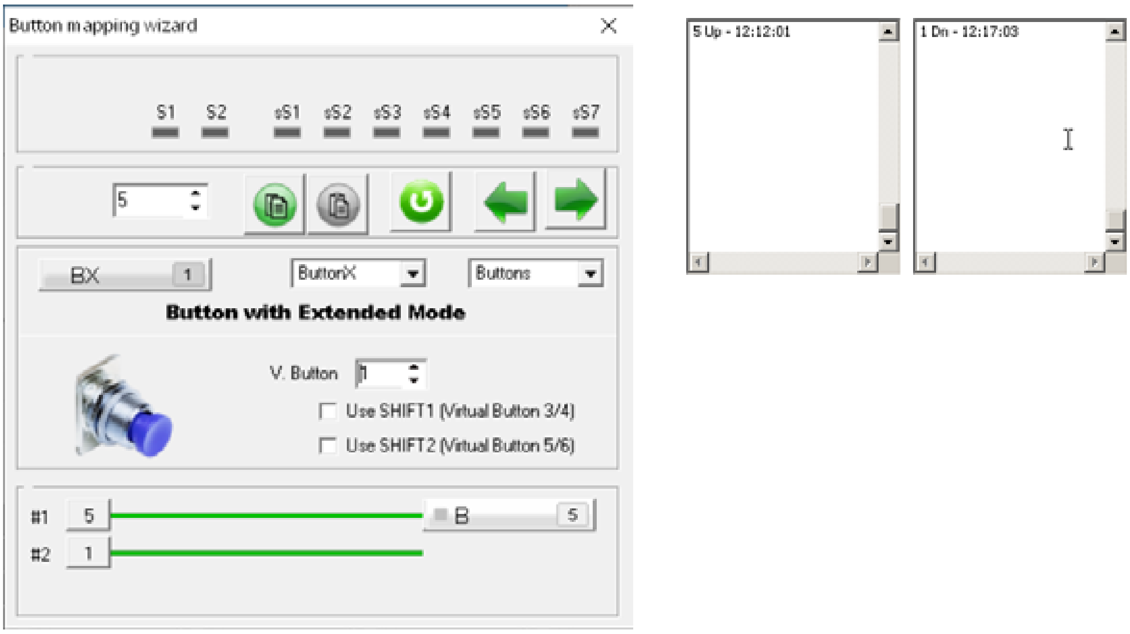
Button controlled by subshift # 7

Description

Button controlled by SubSHIFT #7.

The number of output line depends on combination of global Shift modifier and Sub-Shift local modifier.

if this button is not controlled by global Shift (Fig. 4.11, a), than output line number will correspond to physical one (Fig. 4.11, б). If you press button depressing Sub-SHIFT 7, output line number will be equal to counter **subShift Button** value (Fig. 4.11, в).



а) б) в)

Fig. 4.11.

If this button is controlled by global Shift (**Use SHIFT1 (Virtual Button 3/4)** checked, Fig. 4.12), than output line numbers will depend of Shift 1 и SubSHIFT 7 states and by default will go after line number assigned in **subShift Button** counter.

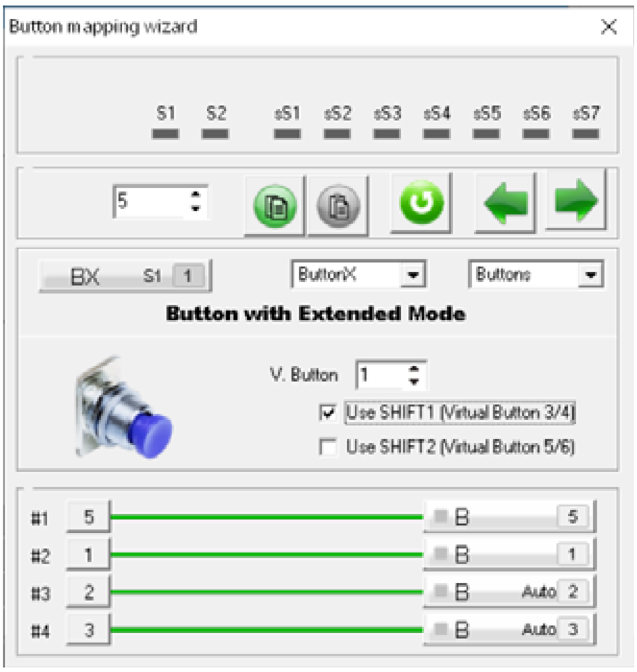


Fig. 4.12.

You can see an example of line numbers depending of modifiers state in table 4.1(for described figure).

Table. 4.1.

	SHIFT1	Off	On
SubSHIFT			
Off		5	2
On		1	3

4.3.6. ButtonD

Description

Button is automatically released (even if physically stays depressed) if linked button i.e. master button is pressed.

May be used for example for two-stage trigger. When the second stage trigger (line 2) becomes pressed, the first one (line 1) will be released automatically. Button master wizard for dependent button is shown on fig. 4.13. Set Master button line number using **Master Button** field.

Fig. 4.13.

Line 6 in this example is 1st trigger of MCG grip. Line 7 is 2nd trigger. Use **Press** counter to set delay for 1st trigger. If 2nd trigger is pressed within 40 ms than 1st trigger will not be registered. Use **Release (Master)** counter to set 1st trigger delay on full trigger release. If 1st trigger will be released within 80 ms than it will not be registered. **Press**=2...4, **Release (Master)**=6...10 values are recommended.

4.3.7. ButtonM

Button controlled by Modal Switch

Description

ButtonM is controlled by Modal Switch (see sect. 7.16 on p. 128). Set index of Modal Switch that will control this button using **MSw #** counter and logical line number using counter **V. Button** (Fig. 4.15). By default it is physical one +1.

Logical line functions are the same with simple button.

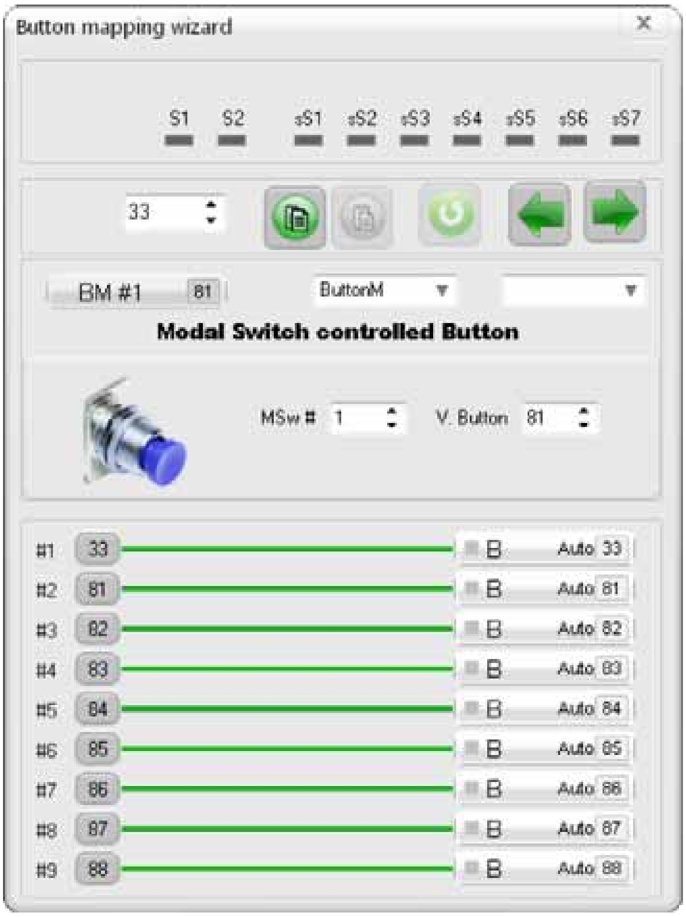


Fig. 4.15.

When physical button with ButtonM function will be pressed logical output will depend of Modal Switch and its internal modifier states.

4.3.8. Shift

SHIFT1 / SHIFT2 / SHIFT0 modifiers

Description

Modifiers allow to multiply button number similarly to keyboard modifiers Shift, Ctrl, Alt.

Parameters

Modifier parameters are shown in **Button Mapping Wizard** dialog (Fig. 4.16).

Track as button checkbox allows to use button with **Shift** function as simple button too. In this case its parameters will be the same as for simple button (see 4.3.1

on p. 52). If checked then when you press SubShift it will modify dependent buttons AND work as joystick button too.

Select shift mode from combo box (Fig. 4.16, 1). Controller can process up to two shifts, so one input line can have three output ones. *Shift0* allows output signal if no other Shift (1 or 2) is pressed.

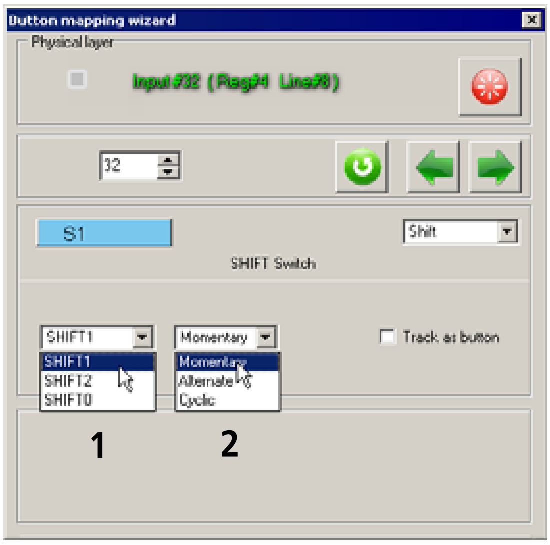


Fig. 4.16.

With *Shift0* you can, for example, use middle position of three-position slider on the Mamba family grip. Physically it is ON-OFF-ON toggle switch. It has no signal in the middle position. Assign *Shift1* and *Shift2* functions to both ON positions. Assign *Shift0* function to any button. **Track as button** will be checked automatically.

DO NOT map *Shift0* button to keystroke! It will work if no *Shift1* or *Shift2* are pressed that is practically permanent. Simple button even depressed generates continues but single output signal. Keystrokes will repeat thus flood system keyboard buffer. In this case you must disconnect joystick.

Shift1 and *Shift2* modifiers can be indicated by LEDs (see sect. 11 on p. 143).

Shift1 и *Shift2* modes:

- Momentary – common, analog to Shift modifier,
- Alternate – with holding, analog to CapsLock modifier,
- Cyclic – cyclic.

Select mode from combo box (Fig. 4.16, 2).

In **Cyclic** mode every button press changes modifier type (**Shift 1** and **Shift 2**). For example button #9 was mapped to following keystrokes:

- without modifier – a,
- Shift 1 – b,
- Shift 2 – c.

Press Shift button and button #9. You will get letter <*b*>. Release buttons. Press Shift once again and button #9. You will get letter <*c*>.

4.3.9. SubSHIFT

SubSHIFT modifier

Description

When you press *Shift* button, it affects all buttons that have checked **Use SHIFT**. *SubShift* function is intended to affect limited number of buttons.

Button Mapping Wizard for **SubSHIFT** function has additional control items (Fig. 4.17).

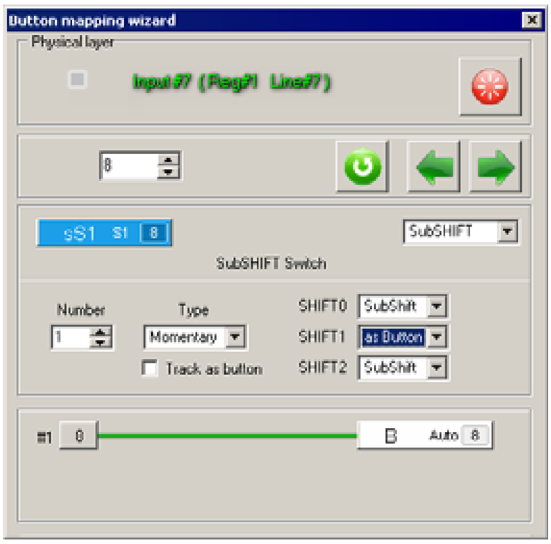


Fig. 4.17.

Set subshift index with **Number** counter. Maximum subshift number is equal to seven.

SubShift modes:

- Momentary – common, analog to Shift modifier,
- Alternate – with holding, analog to CapsLock modifier.

Button with **SubSHIFT** function may depend of **Shift** modifier. Select button mode from combo box for every Shif1 (0...2). When Shift is pressed SubShift button can work as simple button (shifted), or stay **SubShift**.

Track as button checkbox allows to use button with **SubShift** function as simple button too. In this case its parameters will be the same as for simple button (see 4.3.1 on p. 52). If checked than when you press SubShift it will modify dependent buttons AND work as joystick button too.

If **Track as button** is checked than button does not depends of global **Shift**.

Assign *ButtonS* function for buttons depending of SubShifts 1…6 (see 4.3.4 on p. 55).

Assign *ButtonX* function for buttons depending of SubShift 7 (see 4.3.5 on p. 56).

4.3.10. Toggle

Toggle switch

Description

When you close control with **Toggle** function a short pulse will be generated even if the line stays closed. Pulse length is specified by **Time of toggle pulse** global parameter (see 2.3.1 on p. 23). When you open control line with another number can work. By default this number is greater by 1 but can be changed. If you assign the same number than when you press and release control two pulses with identical numbers will be generated.

Button mapping wizard dialog for Toggle function is shown on Fig. 4.18.

Fig. 4.18.

2buttons checkbox controls the ability of the second line work with opening control. If it is checked assign the second line number (for opening pulse) using **2nd virtual button** counter.

Three-position (On-Off-On) Toggle switch features

Synchronization

You can see three-position toggle switch on the back side of Fat Black Mamba case. It is named as **Flaps**. We use this switch to control flaps. When you push toggle stick down flaps go down. Upper position will retract flaps. Middle position does nothing. As it was mentioned above toggle signal is generated at a switch moment. When stick stays stable It does not know about its state. **Sync** function (see 4.3.26 on p. 98) allows to synchronize toggle switches state. When you press button with this function all toggle switches will be polled and controller will get there state. So if Flaps toggle was in the lower position in this time flaps will go down. There is an issue with middle toggle stick position. **Slave** function allows to get this position.

Lower position of Flaps toggle switch of Fat Black Mamba joystick corresponds to line number 13 and upper position to #14. For example assign line #15 to middle position.

Physically line #15 is used by **Pump** toggle switch situated on the left side of Fat Mamba case. We can assign another line number (logical) for this switch so it will not be lost.

Click cell #13. You will see **Button Mapping Wizard** dialog. Choose **Toggle** item from combo box. Check **2 buttons** and **Master**. Set **Master Toggle** counter to 14 (Fig. 4.19).

Fig. 4.19.

Go to next line (14) settings. Check **2 buttons** and set **2-nd virtual button** counter to 15 (Fig. 4.20).

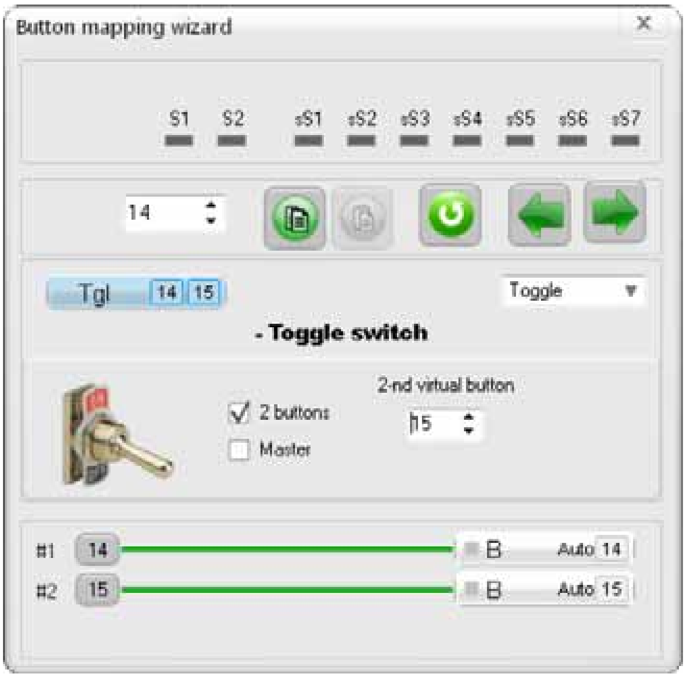


Fig. 4.20.

After you apply these settings pressing **Set** button Flaps toggle switch will generate the following signals:

- switching down – line # 13,
- switching to the middle from any position –line # 15,
- switching up – line # 14.

Physical button as toggle switch

Simple button can be configured as toggle switch. For what? Battle of Stalingrad simulator. You must press button to see briefing. Then you must press it again to cancel viewing. Using button as toggle switch you can use single press. You will see briefing while button is depressed. Release button and return to cockpit view.

How to? Choose any button and assign **Toggle** function to it. Check **2 buttons** and assign the same line number to **2-nd virtual button** counter (Fig. 4.21).

Fig. 4.21.

When you physically press button virtually it will be «pressed and released». When you release button its line will be «pressed and released» once again (Fig 4.22).

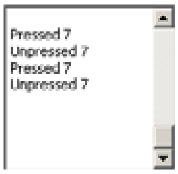


Fig. 4.22.

Restrictions

Controller can process up to 64 toggle switches. *Shift1* and *Shift 2* modifiers do not affect toggle switches.

4.3.11. Encoder

Encoder

Description

Encoder converts axis rotation to pulse sequence. Mouse wheel is an example of encoder. Encoder looks like potentiometer. Encoders of VKB joysticks are presented as three lines. Two of them generate signals when you rotate encoder wheel and the third works when you press wheel axially.

Some encoders have no axial button

For some objects or processes (zoom view, trimmers) significant is not absolute but reference position. And vice versa for example you always must know throttle or

RPM lever position. Instead of potentiometer encoder has no extreme positions. Physical encoder can be configured in the following modes:

- discrete – encoder wheel rotation is converted to pulses of two lines referenced to rotation direction.
- trimmer – encoder works similarly to physical axis; this virtual axis can be considered as independent axis or be used to trim existing one.

Discrete encoder

Choose **Discrete** item from **Type** combo box. See Button mapping wizard dialog for discrete encoder on Fig. 4.23.

Fig. 4.23.

Encoder wheel is rotated discretely with clicks. Select number of pulses that will be generated for every click:

- 1/4 – four pulses,
- 2/4 – two pulses,
- 4/4 – single pulse,
- adv – similar to 4/4.

When you assign **Encoder** function to a line adjacent one will be reserved automatically. Current line generates pulses on rotation to one direction, next for another direction. The first encoder line must be odd. If you try to assign encoder function to even line warning message appears (Fig. 4.24).

Fig. 4.24.

The number of the first encoder physical line on Fig. 4.23 is 67. By default the next line #68 is reserved. You can remap logical (seen in game) line to another number using **But** counter. You can assign logical functions to encoder lines. Encoder lines can be modified (added additional line numbers) with *Shift1* or *Modal Switch1* or *Modal Switch2* modifiers. To use shifts check corresponding control items and choice line numbers using **But** counters. Modified (virtual) encoders can be set as discrete or trimmer similarly to physical one.

Encoder pulse time is equal to **T_Enc** global parameter value (ms). It is recommended to set this value not less then 15 ms. You can set encoder axial button similarly to simple button (see 4.3.1 on p. 52). It is recommended to assign **Trimmer reset** function to it.

You can use single button to reset several trimmers simultaneously.

Trimmer

Select **Trimmer** item from Type combo box to use encoder as analog device. **Button mapping wizard** dialog for this mode is shown on Fig. 4.25.

Fig. 4.25.

Encoder wheel rotates discretely with clicks. Number of output pulses per one click you can select from combo box.

Select **Virt** variant for virtual encoder from external device.

This parameter together with **Multiplier**, specifies the shape of axis response curve. See examples of response curve on Fig. 4.27, 4.28, 4.29.

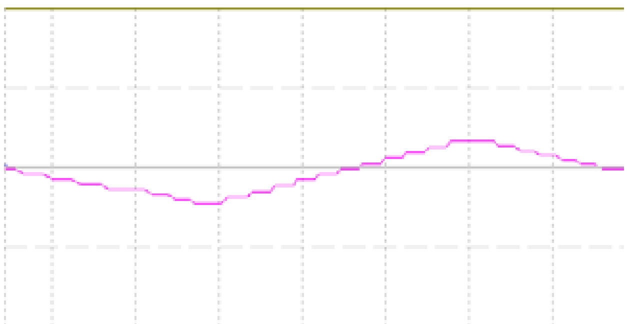


Fig. 4.27. Pulses per click 4/4, Multiplier 32

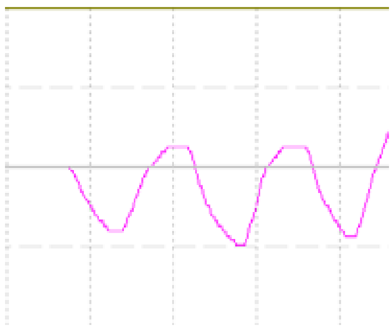


Fig. 4.28. Pulses per click 4/4, Multiplier 256

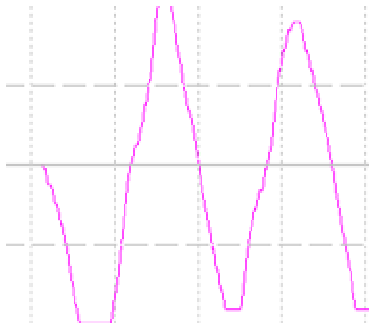


Fig. 4.29. Pulses per click 1/4, Multiplier 32

Multiplier values list by default contains degrees of 2. You can set custom list. Check **New Opt** ant fill in values table.

Assign index of the axis that will be controlled by encoder using **Axis** counter. If existing axis has this number it will be trimmed by encoder. If no axis has this number, new one will be created.

Do not forget to enable this axis and make it visible (check **En** and **Vs** on **Profile – Common-nAxes – Logical axes** tab). Set this axis as **Virtual** on **Physical Axes** tab.

Restrictions
Total of encoders must not be more than 64.

4.3.12. Cyclic switch

Cyclic Switch

Description
Sequential single button pressing virtually presses some adjacent lines. Button mapping wizard dialog for Cyclic switch function is shown on Fig. 4.30.

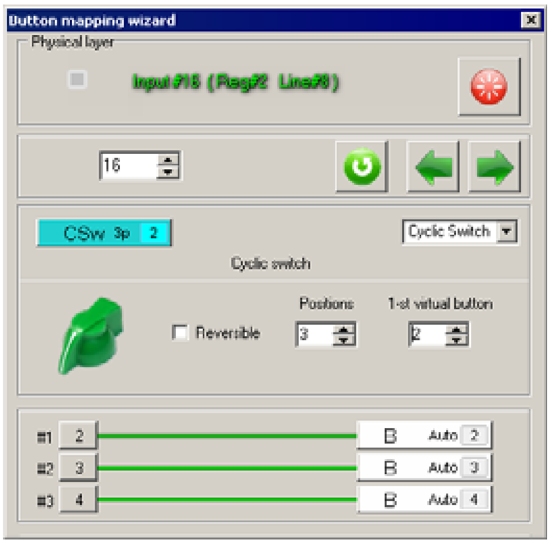


Fig. 4.30.

Positions counters sets virtual line number. **1-st virtual button** counter sets number of the first virtual line that will be pressed with the first pressing of cyclic switch button.

For example shown on Fig. 4.30 first press of button #16 (**Start** button on the right side of Fat Black Mamba case) will switch line # 2. The second – #3, the third – $4. Next press will switch line #2 again and so on. If **Reversible** is checked then lines will be switched in the following sequence: 2 3 4 3 2.

Virtual lines of Cyclic switch can use logical functions.

4.3.13. POV Switch

Discrete POV Switch

Description

Physically discrete HAT is four-position switch. It consists of four pushbutton switches with shaft. HAT uses four lines. Virtually HAT can be represented as eight-position switch. Intermediate positions are generated by software.

HAT position names are:

- HR – to right,
- HD – down,
- HL – to left,
- HU – up.

Button mapping wizard dialog for POV switch is shown on Fig. 4.31.

Fig. 4.31.

Set current HAT index using **Number of POV** counter. Select virtual controller index for this POV using **VC** counter. Set HAT position for current line pressing corresponding arrow or central button on HAT image.

Usually HAT is used for viewing (if you do not use NaturalPoint TrackIR or other similar device). If you do not need HAT as view controller you can configure it as four simple independent buttons. In this case you must configure lines of HAT as buttons (see 4.3.1 on p. 52). Thus you can add up to twelve buttons (using *Shift1* and *Shift2* modifiers).

Restrictions

Total of HATs must not be more than 4. Global parameter **#Hat** (see 2.4.1 on p. 25) specifies maximum HAT number for current configuration.

4.3.14. uStick Switch

Ministick mode switch

Description

Switches analog ministick between HAT and two axes modes. Button master wizard is shown on fig. 4.32.

Fig. 4.32.

Set ministick number using **POV N** counter. Choose switch mode from combo box **Switch by** (table. 4.2).

Table. 4.2.

Mode	Description
Button	Simple button switch.
ButtonAlt	Alternative button switch.
Tempo	Two stage switch. Ministick state depends on press duration. Set default ministick state using **POV mode on start** checkbox.
TempoB	Two stage switch. Ministick state depends on press duration. Set default ministick state using **POV mode on start** checkbox. Instead of Tempo mode short press is registered as button press additionally. If ministick axes configured as relative, **Short Press Axis Reset** checkbox (fig. 4.33 on p. 72) controls axis reset on short press. **Example**. Ministick is in axes mode. **Short Press Axis Reset** is checked. On short press ministick keeps axes mode. Axes jump to zero. **Short Press Axis Reset** is unchecked. On short press ministick keeps axes mode. Axes do not move. Button press is registered.
SHIFT	Shift modifier switches ministick state. Choose shift number using **SHIFT N** counter.
SubShift	SubShift modifier switches ministick state. Choose subshift number using **SubSHIFT N** counter.

Fig. 4.33.

To use uStick switch choose **Always** activity mode (**Active** combo box on **POV** tab).

4.3.15. uPOV Switch

Active POV switch

Description

Switches activity between POV switches. Button master wizard is shown on fig. 4.34.

Fig. 4.34.

Choose first (default) active POV using **POV N** counter. Choose switch mode from combo box **Switch by** (table. 4.3).

Table. 4.3.

Mode	Description
Button	POV switches by button depressing.
Cyclic	POV switches consequently by button short presses.

Counter **N** is enabled for Cyclic mode. Specify number of POVs switching by uPOV. For example 3 POVS are enabled (**#POV** counter on **Global – Common** tab). N=2. Only 2 of POVs will be switched by uPOV. This parameter is similar to CSW (see sect Cyclic switch on p. 69).

Example.

Gunfighter SCG joystick. Two POVs enabled. They use same axes. **On/Off** POV activity mode is chosen (fig. 4.35.).

Fig. 4.35.

On joystick start POV №1 is active. uPOV button press activates POV №2. If **Mouse** output mode is selected for this POV, virtual mouse will work.

On uPOV use uStick MUST be disabled. No one button with this function.

4.3.16. SwitchCB

Complementary button

Description

Several CONSEQUENT lines included into a group. Complementary button is pressed if all other buttons of the group are released. Button master wizard is shown on fig. 4.36.

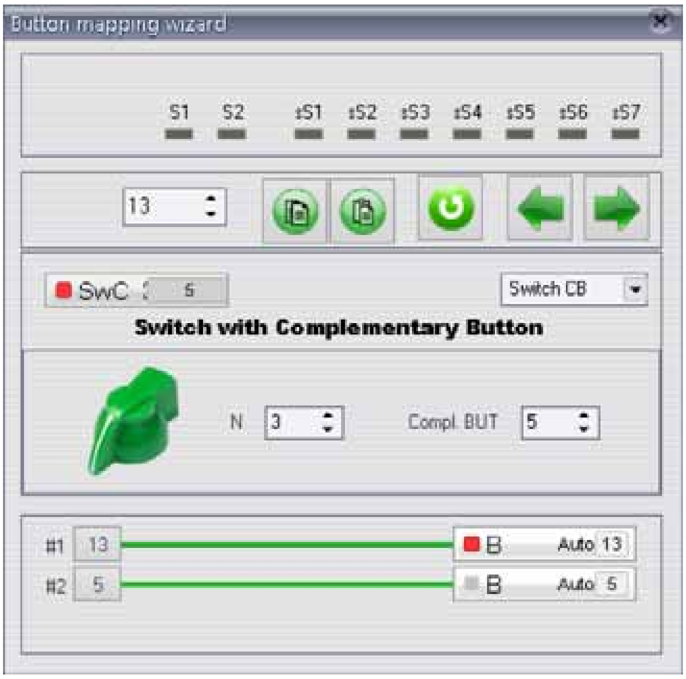


Fig. 4.36.

Set group lines number using **N** counter. Select complementary line number using **Compl.BUT** counter. It is the first line of the group. Line №5 will be pressed if lines 13, 14, 15 will be released. If **N** = 1, button with additional inversed output is created.

4.3.17. Generator

Pulse generator

Description

When you press button with this function pulse sequence will be generated. Global parameter **T_Gen** (see 2.3.1 on p. 23) specifies pulse frequency. The following generator types can be used:

- G1,
- G8,
- GT,
- GT+,
- GTE,
- GTE+,
- GTR,
- GTR2,

Button mapping wizard dialog for generators is shown on Fig. 4.37.

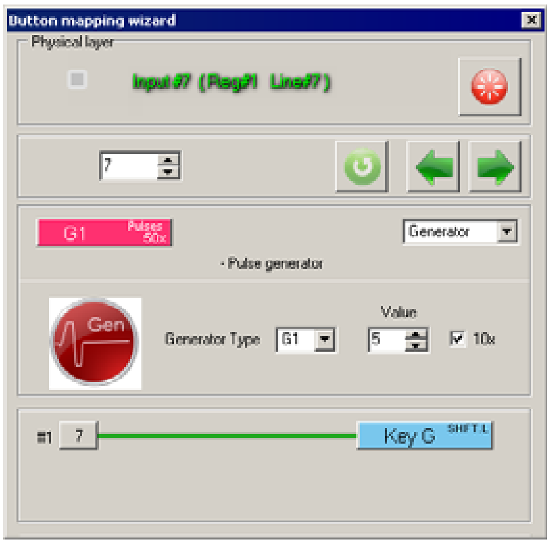


Fig. 4.37.

Choose generator type from **Generator Type** combo box. You can use logical functions for generator pulses. If generator line is used as joystick button than single pulse with specified parameters will be generated. If his line is mapped to keyboard than series of keystrokes will be generated for specified pulse length (or pulse number). Keystroke frequency corresponds wits operation system settings.

G1

Generates specified number of pulses with single button press. Set this number using **Value** counter.

Flaps toggle switch (Fat Black Mamba) settings are shown on Fig. 4.37. It is used for manual gear retract. Keystroke *<Shift>+<G>* is mapped to lower toggle switch position. When you lower handle this keystroke will be generated 50 times. It guarantied retracting gear of Polikarpov I-16 in Il-2 Sturmovik.

G8

Generates pulse batches with specified frequency all the time button is pressed. Set number of pulses in a single batch using **Value** combo box.

H4U button of CMS HAT (HOTAS Warthog grip with Fat Black Mamba case) settings are shown on Fig. 4.38.

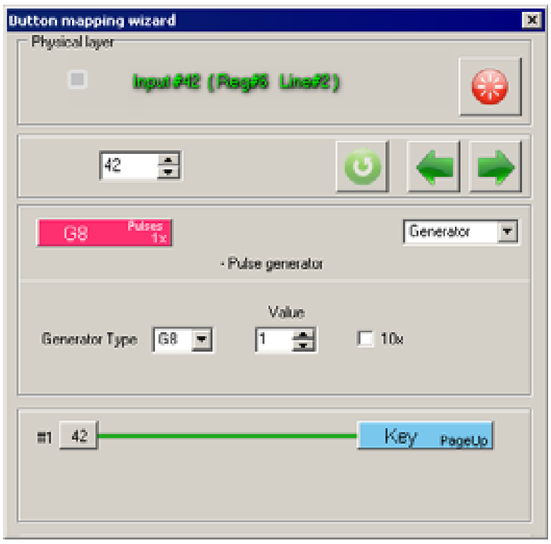


Fig. 4.38.

This button is used to zoom in. <*Page Up*> keystroke is mapped to this button. H4D button of this HAT is specified as G8 too and mapped to keystroke <*Page Down*>. Buttons control zoom in and out.

GT

Generates single pulse of specified length on button press. No matter to button state - will it stay depressed or released.

Fig. 4.39.

Set pulse length in **Value** field, 0,01 s, from 1 to 127 (Fig. 4.39). Selecting **Multiplier** = **10x** you can multiply specified length to 10. Example. **Value** is equal to 20, **10x** selected. 2 s pulse will be generated. Thus GT pulse length range is 10 ms to 12,7 s.

GT+

Generates single pulse of specified length on single button press. If the button will stay depressed more than pulse length, it will be generated until you release button (Fig. 4.40).

Fig. 4.40.

Set pulse length in **Value** field, 0,01 s, from 1 to 127. Checking **x10** you can multiply specified length to 10. Example. **Value** is equal to 20, **x10** checked. 2 s pulse will be generated. Thus GT pulse length range is 10 ms to 12,7 s.

If you press **GT+** several times pulse periods will be summarized.

GTE

Generates single pulse of specified length on button press. No matter to button state - will it stay depressed or released (Fig. 4.41).

Fig. 4.41.

Set pulse length in **Value** field, 0,01 s, from 1 to 127. Checking **x10** you can multiply specified length to 10. Example. **Value** is equal to 20, **x10** checked. 2 s pulse will be generated. Thus GT pulse length range is 10 ms to 12,7 s.

GTE+

Generates single pulse of specified length on single button press. If the button will stay depressed more than pulse length, it will be generated until you release button (Fig. 4.42).

Fig. 4.42.

Set pulse length in **Value** field, 0,01 s, from 1 to 127. Checking **x10** you can multiply specified length to 10. Example. **Value** is equal to 20, **x10** checked. 2 s pulse will be generated. Thus GT pulse length range is 10 ms to 12,7 s.

If you press **GT+** several times pulse periods will be summarized.

Differences between GT and GTE

GT generators are independent. One generated pulse can not be interrupted. If your generator assigned to extend gear it will work the whole time. GTE pulse can be interrupted by another one! For example keystroke F assigned to extend flaps of LaGG-3. Button has GTE function with time equal to 10 seconds. You have pressed button and flaps began to go down. Keystroke V assigned to retract flaps and its button has GTE function too.

You need to retract flaps before full extending. When you press GTE with V keystroke it will interrupt the first generator and flaps will be retracted.

GTR

Generates single pulse of specified length on button press. The second press interrupts pulse (Fig. 4.43).

Fig. 4.43.

Set pulse length in **Value** field, 0,01 s, from 1 to 63. **Multiplier** combo box allows to select multiplication factor. **x10** will multiply specified length to 10. Example. **Value** is equal to 2, **100x** selected. 2 s pulse will be generated.

GTR2

Generates pair of short pulses divided by specified period on button press. The second press generates the second pulse of pair before period ends (Fig. 4.44). Short pulse length is specified by **T_Gen** parameter (see 2.3.1 on p. 23).

Fig. 4.44.

Set period between pulses length in **Value** field, 0,01 s, from 1 to 63. **Multiplier** combo box allows to select multiplication factor. **x10** will multiply specified length to 10. Example. **Value** is equal to 2, **100x** selected. Period length will be equal to 2 s.

4.3.18. Tempo

Two stage button

Description

Button output depends on button depressing time. The short press will cause signal of one line but more long one – another one. Such function is used in real modern planes. **Tempo Time** global parameter (see 2.3.1 on p. 23) specifies depressing period. Select function type from **TEMPO Type** combo box.

Tempo1 and Tempo2

2-position switches.

Button mapping wizard dialog for Tempo1 and Tempo2 functions is shown on Fig. 4.45.

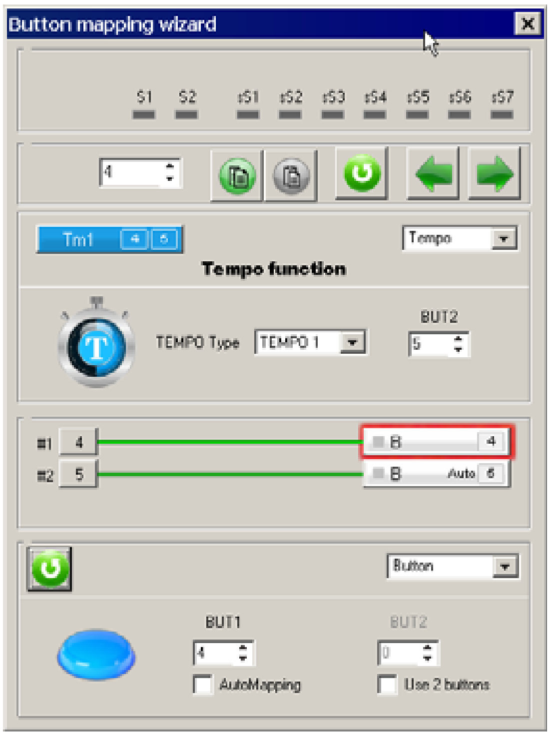


Fig. 4.45.

Use **BUT2** counter to choose the second line number (see Free line choice on p. 50). Both lines of TEMPO can use logical functions. If button depressing time is less than **Tempo Time** value, than first line pulse time will be equal to **T_Tgl** value (see 2.3.1 on p. 23). If depressing time exceeds **Tempo Time** value the result depends on **TEMPO Type** parameter.

- **Tempo 1** – second line pulse length is equal to **T_Tgl** value in no matter to real depressing time.
- **Tempo 2** – second line pulse length is equal to button depressing time.

Tempo 3
3-position switch.

Button mapping wizard is shown on Fig. 4.46.

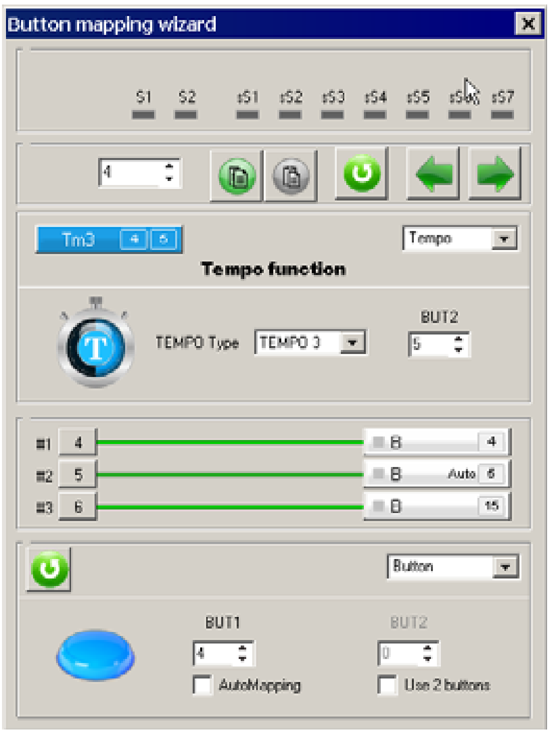


Рис. 4.46.

Double click switch mode is added for Tempo 3. For configuration shown on fig. 4.46 short press switches to line 4, long – 5. Double click enables line 15.

Tempo 3s
3-position Shift modifier.

Button master wizard is shown on fig. 4.47.

Рис. 4.47.

Associate shift modifiers with every Tempo mode (Short / Long / Double). Do not use other shift modifiers if you use TEMPO 3s function.

Tempo 3A
Static 3-position switch.

Button mapping wizard is shown on fig. 4.48.

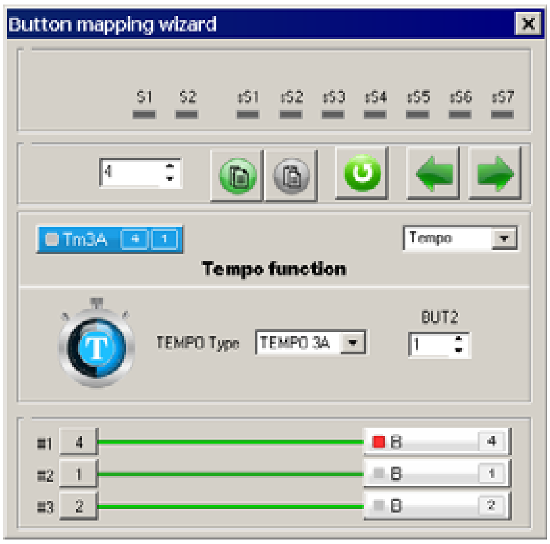


Рис. 4.48.

One of lines is «pressed» permanently. Lines are selected in the same manner as for Tempo 3.

For configuration shown on fig. 4.48 line 4 is pressed by default. Short press switches to the same line 4, long – 1. Double click enables line 2.

4.3.19. Trimmer

Trimmer

Description
Controls axes (physical or virtual) with buttons. Function modes:

- **Trimmer Reset** – Resets trimmer(s) to default condition. Returns axis with center to the central position and axis without center to zero. Also stores current axes trim value. It can be reapplied to axes using Trimmer Return function.
- **Trimmer Return** – Reapplies trim value, stored with Trimmer Reset function to selected axes.
- **Trimmer+**, **Trimmer-** – Trimming of existing axis or creation of virtual one. Axis response is changing until button is pressed. When you release button axis stops. + or - defines trimming direction.
- **Trimmer Auto+**, **Trimmer Auto-** – Alternative trimming. When you release button axis response falls to center or zero regarding to axis type. + or - defines trimming direction.
- **Trimmer SET+**, **Trimmer SET-** – Sets axis response to specified value.

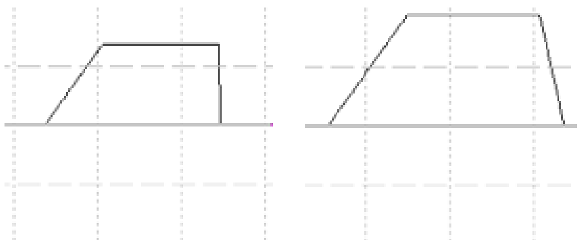
Choose desired mode from **Function** combo box.

Trimmer Reset, Trimmer Return
Button mapping wizard dialog for Trimmer Reset function is shown on Fig. 4.49.

Fig. 4.49.

Check axis numbers that will be reset in **Applied axes** group. Axes 1, 2 and 8 will be reset in this example. Virtual axis # 8 (encoder as trimmer, see 3.5 on p. 36) is combined with axis #2. Single button will reset both axes simultaneously.

Global parameter Trimmer Time defines duration of trimmer reset process. If **Trimmer Time**=0, then trimmer reset will be instant. (Fig. 4.50, a). Fig. 4.50, b) shows trimmer reset if **Trimmer Time**=300.



a) b)

Fig. 4.50.

Button mapping wizard dialog for Trimmer Return function is similar to one for Trimmer Reset and is shown on Fig. 4.51.

Fig. 4.51.

Check axis numbers that will be retrimmed with values, stored while resetting with Trimmer Reset function in **Applied axes** group. Trimming of axes 1, 2 and 8 will be restored in this example.

Trimmer+, Trimmer–, Trimmer Auto+, Trimmer Auto–
Button mapping wizard dialog for these trimmers is shown on Fig. 4.52.

Fig. 4.52.

Signs of **Trimmer+**, **Trimmer–**, **Trimmer Auto+**, **Trimmer Auto–** specify trimming direction. Axis response for **Trimmer+** and **Trimmer–** will be fixed after button is released. Axis response for **Trimmer Auto+** and **Trimmer Auto–** will return to the center (axis with center) or zero (without center).

Choose trimmed axis number from **Axis** combo box. If there exists an axis with specified number it will be trimmed. If an axis does not exist it will be created. **Multiplier** combo box value specified response speed. Select multiplier value equal to degree of 2 or **Free**. In this case set custom value using **MPL** counter.

Trimmer SET+, Trimmer SET–

Button mapping wizard dialog for these trimmers is shown on Fig. 4.53. Signs of **Trimmer SET+** and **Trimmer SET–** specify trimming direction. After button press axis response will be equal to specified value.

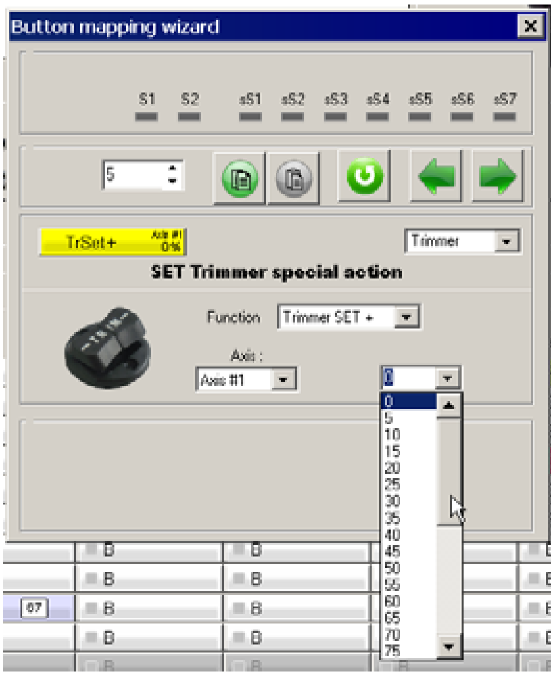


Fig. 4.53.

Choose trimmed axis number from **Axis** combo box. Choose trimmed axis number from **Axis** combo box. If there exists an axis with specified number it will be trimmed. If an axis does not exist it will be created. Items of expanded combo box allow to specify response value.

Global parameters

In order to use listed functions choose **Trimmer+** or **Trimmer–** for desired axes from **Trimmer** combo box on **Profile – Common-n-Axes – Physical Axes** tab.

If function creates new axis check **En** and **Vs** for it on **Profile – Common-nAxes – Logical axes** tab. Set this axis as **Virtual** on **Physical Axes** tab.

4.3.20. Curves

Dynamic equalizer

Description
Allows temporary apply custom response curve (see 3.6 on p. 40) to chosen axes. This function is similar to **DR** (see DR on p. 91).

Crv
Button mapping wizard dialog for Curves – Crv is shown on Fig. 4.54.

Fig. 4.54.

Check customized axis numbers in **Applied to axes** group. UNCHECK **Eq** for these axes on **Profile** – **Common-n-Axes** – **Physical Axes** tab.

If **Eq** is checked custom curve is applied to an axis permanently.

If empty value of **Eq N** combo box will be assigned for axis on **Physical Axes** tab (see sect. 3.2.1 on p. 30), than curve with number, corresponding to axis number will be applied (see sect. 3.6 on p. 40). You can assign custom curve number for axis instead.

If **alternate action** is checked function works as a trigger. The first press enables custom mode and the second one disables it.

Crv2
Allows temporary apply custom response curve up to 3 chosen axes simultaneously. Button mapping wizard dialog for Curves – Crv2 is shown on Fig. 4.55.

Fig. 4.55.

Select axes numbers using **Axis** counters. Select **Curve number** for each axis (see sect. 3.6 on p. 40). UNCHECK **Eq** for these axes on **Profile – Common-n-Axes – Physical Axes** tab.

If **Eq** is checked custom curve is applied to an axis permanently.

If **alternate action** is checked function works as a trigger. The first press enables custom mode and the second one disables it.

4.3.21. Axes fixation

Fix Axes

Description

Axis modifiers allow to set specified axis response value.

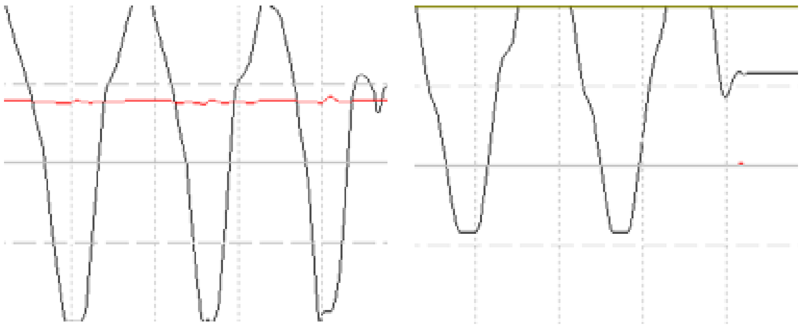
FA0

Allows to set current axis position as its center («helicopter trimmer»). Fig. 4.56 shows response of axes X and Y with **FA0** function enabled depending on **Rls Time** (FA0 release time) parameter (see sect. 2.4.4 on p. 25). Select FA0 mode from corresponding combobox on **Global – Common** tab (see table 4.4).

Trimmer Reset button (see sect. Trimmer Reset, Trimmer Return on p. 84) resets FA0 for all modes.

Table. 4.4.

FA0 Mode	Description
M1	Move axis to desired position and press button. Axis position becomes new center after button release+**RLS Time** value.
M2	Move axis to desired position and press button. Axis position becomes new center after button release+**RLS Time** value or after axis centering (if quickly than **RLS Time** value).
M3	Move axis to desired position. Short button press: axis position becomes new center after button release+**RLS Time** value. Long button press freezes axis in current position until short press.
M4	Move axis to desired position. Short button press: axis position becomes new center after button release+**RLS Time** value. Long button press resets FA0.



Trimmer mode = Modified   Trimmer mode = Standard

Fig. 4.56.

FA1

Fixes axis without center (throttle, for example) in zero position and axis with center (pitch, yaw etc.) in central position. Axis is fixed until button with FA1 function will be released.

FA2

Fixes axis in the current position. Axis is fixed until button with FA2 function will be released.

FA3

Sets axis response to specified value. **FA3 val** variable specifies response value in percents of the whole response range. This parameter for each axis you can find on **Profile – Common-n-Axes** tab. Fig. 4.57 shows X and Y axes response when FA3 button is pressed four times. **FA3 val** is equal to 45.

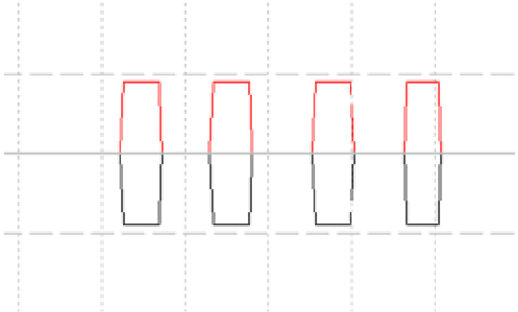


Fig. 4.57.

Indeed joystick grip stayed in the center.

DR

Reduces axis response in specified rate. **D.Rate** (**Global – Common** tab) parameter specifies rate value in percents of the whole range. This function can be useful when you aim the target. It is similar to *Curves* function (see 4.3.20 on p. 87). Fig. 4.58 shows *DR* button work. This button was depressed for some time and then released. Joystick grip was moved by the same manner within the whole range.

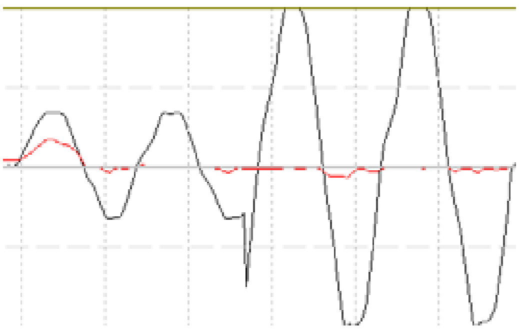


Fig. 4.58.

FA2, FA3, DR modifiers have **alternate action**. If it is checked modifier works as trigger that is the first press enables axis fixation and the second disables it.

Button mapping wizard dialog for axis fixation functions is shown on Fig. 4.59.

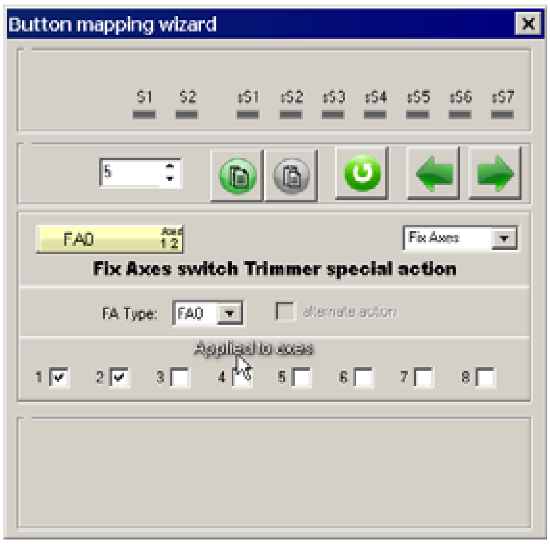


Fig. 4.59.

Choose fixation mode from **FA Type** combo box. Check axis numbers that will be affected in **Applied to axes** group.

Modification parameters:

FA0, **FA1**, **FA2**, **FA3** variables (ms) – specify transition time for corresponding function (modifications are applied to axis response not immediately).

4.3.22. AUX Axes

Auxiliary axis

Description

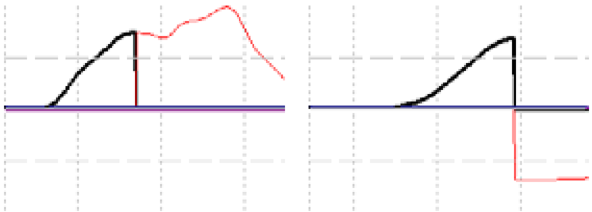
Functions of this group allow «swap» axes. **Button mapping wizard** dialog for AUX axes is shown on Fig. 4.60.

Fig. 4.60.

Choose function from **AUX Function** combo box.

SWAP

Allows to rotate physical axis (source) but get response of another one (target) if **SWAP** button is pressed. Source axis response in this case will be equal to zero for axis without center or goes to the center for axis with it. Target axes response will be equal to source one on the moment of button pressing (Fig. 4.61, a). If target axis is inverted, than response value will be inverted too (Fig. 4.61, б).



a) б)

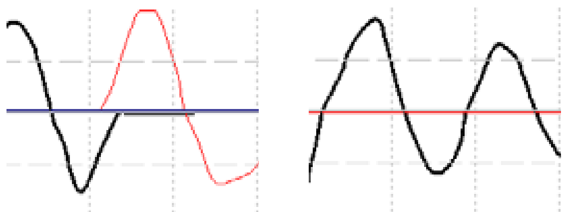
Fig. 4.61.

Select source axis number from **Source** combo box and target one from **Target** combo box. For example shown on Fig 4.60 on p. 92 when you will rotate X (#1) axis with pressed SWAP button Z (#3) axis response will vary. SWAP button can affect several axes. **Num** field value specifies modified axes number. If **Num**=2, than for this example when you press SWAP button and rotate X (#1) axis than Z (#3) axis will be «rotated». Y (#2) axis rotation will «rotate» Rx (#4) axis.

REMAP

Allows rotate several axes linked with source axis. An example is shown on Fig. 4.62.

X (#1) axis is source, Z (#3) is target. Fig. 4.62, a) – REMAP button released. When you rotate each of these axes they work. X (#1) axis response is drawn by bold line. Fig. 4.62, b) – REMAP button is pressed. When you rotate X (#1) axis it does not response. When you rotate Z (#3) axis than X axis «rotates» too.



a) b)

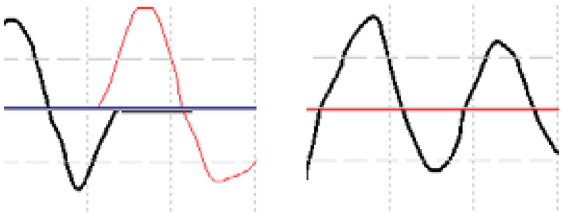
Fig. 4.62.

If target axis is inverted than its response will be inverted too.

Set number of linked axes in **Num** field. For example if **Num**=2, then rotation X (#3) axis will cause rotation of #3 and #1, rotation axis #4 – #4 and #2.

SWITCH
Modifier is opposite to REMAP. If button with SWITCH function is pressed target axis is disabled. Response of this axis will appear if source axis will be rotated. All other function parameters are the same to REMAP function ones.

Axis #1 is source and axis #3 is target (Fig. 4.63). Fig. 4.63, a) button with SWITCH function is not pressed. Axes #1 (bold line) and #3 response separately. SWITCH button is pressed (Fig. 4.63, б). When you rotate axis #3 it does not response. When you rotate axis #1 you can see axes #1 and #3 responses.



a) б)

Fig. 4.63.

SWITCH 0
Similarly to SWITCH. If button is pressed target axis is zeroed and disabled. Response of this axis will appear if source axis will be rotated.

PAI INV
Inverts axes. Set number of first inverted axis using **Source** field. Set inverted axes count using **Num** field. **Source** = 1, **Num** = 2. If button is pressed, axes №1 and №2 will be inverted. Fig. 4.64 shows axis response on different button state with the same axis direction.

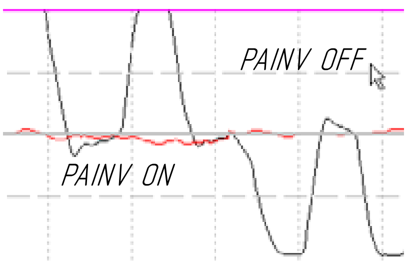


Рис. 4.64.

SPLIT Rev
Splits axis to two semiaxes symmetrically to center. Set splitted axis using **Source** field. Function result is shown on fig. 4.65.

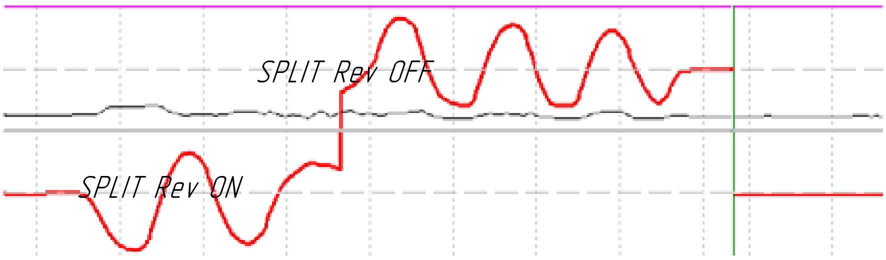


Рис. 4.65.

4.3.23. RelAxes

Relative axes control

Description

This function allows to set relative axis (see 3.4 on p. 35) response value. Select function mode from **RelAxes Function** combo box.

RESET

RESET allows to reset response axis value. **Button mapping wizard** dialog for RelAxes function is shown on Fig. 4.66. Check applied axis numbers in **Applied to axes** group.

Fig. 4.66.

Button press resets selected axes response value to zero.

SET FA3 Val

Set Value allows to set selected axes response value equal to **FA3 val** (see 3.3 on p. 33) parameter. **Button mapping wizard** dialog for RelAxes function is shown on Fig. 4.67. Check applied axis numbers in **Applied to axes** group.

Fig. 4.67.

SET Value 2

SET Value2 allows to set selected axes response value equal to assigned. **Button mapping wizard** dialog for RelAxes function is shown on Fig. 4.67. Set axes using counters **Axis** #. Set target values using % counters.

Fig. 4.68.

4.3.24. DZ Switch

Deadzone dynamically disable

Description

Button press disables deadzone of selected axes. Button mapping wizard is shown on fig. 4.69. Check axes numbers to disable deadzone.

Fig. 4.69.

4.3.25. RPB

Button replica

Description

Enables virtual button press simultaneously with physical one. **Button mapping wizard** dialog for RPB is shown on Fig. 4.70.

Fig. 4.70.

Choose physical button number that will be source for virtual using **Replicated button** counter. For this example when you press Start button (left side of Fat Black Mamba case, line #16) line 32 will generate a pulse too. Line-replica can use logical functions (see Logical (output) function choice on p. 51).

4.3.26. Sync

Toggles synchronizer

Description

Sync button controls Toggle switches (see section 4.3.10 on p. 62) and Buttons Alt in pulse mode (see section 4.3.2 on p. 54).

Synchronization

Button mapping wizard dialog for Synchronization subfunction is shown on Fig. 4.72.

Fig. 4.72.

Check **Toggles** to control Toggle switches. If Sync button is pressed all lines of switched on Toggles will generate pulses. For two state Toggle switch the pulse will be generated by switched on position (see 4.3.10 on p. 62).

Example. Fat King Cobra joystick has four toggles. Three of them are *On* and one *Off*. When game started it «does not knows» about toggle states. Controls are not scanned automatically. After you press Sync button system will get current toggle states.

See also about three-way toggle switch features in Three-position (On-Off-On) Toggle switch features on p. 62.

Check **BA** to control ButAlt lines. If Sync button is pressed it affects all ButAlt lines with the following properties:

- **Default state** is ON,
- **Pulse** is checked,
- **Set** index corresponds with this parameter of Sync button.

ALL value for Sync affects all But Alts no matter to their sets. After Sync button press all suitable ButAlt lines will generate pulses.

State setting

Button mapping wizard dialog for SET subfunction is shown on Fig. 4.74.

Fig. 4.74.

Sync (SET) button affects all ButAlt buttons with Pulse = On and default state =On. Press this button will generate pulses.

4.3.27. NoF

No function

Description

Disables any function for button. **Button mapping wizard** dialog for NoF function is shown on Fig. 4.75.

Fig. 4.75.

Chapter 5. Logical button functions

5.1. Overview

Each of joystick control is connected to controller by single (button, single-state toggle switch) or several (encoder, HAT, Two-state toggle switch) lines. Physically line corresponds to pair of conductors with a specific number. When you press button its line generates a signal. When you rotate encoder wheel in one direction you get a series of its first line pulses. Another direction generates pulses of another line with number greater (or less)) by one. Physical line signal is received by controller. But operation system and the game will receive just logical signal. By default if no logical function is applied, line numbers will be the same. Logical buttons engine executes the following tasks:

- remap control lines,
- control multimedia, use operation system functions, launch applications, work with virtual mouse and so on with use joystick controls,
- map joystick buttons to keystrokes.

5.2. Logical function setup modes

You can obtain access to logical function parameters from **Button mapping wizard** dialog on **Physical layer** tab or directly on **Logical layer** tab.

5.2.1. Access from Physical layer tab

When you set up physical function it can use logical function too. For example simple button or toggle switch can be mapped to keystroke or mouse button or even axis or wheel.

> Some physical functions have no access to logical functions, Shift for example.

If physical function has access to logical one corresponding control items are accessible in **Button mapping wizard** dialog. For example **Button mapping wizard** dialog for simple button (*Button*) is shown on Fig. 5.4. It appears after you click button line number cell on **Profile – Buttons – Physical layer** tab.

Fig. 5.1.

Line #16 is customized. By default logical line number will be the same with physical one i.e. 16. In order to apply logical function click logical function sign as shown on a picture. Dialog view will change. Control items for logical function parameters will appear (Fig. 5.2).

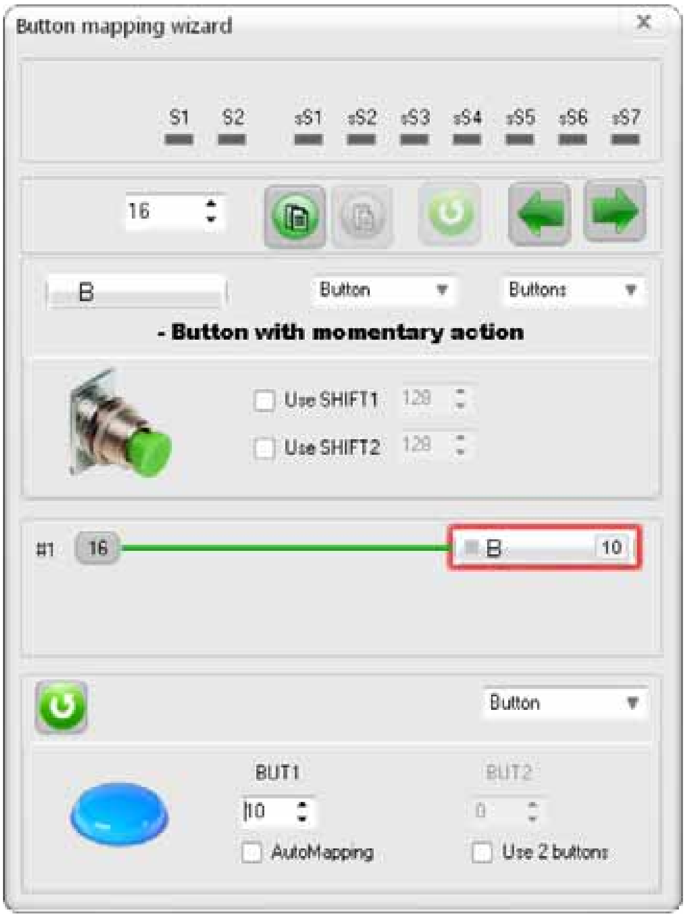


Fig. 5.2.

5.2.2. Access from Logical layer tab

In order to access logical function settings you can open **Profile – Buttons – Logical layer** tab and click the cell with number of desired line. **Quick logical layer wizard** dialog will appear (Fig. 5.3).

Fig. 5.3.

5.2.3. Function selection

Work with both dialogs is similar. You can select function from combo box (Fig. 5.4).

Fig. 5.4.

See brief function descriptions in table 5.1.

Table. 5.1.

Function name	Description
Button	Simple button.
HAT	HAT switch.
Keyboard	Virtual keyboard.
Mice	Virtual mouse.
Macro	Using macro.
Audio	Audio application control.
Multimedia	Multimedia application control.
Application	Launch applications.
System	System functions execution.
No Function	Logical functions disable.
Void	Delay (for use in macro)

Be careful to use **System** function. Improper use can cause operation system mal-function.

5.3. Button

Virtual button

5.3.1. Overview

Virtual buttons engine allows to remap button numbers. By default button logical number (recognized by OS) is the same with physical one (specified by wiring). **Quick logical layer wizard** dialog is shown on Fig. 5.5.

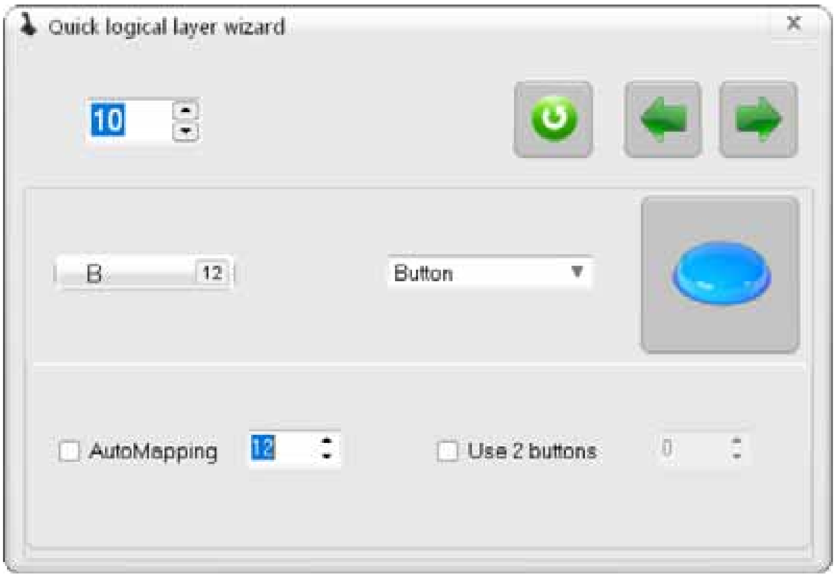


Fig. 5.5.

In order to remap default logical button number uncheck **AutoMapping** and assign number using counter.

5.3.2. Free line choice

When you remap line number you must know that new line number is not occupied. Click line number counter. **Logical layer** dialog appears (Fig. 5.7). Occupied lines are red but free – black. Click line cell to choose its number.

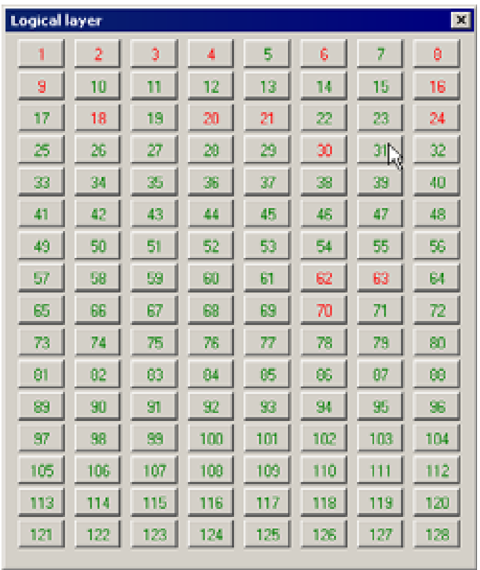


Fig. 5.7.

Using remap engine you can make button mapping more useful. For example the first trigger of Warthog grip on Fat Black Mamba case has physical (and by default logical) number 32. Usually this trigger works very often – to control weapon. It is reasonable to remap its number to #1. This example is shown on Fig. 5.5. You can remap the second trigger line number from 25 to 2 similarly.

If you use encoder as analogue trimmer its two lines are not used. For Mamba family the first encoder physically occupies lines #5 and #6. You can fearlessly use these lines for own purposes. If you want to use default mapping check **AutoMapping**. If you map several physical buttons to the same logical line it will be activated by any of them.

5.3.3. Simultaneously button activation

If you want to activate two logical lines when press single button check **Use 2 buttons** and assign second line number.

5.4. HAT

Discrete virtual POV switch

5.4.1. Description

Quick logical layer wizard dialog is shown on Fig. 5.8.

Fig. 5.8.

Set virtual POV index using **POV N** counter. Press button with desired direction for this logical line. Select virtual controller using **VC** counter.

5.5. Keyboard

Keystroke mapping

5.5.1. Overview

Keyboard item allows to map button to keystroke. **Quick logical layer wizard** dialog for this function is shown on Fig. 5.10.

Fig. 5.10.

5.5.2. Keystroke assignment

You can assign single keystroke to button pressing physical key or choose it from combo box.

Some keystrokes for example functional keys can be assigned from combo box only.

Chosen keystroke will appear in combo box, In addition you will see its scancode.

When you work with keystroke mapping note that any key press will affect this function. Use mouse only to control process unless you really assign keystroke.

5.5.3. Keyboard modifiers

You can use keyboard modifiers *Ctrl, Alt, Shift, Win*. Right and left modifiers are distinct. You can use modifiers pressing physical keys or checking corresponding checkboxes. Simultaneously modifiers use (RCtrl+RShift+A) is allowed.

5.5.4. Mapping completion

In order to complete keystroke mapping and go to the next line processing press **Previous** or **Next** button. **Clear** button allows to cancel al current settings change.

5.6. Mice

Mouse control

5.6.1. Overview

Mice item allows you to control mouse axes, scroll wheel and buttons using joystick buttons.

5.6.2. Mouse buttons

Quick logical layer wizard dialog for this function is shown on Fig. 5.11.

Fig. 5.11.

In order to control mouse buttons choose **Button** item. Button type – left, right etc. – choose from combo box. **Mice On/Off** item allows to switch mouse control. You MUST assign this function to one of buttons if **On/Off** item from **Active** combo box was chosen in **Mouse** group on **Global – Common** tab (see 2.4.11 on p. 28). If **R+A** mouse type was chosen then **Set center point** item will place mouse cursor to predefined screen point (see sect 2.4.11 on p. 28). Select point index from **SP #** counter.

5.6.3. Mouse axes control

Wheel item (Fig. 5.12) allows to control mouse axis using button. You can choose mouse axis – **X** or **Y**, or mouse **Wheel**. Assign direction – **Up** or **Down** and velocity multiplier. If multiplier is equal to zero, <u>cursor autoacceleration</u> will be used.

Fig. 5.12.

5.7. Macro

Macro control

5.7.1. Overview

Macro is a named keystroke combination saved in a file that can be called by single button press. See Chapter 8 on p. 133 how to prepare macro files.

Macro item allows you to launch macro using joystick buttons.

5.7.2. Macro assignment

Quick logical layer wizard dialog for this function is shown on Fig. 5.13.

Fig. 5.13.

Set macro number using counter. If you want to automatically repeat macro if its button stays pressed at macro end check **Repeat**. If unchecked you must restart macro manually.

You MUST set macro parameters and SAVE it on **Macro** tab BEFORE Macro function assigning to a button.

5.8. Audio

Sound control

5.8.1. Overview

Audio item allows you to control computer audio using joystick buttons.

5.8.2. Function setup

Quick logical layer wizard dialog for this function is shown on Fig. 5.14.

Fig. 5.14.

Select specific function (mute, volume increment and so on) for current button from **Audio control** combo box.

5.9. Multimedia

Multimedia control

5.9.1. Overview

Multimedia item allows you to control computer multimedia using joystick buttons.

5.9.2. Function setup

Quick logical layer wizard dialog for this function is shown on Fig. 5.15.

Fig. 5.15.

Select specific function (mute, volume increment and so on) for current button from **Multimedia control** combo box.

5.10. Application

Application launch

5.10.1. Overview

Application item allows you to launch default applications for example e-mail client, word processor etc. using joystick buttons.

5.10.2. Function setup

Quick logical layer wizard dialog for this function is shown on Fig. 5.16.

Fig. 5.16.

Select specific function (mute, volume increment and so on) for current button from **Application control** combo box.

5.11. System

System function control

5.11.1. Overview

System item allows you to execute some system functions such as power down, sleep etc.

Be careful using this function! Improper use can cause operation system malfunction.

5.11.2. Function setup

Quick logical layer wizard dialog for this function is shown on Fig. 5.17.

Fig. 5.17.

Select specific function (mute, volume increment and so on) for current button from **Windows system control** combo box.

5.12. No function

No Function item allows to deactivate button.

5.13. Void

Delay in macro

See sect. Delay parameters on p. 134.

Chapter 6. HAT/POV parameters

6.1. Overview

Joystick can have up to four HATs. Physically discrete HAT is four-position switch. It consists of four pushbutton switches with shaft. There can be additional axis push button. HAT uses four lines. Analogue HAT is two-axes ministick. It can have push button too. Using NJoy32 controller you can configure POV#1 and POV#2 as analogue as well as discrete HATs. POV#3 and POV#4 can be configured as discrete devices only. Control units of **POVs** tab (Fig. 6.1) allow to configure POV#1 and POV#2.

Fig. 6.1.

6.2. Ministick modes

Select ministick mode from **POV Type** combo box (Table. 6.1).

Table. 6.1.

Name	Description
Discrete	Standard discrete HAT. Detailed description of this kind of devices you can find in section 4.3.13 on p. 70.
LoRes 4W	4-way low resolution HAT.
LoRes 8W	8-way low resolution HAT.
HiResPOV	High resolution HAT. Not used in games at present time((.
Shifter 6W	6-position shifter. Virtual gear box.

6.3. Output mode

All ministick modes except **HiResPOV** can produce several types of output. Select desired output from **Output** combo box (Table. 6.2).

Table. 6.2.

Name	Description
POV	HAT. Point of View.
Buttons V	Logical buttons set.

Table. 6.2.

Name	Description
Buttons L	Virtual buttons set.
Numpad	Numpad buttons.
Mouse Rel	Relative mode virtual mouse control.
Mouse Abs	Absolute mode virtual mouse control.

6.3.1. POV

Ministick is represented as POV switch.

6.3.2. Virtual/Logical buttons

Ministick is represented as a set of buttons of corresponding level. Button number depends on ministick mode, **LoRes 8W** or **LoRes 4W**. Assign first button number of this set using **But#1** counter (Fig. 6.2).

Fig. 6.2.

Other buttons will have next numbers. **@once** checkbox allows to use diagonal ministick pressing. If it is checked both buttons will be pressed simultaneously.

6.3.3. Numpad

Ministick works as numpad keys. Additional control units are enabled for this mode (Fig. 6.3).

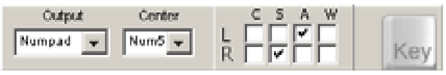


Fig. 6.3.

When ministick is in the center *Numpad5* key can automatically be pressed. Select **Num5** item from **Center** combo box to enable this action. By default NoFunction logical function is assigned to *Numpad5* key. Check **C, S, A, W** to add modifiers *Ctrl, Shift*, *Alt*, *Win* left (row **L**) or right (row **R**).You can map a keystroke to it. To do so click rectangle with default function name. **Quick logical layer wizard** dialog appears (Fig. 6.4).

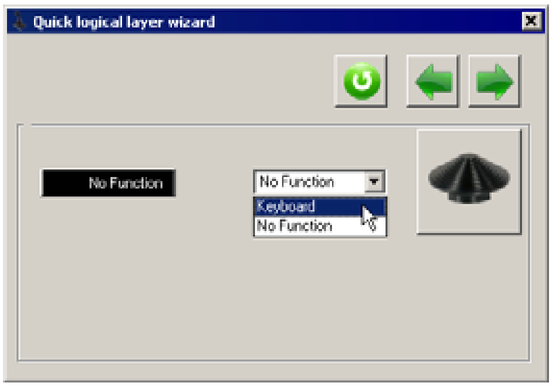


Fig. 6.4.

Keystroke mapping is described in section 5.5 on p. 106.

You must ENABLE keystroke mapping (see 2.4.9 on p. 27).

If mapping is disabled but you have decided to use ministick as numpad warning message appears (Fig. 6.5).

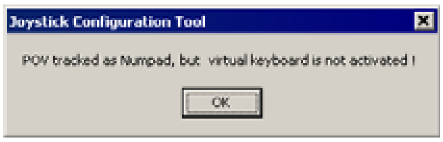


Fig. 6.5.

6.3.4. Mouse

Enable or disable virtual mouse using control units on **Clobal – Common** tab (see sect. 2.4.11 on p. 28).

6.3.5. Shifter 6W

Ministick is represented as set of 6 buttons or POV positions. If output is configured as POV, you can imagine Shifter as 8-position POV without 2 horizontal positions.

Set first button number using counter **But#1** (fig. 6.6).

Рис. 6.6.

Button numbers for this example are shown on fig. 6.7.

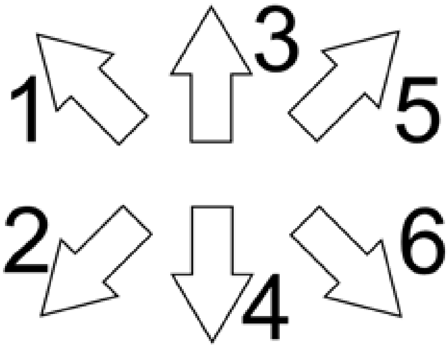


Рис. 6.7.

6.4. Ministick axes binding

If you selected **LoRes 8W** or **LoRes 4W** ministick mode, you must bind it to joystick axes using control units, shown on Fig. 6.8.

Fig. 6.8.

You can bind ministick to ANY joystick axes similarly to virtual mouse (see 2.4.11 on p. 28). If you want to know what physical axes numbers uses ministick in fact, open **Test** tab, move ministick and see its response (see 10.1.2 on p. 140).

Control units functionality is shown in Table 6.3.

Table. 6.3.

Name	Description
VC#	Virtual controller number.
2D	If checked ministick has two axes binded to pair of orthogonal axes. If unchecked ministick has single X axis.
X,Y	Counters allowing to assign joystick axes numbers binded to X and Y ministick axes.
Inv	Axes inversion.
DZ	Deadzone size in percents of full response range. Specifies button pressing treshold for **LoRes 8W** or **LoRes 4W** modes or deadzone for **HiResPOV**.
Active	Ministick activity mode. If **Always** mode selected it is active permanently. If **On/Off** you must assign button to control ministick (see 4.3.14).

Chapter 7. Boolean functions

7.1. Description

Allow to control virtual button press using other buttons state. For example Eject button will work if both specified buttons will be pressed simultaneously only. Boolean functions can be connected to chains thus generating logical sequences. Open **Boolean** tab to set boolean functions. Press any cell. Boolean functions dialog will be opened (Fig. 7.1, a). Select function name from list (Fig. 7.1, b).

a)

b)

Fig. 7.1.

Boolean functions may have input source types shown on Fig. 7.2: physical button press, logical or virtual – the result of logical functions, Shift modifiers and so on.

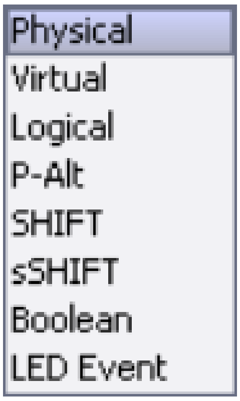


Fig. 7.2.

Select input type and set its index using **But N** counter. Check **Inv** to invert input. For example Physical line #5 with Inv checked means that input will be registered if button #5 is NOT pressed.

Select output type from similar list (Fig. 7.3).

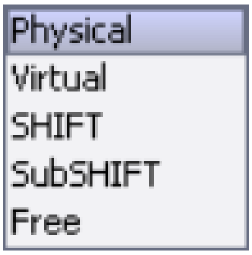


Fig. 7.3.

7.2. NOT

Setup dialog is shown on Fig. 7.4.

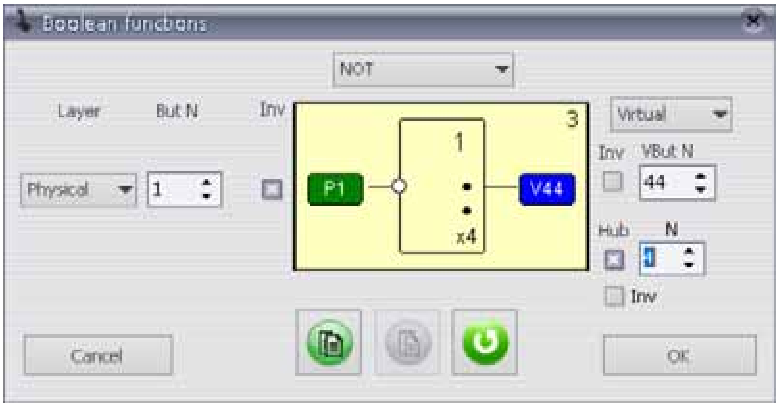


Fig. 7.4.

Output is registered if input is not. Set input event and check **Inv**. Set output event.

Virtual button #44 will be registered if physical #2 is pressed. Check **Hub** to register several output (up to 4) lines. They indexes begin from VBut N (Fig. 7.5).

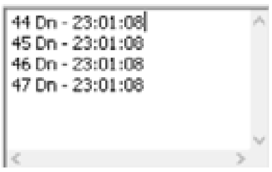


Fig. 7.5.

7.3. 2AND

Setup dialog is shown on Fig. 7.6.

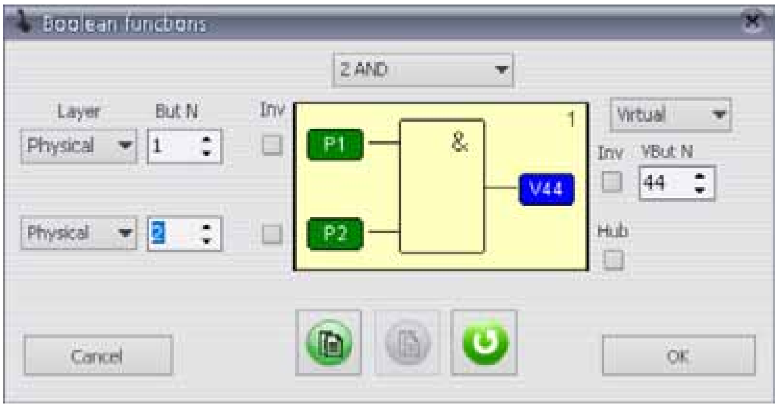


Fig. 7.6.

Output is registered if both input events are ON. Virtual button #44 will be registered if both physical buttons #1 AND #2 are pressed. Check **Hub** to register several output (up to 4) lines.

7.4. 2OR

Setup dialog is shown on Fig. 7.7.

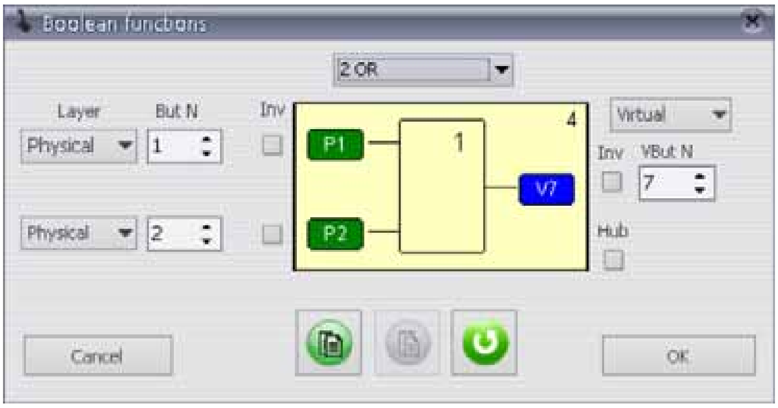


Fig. 7.7.

Output is registered if any input event is ON. Virtual button #7 will be registered if physical button #1 OR #2 or both are pressed. Check **Hub** to register several output (up to 4) lines.

7.5. 2XOR

Setup dialog is shown on Fig. 7.8.

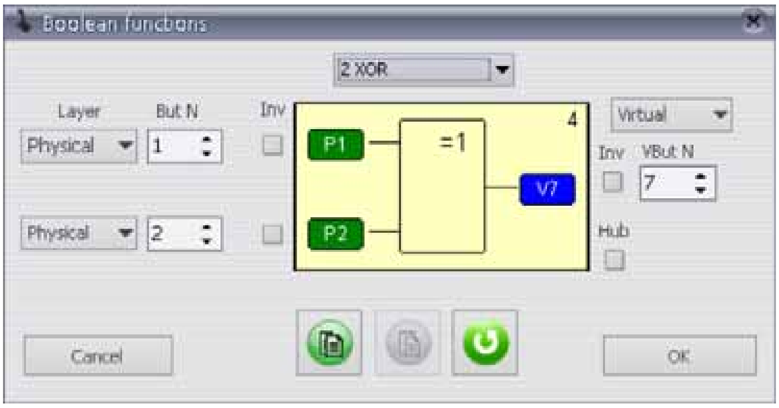


Fig. 7.8.

Output is registered if any of input events is ON while another is OFF. Virtual button #7 will be registered if physical button #1 is pressed AND #2 is released or vice versa.


2 Dn - 23:09:53
7 Dn - 23:09:53
1 Dn - 23:09:55
7 Up - 23:09:55
1 Up - 23:09:56
7 Dn - 23:09:56
2 Up - 23:09:57
7 Up - 23:09:57

Fig. 7.9.

Check **Hub** to register several output (up to 4) lines.

7.6. 3 AND/3 OR/3 XOR

3 AND, 3 OR and 3 XOR functions are similar to corresponding functions with two inputs.

7.7. Triggers; general info

Trigger is an element that has two stable states that can store state information. The element can be used to change state by signals applied to one or more control inputs and will output its state. Possible input sources can be selected from combo box (Fig. 7.10).

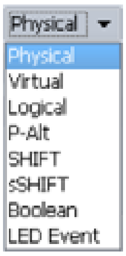

Physical
Physical
Virtual
Logical
P-Alt
SHIFT
sSHIFT
Boolean
LED Event

Fig. 7.10.

See inputs description in table 7.1.

Table. 7.1. Trigger input sources

Name	Parameter	Note
Physical	Physical line number	
Logical	Logical line number	
Virtual	Virtual line number	
P-alt	Button Alt physical line number	
Shift	Shift number	
sShift	Subshift number	
Boolean	Boolean function number	Boolean function output state
LED event	LED event number	LED event state

Possible output types can be detected from combo box (Fig. 7.11).

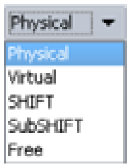


Fig. 7.11.

See outputs description in table 7.2.

Table. 7.2. Trigger outputs

Name	Parameter	Note
Physical	Physical line number	
Virtual	Virtual line number	
Shift	Shift number	
sShift	Subshift number	
Free	Free event	Can be used as LED event

Inversion checkbox inverts parameter value. Input is ON if button is NOT pressed for example. **Dynamic** checkbox controls parameter type:

- edge-triggered,
- level-triggered.

Level-triggered means that input state depends of source state, e.g. button is pressed or not. Edge-triggered means that input state depends of source state change moment. Button stays pressed – no input. Input will be registered at press time only. Registers off to on transition.

Hub checkbox controls number of same outputs, up to 4.i

7.8. RS Trigger

Setup dialog is shown on Fig. 7.12.

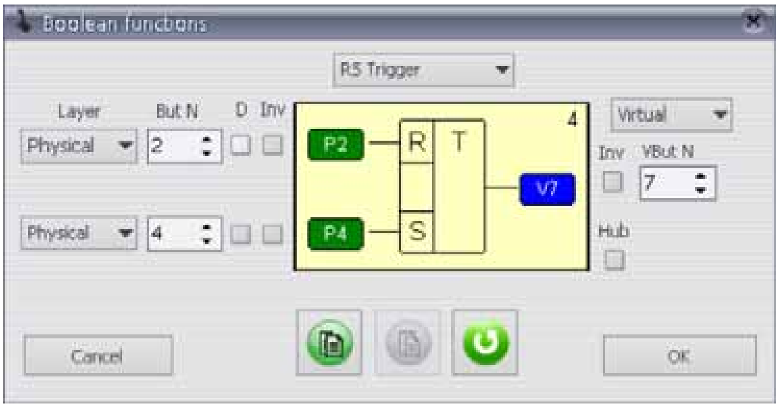


Fig. 7.12.

Trigger has two stable states. Inputs S and R toggle these states.

R=1 (button #2 pressed) output stays off.

S=1 (button #4 pressed) output=ON (virtual button 7 registered).

S=1 (button #4 pressed more times) output stays ON (virtual button 7 registered).

R=1 (button #2 pressed) output=OFF (virtual button 7 released).

R=1 (button #2 pressed more times) output stays OFF (virtual button 7 released).

7.9. RT Trigger

Setup dialog is shown on Fig. 7.13.

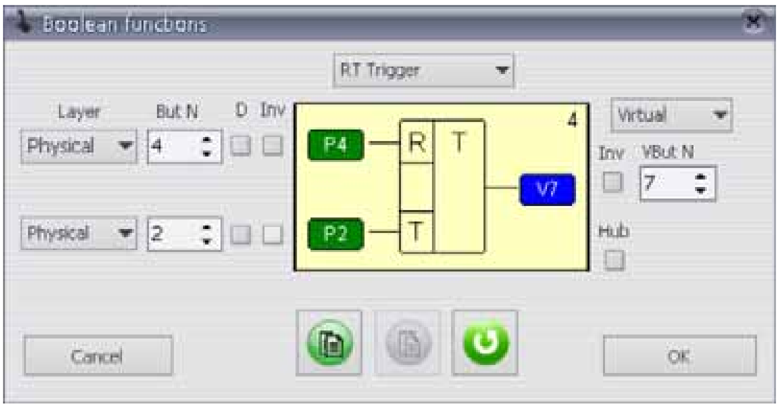


Fig. 7.13.

Trigger has two stable states. Input T toggles these states with every press IF input R is OFF. If R is ON, than output stays unchanged regardless to T state. Check **Hub** to register several output (up to 4) lines.

7.10. RST Trigger

Setup dialog is shown on Fig. 7.14.

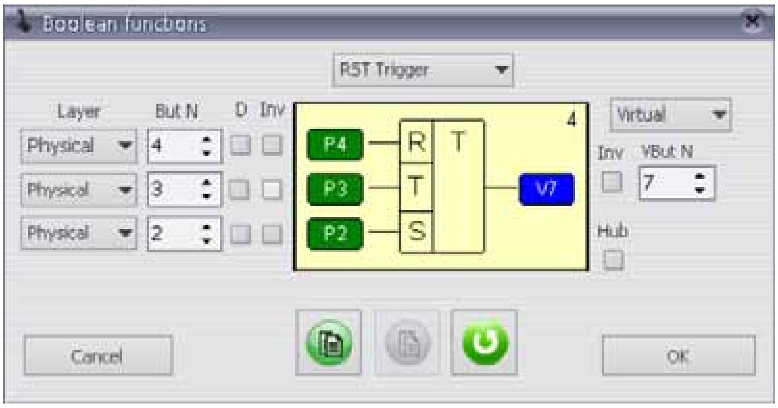


Fig. 7.14.

Trigger has two stable states. It is combined of RS and RT triggers. Input T toggles these states with every press IF input R is OFF. If R is ON, than output stays unchanged regardless to T state as RT trigger. Inputs S and R toggle trigger state as RS trigger. Check **Hub** to register several output (up to 4) lines.

7.11. JK trigger

JK trigger is similar to RST one. Setup dialog is shown on Fig. 7.15.

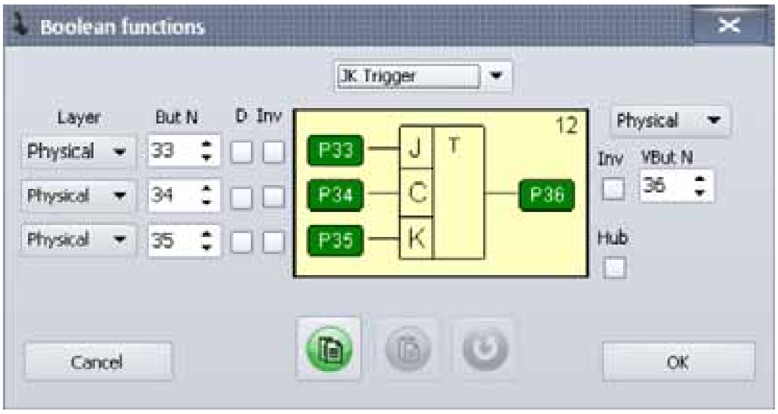


Fig. 7.15.

Trigger has two stable states. Input C toggles these states with every press IF inputs J AND K are ON.

If J is ON, than with C ON output becomes ON. If K is ON, than with C ON output becomes OFF.

7.12. D trigger

Setup dialog is shown on Fig. 7.16.

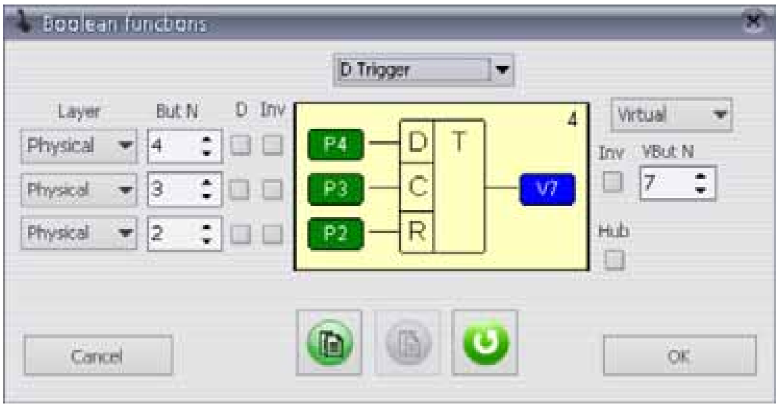


Fig. 7.16.

If D is ON, than C toggles output to ON. If D is OFF, than C toggles output to OFF. R toggles output to OFF.

7.13. M counter

Setup dialog is shown on Fig. 7.17

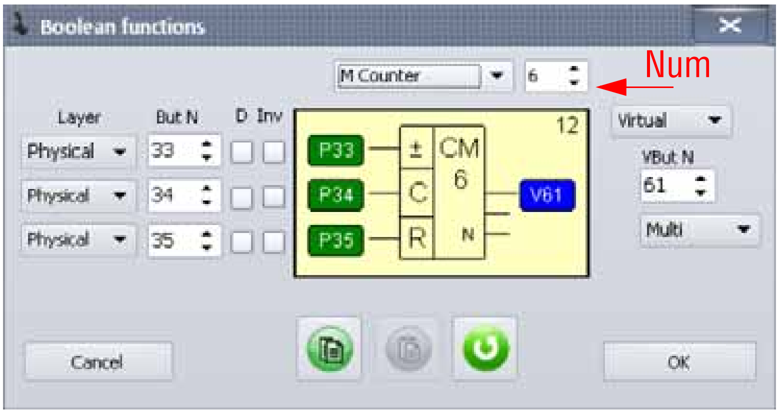


Fig. 7.17.

C is a count input. Output is registered after Num-1 **C** events. If Num=6, every 5th physical button 34 press will cause virtual press of line 36. **R** input resets press sequense. If you have pressed button 34 three times and then pressed button 35, you must begin series from the beginning. ± input reverses counter. If button 33 is pressed, the first button 34 press activates input. Next one clears it. The sequence begins. This description refers to **Single** mode. If you select **Multi** mode then every button 34 will consequently and cyclically press virtual buttons from VButtN to VButtN+Num. 61->62->63->64->65->66->36.

7.14. Comparator 1

Setup dialog is shown on Fig. 7.18.

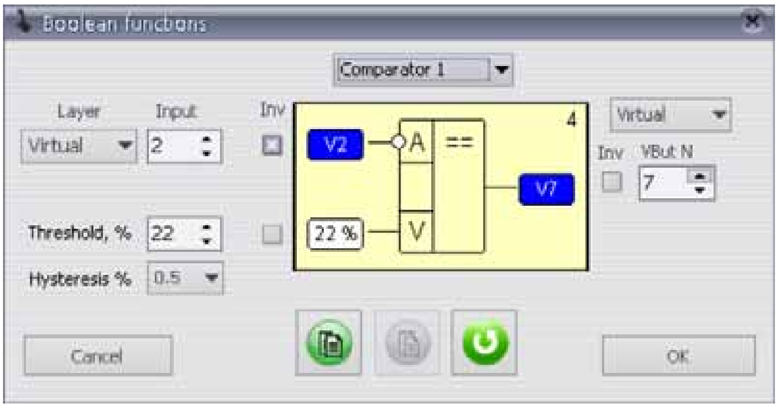


Fig. 7.18.

Single treshold comparator. Enables output if axis responce is greater than specified value.

Select axis type from **Layer** combobox and its index (**Input** counter). It is recommended to use **Virtual** or **Logical** axis type. For **Physical** or **Virtual** types, which have center **Inv** checkbox allows to select response direction. For **Logical** type this parameter is ignored. Set treshold value in percents of full response range. Hysteresis (in percents) is an optional parameter.

Fig. 7.20 shows an example of function work.

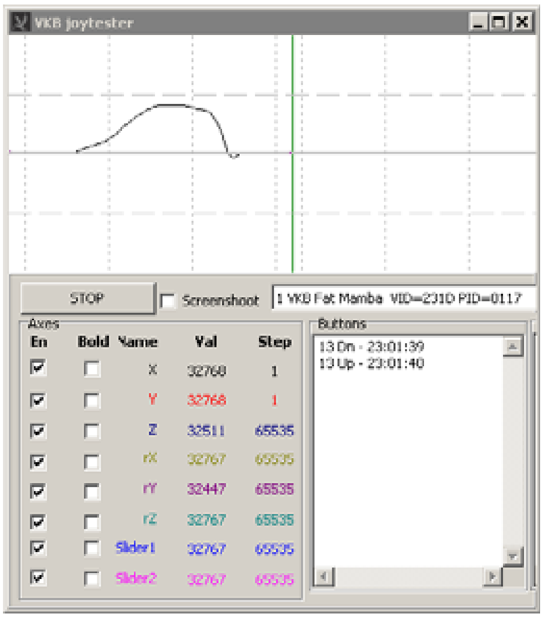


Fig. 7.20.

Fig. 7.21 shows an example of function work if **inv** is checked.

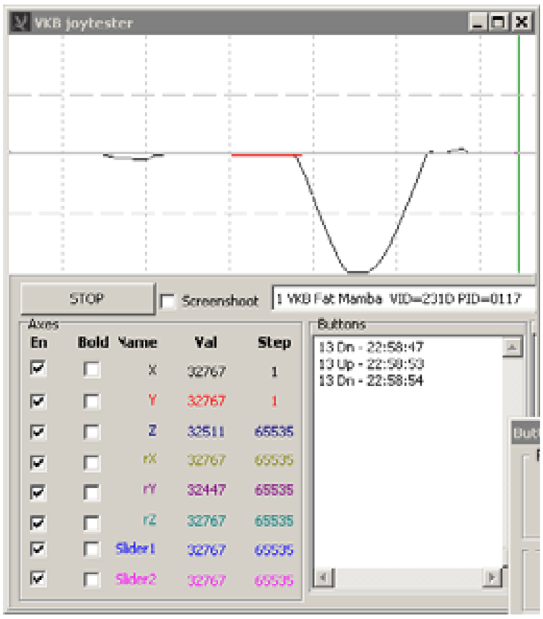


Fig. 7.21.

7.15. Comparator 2

Setup dialog is shown on Fig. 7.22.

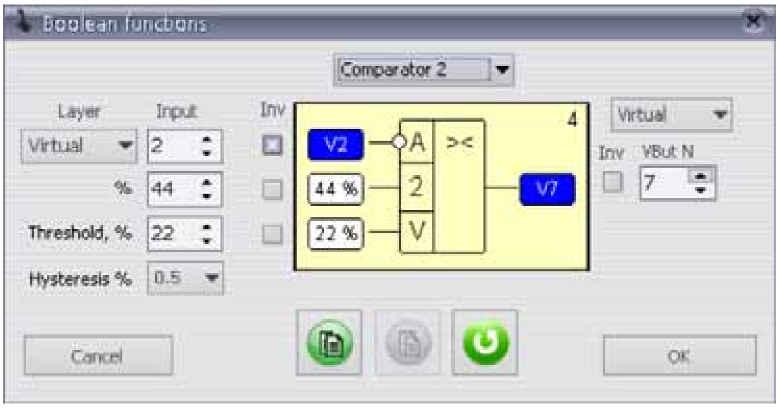


Fig. 7.22.

Dual-treshold comparator. Enables output if axis responce is greater than first treshold value and less than second one. Second treshold (44% at example) must be greater than first (22%). Fig. 7.23 shows an example of function work.

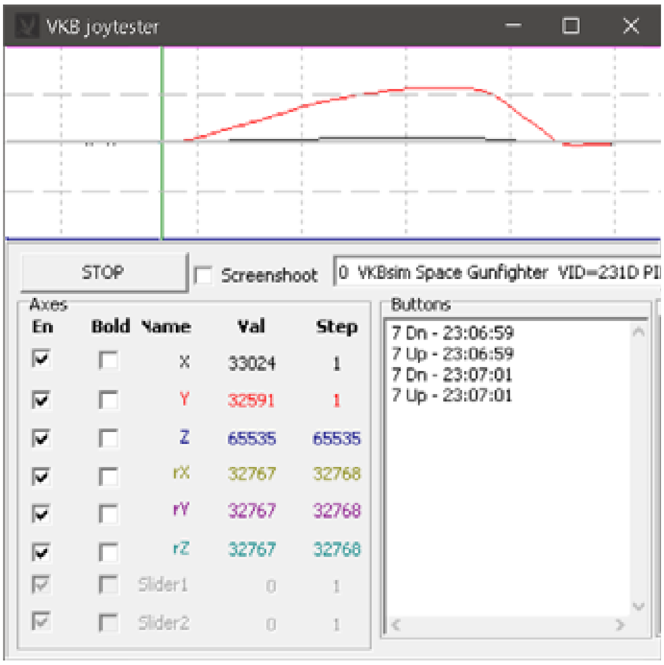


Fig. 7.23.

7.16. Modal switch

7.16.1. Intro

Modal switch is a control modifier. It is reasonable to use it as rotary switch - multiShift. FSM-GA rotary switch is shown on Fig. 7.24. But it is not limitation for your fantasy.

Fig. 7.24.

Modal Switch setup dialog is shown on Fig. 7.25.

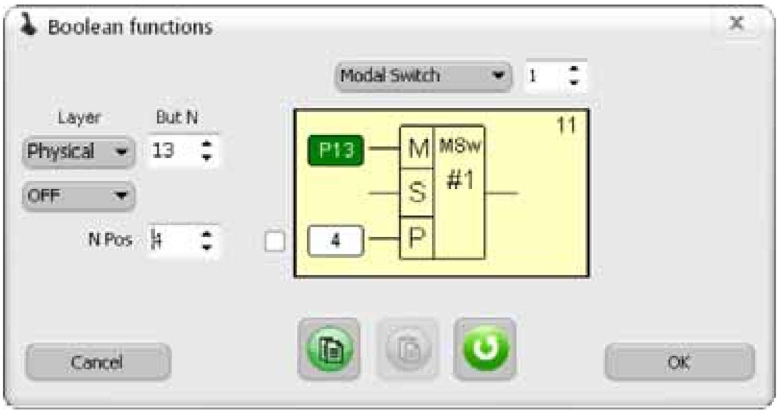


Fig. 7.25.

Select input type from combo box **Layer**. List of types is standard for Booleans. Physical line # 13 in this example corresponds with Mode 1 position of rotary. **N Pos** field value, equal to 4 corresponds with rotary modes number. Thus our Modal Switch is four-shift modifier. Every Modal Switch has unique index from 1 to 4. Set it (1 in this example) using counter.

Modal switch controls states of ButtonM button (see sect. 4.3.7 on p. 58). Line #61 is selected for example. Button Mapping Wizard is shown on Fig. 7.26.

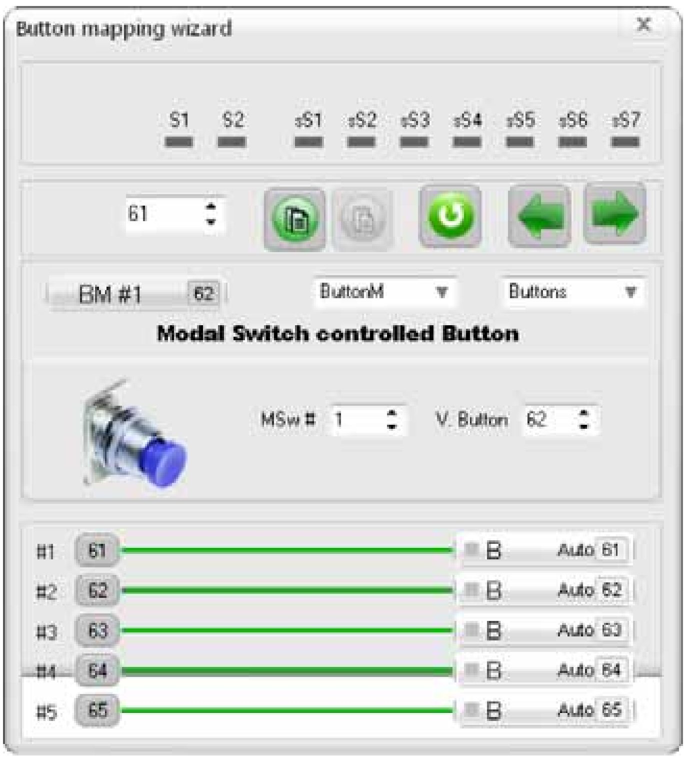


Fig. 7.26.

ButtonM is controlled by **MSw #**=1. Every rotary position is modifier for Button M. Assign first modified line using **V.Button** counter. The result of Modal switch is shown on Fig. 7.27.

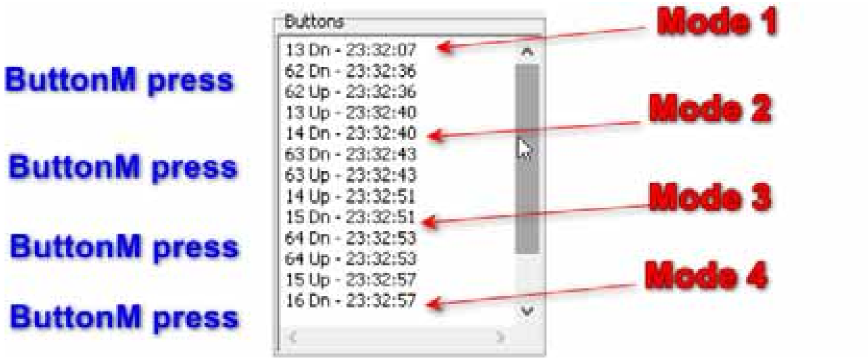


Fig. 7.27.

7.16.2. Shift

S input on Fig. 7.25 on p. 128 is off. This is Shift modifier working similarly to keyboard Shift. Physical line #12 is assigned as Shift (Fig. 7.28).

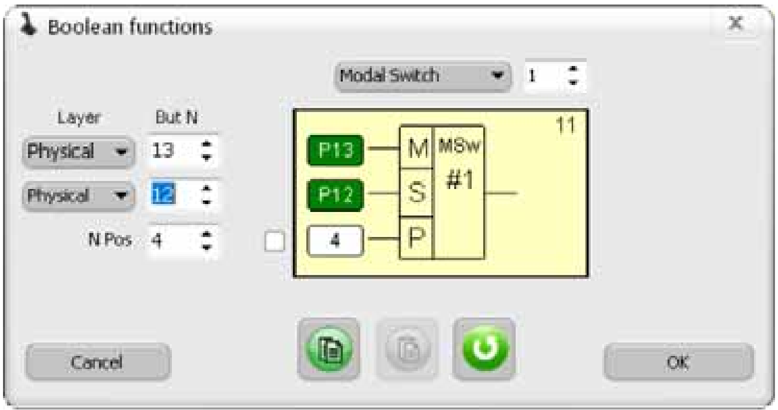


Fig. 7.28.

The result of Modal switch with Shift is shown on Fig. 7.29.

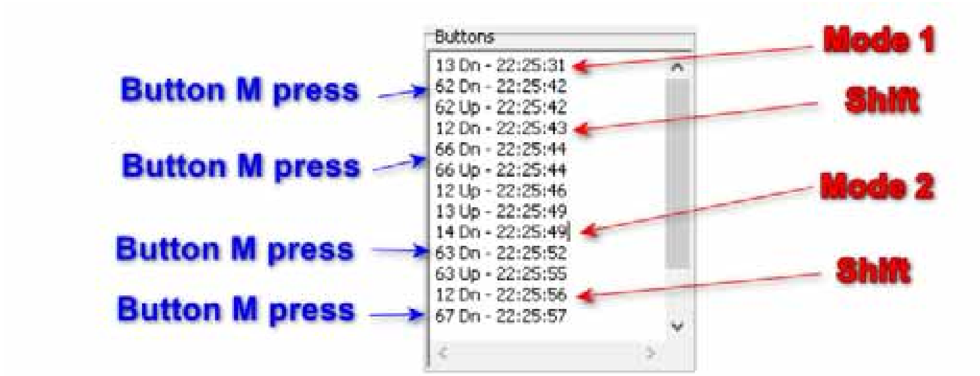


Fig. 7.29.

Button M output line index with Shift is equal its number + **N Pos** value. Shift using allows to double output lines number.

7.16.3. Null position

Neutral Position checkbox allows to shift output lines by one position (Fig. 7.30).

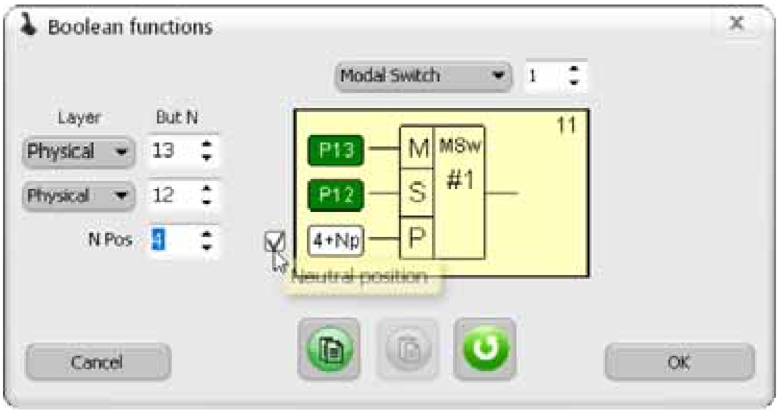
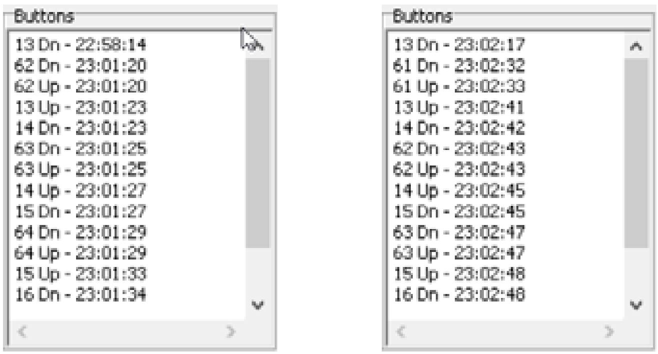


Fig. 7.30.

Outputs are shifted by one positions. See result on Fig. 7.31.



a) b)

Fig. 7.31.

Fig. 7.31, a) shows output result if Neutral Position checkbox is OFF, fig. 7.31, b) shows output result if it is ON.

7.17. Axis 2 buttons

You can convert axes 1...16 rotation to the sequence of button pressings. The whole axis response range is divided to some zones. Every zone will have corresponding button. While you move the grip axis response varies. When it comes to one of the zones, corresponding button will be virtually pressed.

Setup dialog is shown on Fig. 7.32.

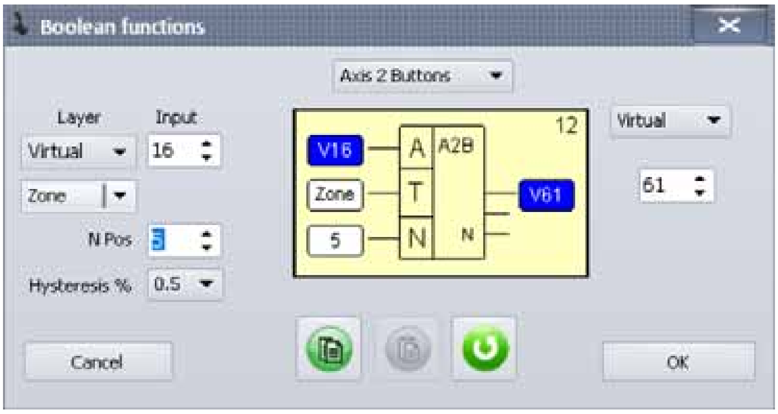


Fig. 7.32.

Choose axis response range division type from **Type** combo box. Set zones number using **N Pos** counter. **Hysteresis** combo box sets width of button actuation in the edge in percents of the whole response range. This parameter removes uncertainty of button work near zone edge. If **Hysteresis** = 0, the button will be pressed exactly at the edge. Set the first button number of sequence using **Vbut1** field. The following button numbers will increase to **N Pos** field value. For example four zones were created (**N Pos** = 5), **VBbut1** = 61 and **Zones** type was chosen. When you will rotate axis without center between extreme positions buttons 61, 62, 63, 64, 65 will be pressed consequently.

7.17.1. Edge 1

Edge 1 – single button N=**VBbut1** press on bound zone cross on axis response ascending. Single button N=**VBbut1+1** press on bound zone cross on axis response descending. If **N Pos** = 5, there will be registered 4 pulses.

7.17.2. Edge 2

Edge 2 – buttons from **VBbut1** to **VBbut1+N Pos–1** will be pressed on zone edges.

7.17.3. Zone

Zone – buttons from **VBbut1** to **VBbut1+N Pos** will be pressed while axis response belongs to the zone.

Chapter 8. Macro setup

8.1. Overview

Macro can be described as a named sequence of logical button actions i.e. simple button press, keystrokes and so on. Each action or macro element is named as **point**. By default macro consists of four points. You can concatenate several macros to increase points total. Each single macro can have specific timing – whole point duration and a part of this time in which virtual button stays pressed.

8.2. Macro parameters

8.2.1. Overview

Control items of **Macro** tab (Fig. 8.1) allow to set up macro parameters.

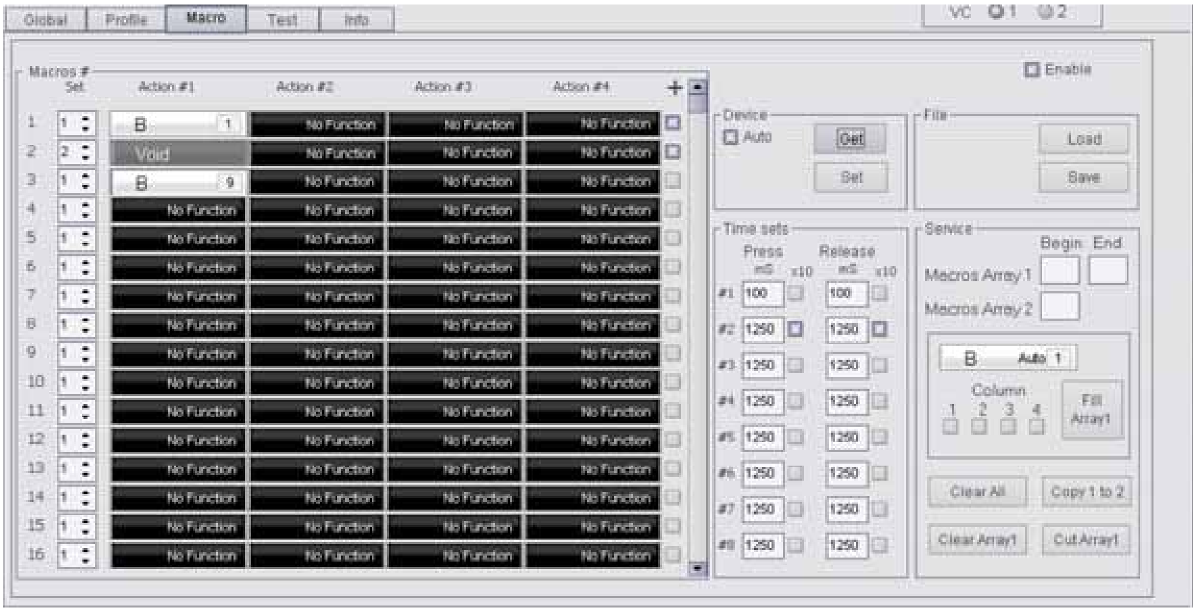


Fig. 8.1.

Each macro has its own index – up to 118. Index of the macro is its name. This parameter must be specified when you set up macro function (see 5.7 on p. 109).

8.2.2. Point parameters

Common functions

In order to set up point parameters click its cell. **Quick logical layer wizard** (Fig. 8.2) will appear.

Fig. 8.2.

Each point is a logical button function. You can find detailed description of these functions in Chapter 5 on p. 101.

Delay parameters

There is special logical button function – **Void**. It is used for macro only. Using Void you can set empty point that makes delay between other functions. For example you want macro «press» Button 1 then Button 2 after pause. See Quick logical layer wizard on Fig. 8.3.

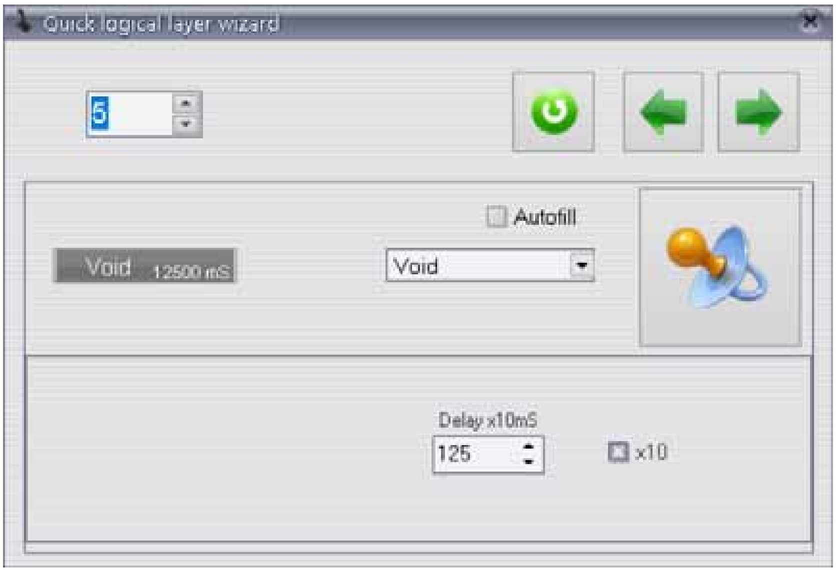


Fig. 8.3.

Set delay value in **Delay** field in milliseconds. Value will be multiplied by 10. Check **x10** to multiply by 10 one more time. If Delay=0 than pause will determined by common timing parameters **Press** and **Release**.

Check **Continued macro** to append **next** macro to current one. You can append not only next macro but one with specific number. In this case assign **Macro** function to the last point of current macro and set desired number for it (Fig. 8.4).

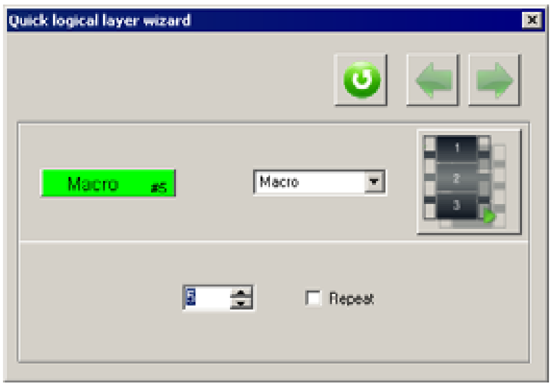


Fig. 8.4.

8.3. Macro timing

Control items of **Time sets** group allow to set up macro timings. Eight time sets can be used. Set point press duration time (1... 1250 ms) in **Press** field. Set release duration time in **Release** field. You can assign time set to a macro using **Set** counter.

8.4. Operations with macro

After you have completed macro setup press **Set** button in **Device** group to load current parameters to controller. **Get** button allows to read parameters from controller.

Save button allows to save current macro parameters to file with *mcr* extension. **Load** button allows to read parameters from file. Do not forget to press Set button to load parameters to controller!

In order to let your macro work check **Enable**.

8.5. Group operations

Some settings can be applied to several macros and points simultaneously. Use control items of **Service** group for it (Fig. 8.5).

8.6. Point group clearing

Clear all button in **Service** group allows to reset all points of all macros.

Clear Array1 button allows to reset specified macro range. Counters **Begin** and **End** in **Macros Array1** group (Fig. 8.5) specify range limits.

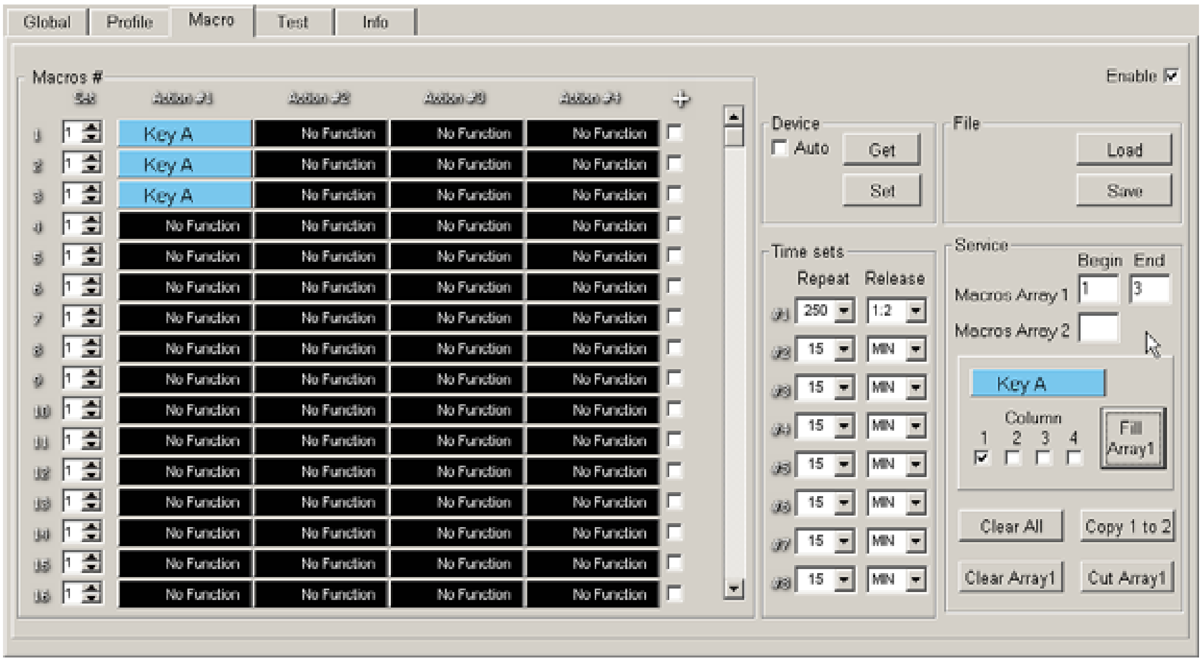


Fig. 8.5.

8.7. Filling point array

You can fill point array with the same functions. For example Action#1 column of macros 1...2 is filled with *A* keystroke on Fig. 8.5. Click logical button cell (Fig. 8.6) and assign desired function in **Quick logical layer wizard** dialog that will appear.

Fig. 8.6.

See detailed description of logical functions in Chapter 5 on p. 101.

Set macro range limits using **Begin** and **End** counters in **Macros Array1** group **Macros Array1** and column range limit using **Column** checkboxes, then press **Fill array1** button.

8.8. Using clipboard

Copy 1 to 2 allows to copy specified macro range to clipboard (counters **Begin** and **End** in **Macros Array 1** group specify range limits) and paste this macros from macro number specified in **Macros Array 2** field. Current macro assignments will be lost.

Chapter 9. Service functions

9.1. Loading parameters

You **must** press **Set** button to load current parameters into controller memory and apply them.

9.1.1. Forced loading

Versions of controller firmware and configuration tool must correspond. Otherwise some functions can malfunction. Profiles i.e. parameter sets also must correspond to firmware version. In some cases it is better to reassign all axes and buttons all over again. By default loading nonmatching profiles is forbidden. But if you want to load parameters anyway, for your own risk, edit configuration file *zconfig.ini* saved in the same folder that *VKBDevCfg.exe*. Add *ForcedWriteID*=1 string to *[User]* section, save this file and restart *VKBDevCfg.exe*. You will be able to load any profiles regardless of versions. If profile does not match to firmware you will see warning message (Fig. 9.1).

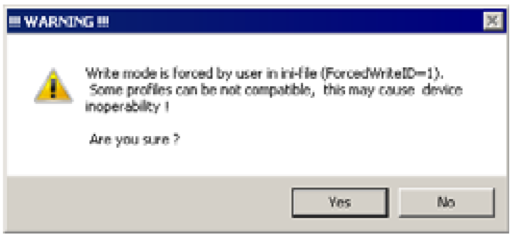


Fig. 9.1.

You must confirm or cancel loading using message buttons.

9.1.2. Partial parameter loading

Add *PartialWrite*=1 string to *[User]* section of *zconfig.ini* file and you will be able to load parameter set partially. For example you want to reassign button mapping only.

After you press **Set button Partial write settings** dialog will appear (Fig. 9.2).

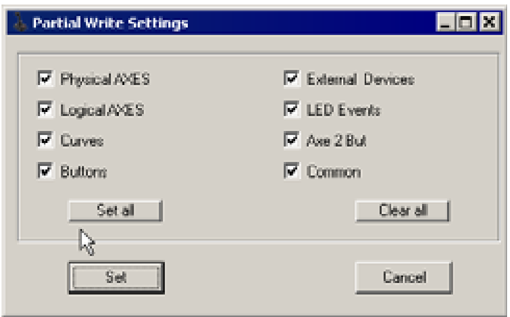


Fig. 9.2.

Check parameter names that will be loaded to controller. **Set all** and **Clear all** buttons allow corresponding choices. Press **Set** button to complete loading. **Cancel** button allows to cancel loading.

9.2. Current controller parameters

Get button allows to retrieve current controller parameters.

No matter what tabs of configuration tool are open. The whole parameter set will be retrieved.

If you have made some parameter changes and then decided not to load them to controller you can simply press **Get** button. It is possible only if you have not pressed **Set** button before.

9.3. Saving profile

You can save current profile, i.e. parameter set to file. To do so press **Save** button and choose folder and enter file name. By default file will have *cfg* extension.

9.4. Loading profile

9.4.1. Load button using

Saved profile can be loaded into controller memory. Press **Load** button, open folder containing profile and choose file with *cfg* extension.

9.4.2. Drag-n-drop using

Using VKBDevCfg.exe starting with 0.85.06 version you can use drag-n-drop to load profile from file. Simply drag file name from windows explorer to configurator window and drop it. If **Set After Load** on **Settings** tab is checked then parameters will be saved to controller memory automatically. Otherwise you must press **Set** button as usual.

9.5. Button assignments report

You can create list of joystick controls assignment Fast Report format. Press **Device Report** button. **Print Preview** window will appear (Fig. 9.3).

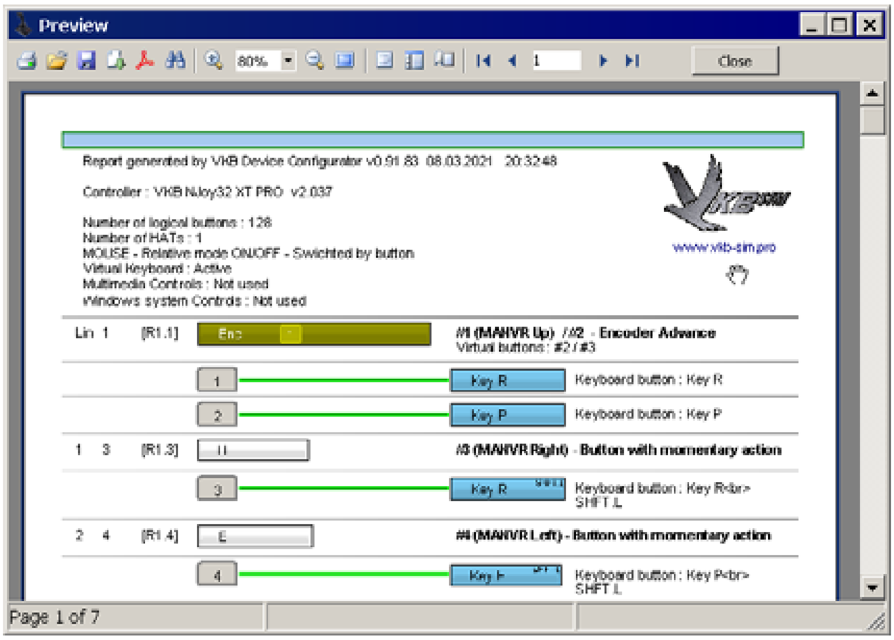


Fig. 9.3.

Physical and logical layer joystick controls assignments are shown in this window. Hover line number to see its assignments. Callout with needed data will appear (Fig. 9.4).

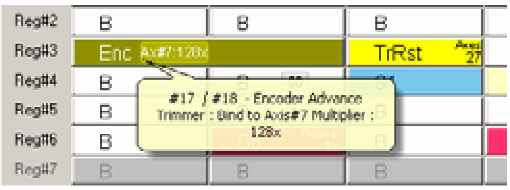


Fig. 9.4.

Chapter 10. Testing controls

10.1. Testing using configuration

Open **Test** tab.

10.1.1. Buttons testing

Open **Buttons/POVs** tab to test buttons, toggle switches, HATs, encoders etc. (Fig. 10.1). Activate controls and see results in this tab.

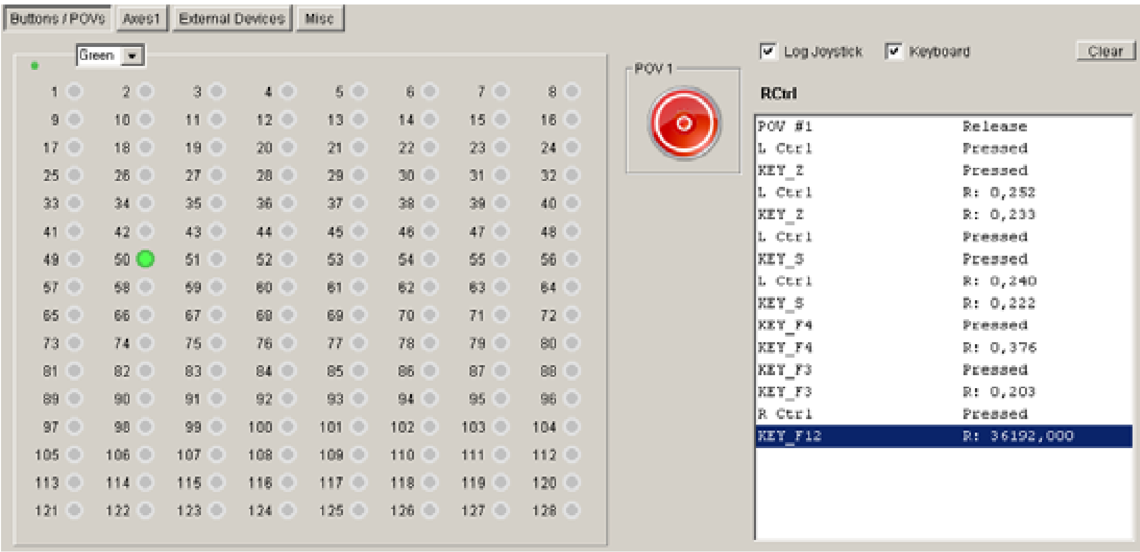


Fig. 10.1.

Check **Log joystick** and **Keyboard** to test keyboard mapping.

If you have checked **Log enable** and **Keyboard** you must restart configurator after test completion.

10.1.2. Axes testing

Open **Axes1** tab to test joystick axes (Fig 10.2). Axis response is shown in graphical and digital forms.

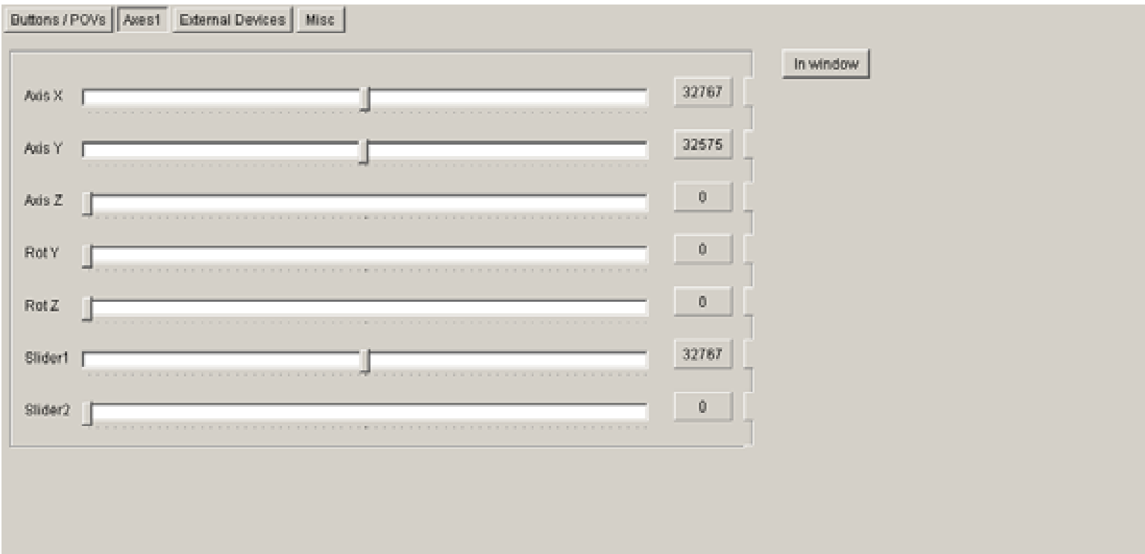


Fig. 10.2.

10.1.3. BUS testing

Open **External devices** tab to test BUS connection (Fig. 10.3). Connection error level will be shown. BUS can be tested for Master device only.

Fig. 10.3.

10.1.4. MARS and LEDs testing

Open **Misc** tab to test MARS sensors and LEDs (Fig 10.4).

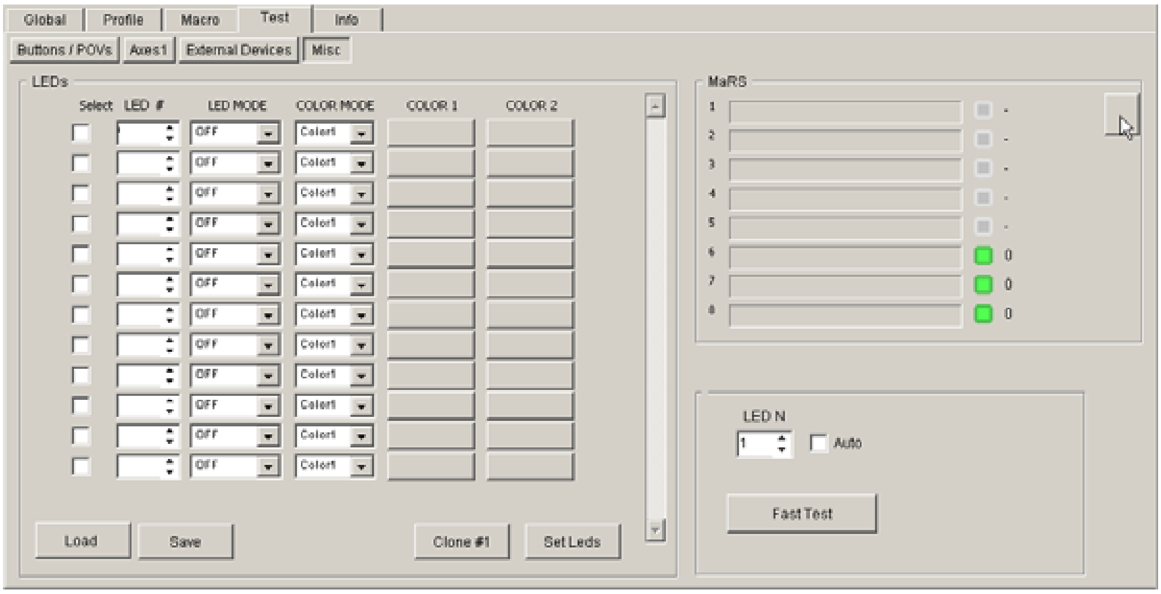


Fig. 10.4.

MARS testing

Press **MARS** button. If sensors work correctly you will see green marks. Red marks mean MARS failure.

LEDs testing

For testing purposes you can specify LED state. Choose LED number using **LED #** counter. Choose LED mode, color mode and color intensity. Press **Set Leds** button to apply settings.

Press **Restart** button on **Action** tab to restore current LED settings.

For instant test select LED number using **LED N** counter and press **Fast test** button. Chosen LED will flash.

You must append *Test Misc Enabled=1* string to *[Common]* section of *zconfig.ini* file to enable **Misc** tab.

Chapter 11. Indication configuration

11.1. Overview

11.1.1. Standard LEDs

LEDs can be used to indicate joystick state. For example Mamba series joystick case has six LEDs, Gladiator has two LEDs. GNX modules use up to 32 LEDs. Standard means LEDs on joystick base or grip.

11.1.2. Additional LEDs

You can use additional RGB LEDs WS2812 (https://www.drive2.ru/b/1646666/) for joystick buttons and axis state indication. Leds are selled as bands and differ in LED number per one meter, 30 (Fig. 11.1), 60 or 144.

Fig. 11.1.

Other variant – linear panels with 8 LEDs (Fig. 11.2) or 2D, 8*8, 8*16 etc.

Fig. 11.2.

Use fields of **Mode** group to configure using different LED types (fig. 11.3).

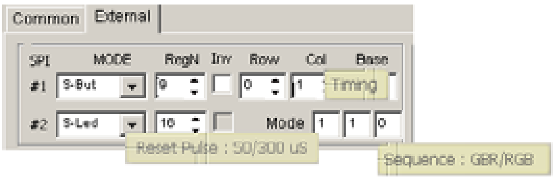


Fig. 11.3.

See configuration example in table 11.1.

Table. 11.1.

LED type	Values set
WS2812B	000
WS2812D	100
APA106	001

Use BUS connector to connect LEDs to controller. Fig. 11.4 shows NJoy32 single-plate controller connector.

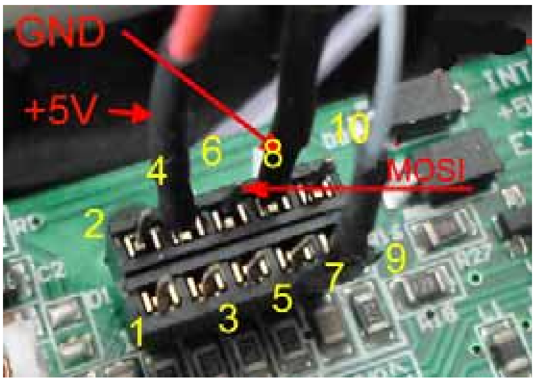


Fig. 11.4.

The following lines are used for LED connection:

- 4 - VCC +5B,
- 6 - MOSI,
- 8 - ground.

LED band contacts have corresponding designations. NJOY32 can control up to 80 LEDs with external power supply. It is not recommended to connect more than 5 LEDs without power supply. LED band has 3 signal contacts and 2 for external power connection, for example cell phone charger. LEDs connection without external power is shown on Fig. 11.5.

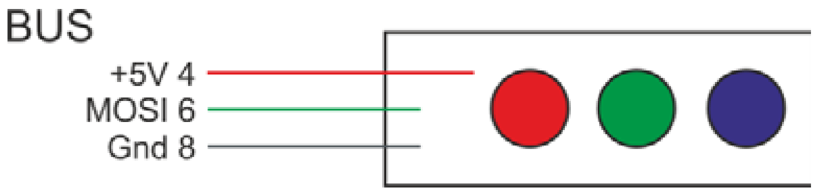


Fig. 11.5.

LEDs connection with external power is shown on Fig. 11.6.

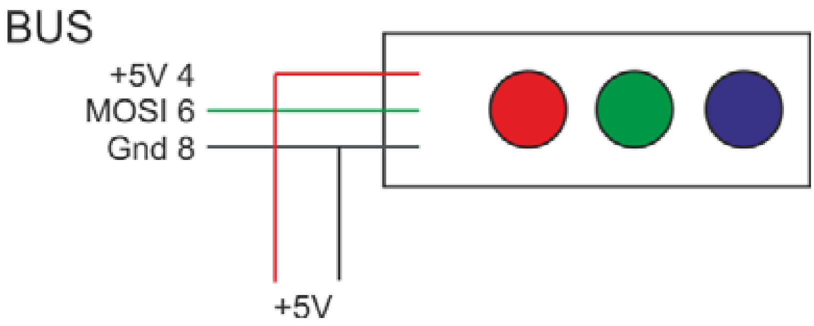


Fig. 11.6.

+5 V from power supply connect to LEDs only! Do not connect it to controller +5 V line.

Choose **S-LED** item from **#2** combo box to enable and control LEDs. Set Number of connected serial LEDs using corresponding counter. Numbers of these LEDs begin from 8, 16, 24, 32. Set it using **Base** counter. If you use, for example, 8x8 LED matrix with GNX modules, set **Base** value = 32 to avoid intersections between base and additional LEDs (Fig. 11.7).

Fig. 11.7.

Set LEDs common brightness using **Bright** counter from 1 to 16.

An example of LED settings is shown on Fig. 11.8. The first additional LED with number 8 (the closest to controller on LED band) will flash ultra fast using two colors, green and light violet when SHIFT button is pressed.

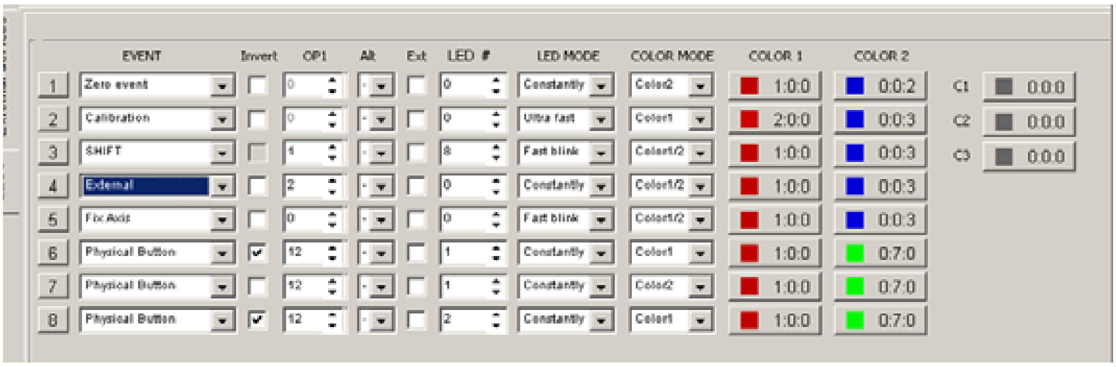


Fig. 11.8.

11.1.3. LED parameters

The following parameters are used to control LED light:

- color,
- frequency,
- brightness.

To set up indication open **Global – External – LEDs** tab. Names of indicated controller states and corresponding **EVENT** combo box items are shown in table. 11.2.

Table. 11.2.

Event flag item	Controller state	Note
External	No indication.	
Zero event	Default controller state.	No button pressed, axes in zero or center.
SHIFT	Shift button pressed.	
SubSHIFT	SubShift button pressed.	
Fix Axis	FA (Fix Axes) button pressed.	
Calibration	Calibration is executed.	
Physical Button	Physical button pressed.	Indication can be inverted so LED will flash when button is not pressed but go out when button is pressed.
Virtual Button	Virtual button activated.	
Logical Button	Logical button activated.	
Axis in center	Axis is in center or in zero position.	Can be inverted.

Table. 11.2.

Event flag item	Controller state	Note
MaRS fault	MaRS sensor failure.	Set testing MaRS number in **OP1** field.
Calibration fault	Calibration failure.	
Rudder connect	Pedals are connected to controller.	If controller has **Pedals** port.
BUS error	External device connection to BUS port failure.	
POV active	uStick is used as POV.	See Chapter 6 on p. 114.
Mice active	Virtual mouse is active	See 2.4.11 on p. 28.
Profile N	Active profile number	
Cyclic Switch	Cyclic Switch state	
P-Alternate Function	Alternative physical button activated	
V-Alternate Function	Alternative virtual button activated	
Boolean function	Active Boolean function index	

11.2. Indication settings

Open **Global** – **External** – **LEDs** tab (Fig. 11.9).

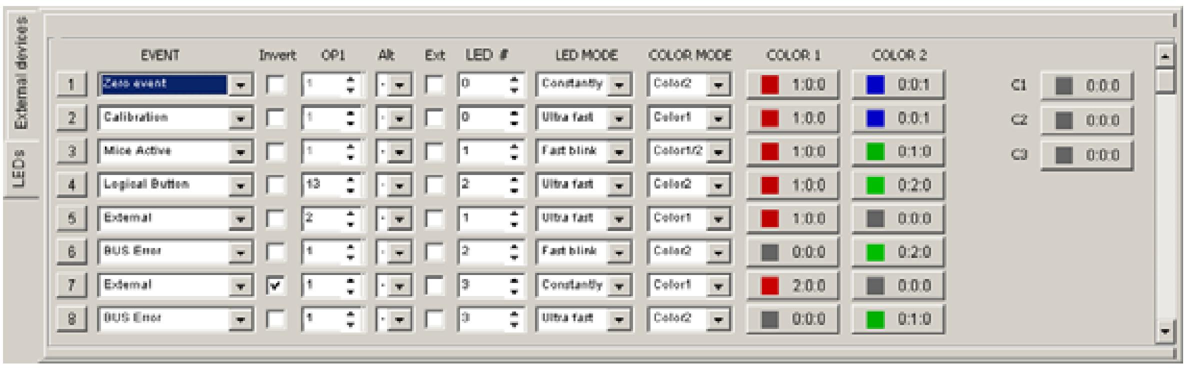


Fig. 11.9.

Choose desired event that you want to indicate from **Event** combo box. Use **Invert** checkbox to invert event. By default it is unchecked. For example if you have assigned LED to indicate axis central position than it will flash when axis is in its center. If you check **Invert**, than LED will not flash when this axis is in center. It can be useful in some cases. For example axis #8 is used to trim Axis #2 (roll). **Invert** is checked. Corresponding LED will flash only if roll axis is trimmed.

Set additional parameter in **OP1** field (needed for some events, see table 11.3).

Table. 11.3.

Event flag	Parameter
SHIFT	0 – Shift 1; 1 – Shift 2; 2 – Shift 0.
SubSHIFT	SubShift number.
MaRS fault	Testing MaRS number, 1...8.
Axis in center	Axis number, 1...8.
Physical Button, Virtual Button, Logical Button, P-Alternate Function, V-Alternate Function.	Button line number.
POV active	Active POV index.
Cyclic Switch	▼ Cyclic Switch index (see sect. 4.3.12 on p. 69), ▼ Cyclic Switch position.
BUS Error	Multifunction BUS device index.

Alternative color is used to indicate that its event NOT occurs. Select one of alternative colors C1, C2 or C3 from **Alternative Color** combo box. Configure selected color in **Color select** dialog. Press **Color 1** button to set corresponding color parameters. You will see setup dialog (Fig. 11.10).

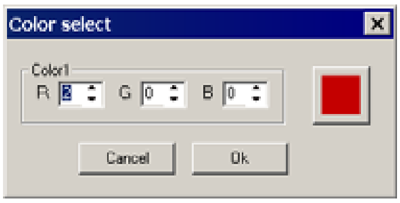


Fig. 11.10.

Using counters set up RGB components brightness. To complete setup close dialog. Set up the second color in the same manner.

Use **Alternative Color** for events with minimal index (priority) in order not to override other events for same LED. It shines in **LED mode Constantly** with chosen color.

Check **Ext**. to transmit LED state via network.

Set LED index for this event in **LED#** field. Single system LED has number 0. You can assign the same LED to indicate different events. In this case use different light parameters i.e. color, brightness, frequency. If some events assigned to single LED will occur simultaneously will be indicated event with greater number.

Choose the following LED light mode from **LED Mode** combo box:

- **Off** – LED is off,
- **Constantly** – constant light,
- **Slow Blink** – slow blink,
- **Fast Blink** – fast blink,
- **UltraFast** – ultra fast blink,
- **Flash** – short flashes with wide period.

Select the following LED color mode from **Color Mode** combo box:

- **Color1** – color 1 only,
- **Color2** – color 2 only,
- **Color1/2** – colors in sequence beginning from 1,
- **Color2/1** – colors in sequence beginning from 2,
- **Color1+2** – mixed color,
- **Color1+** – flashing brightness of color 1,
- **Color2+** – flashing brightness of color 2.

11.3. LED Gauge

Allows to indicate axis condition using RGB LEDs. Open **Profile – LED Gauge** tab to set indication up (Fig. 11.11).

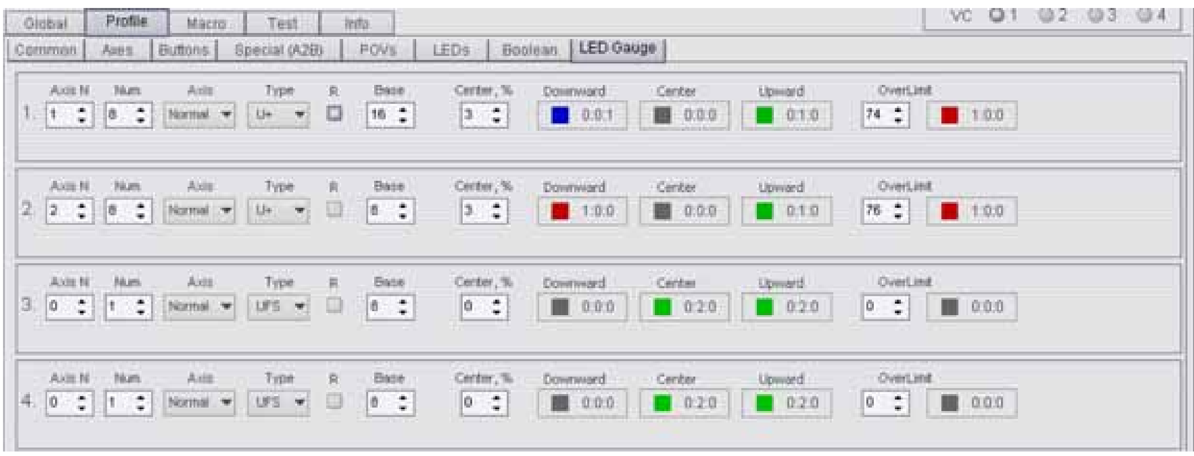


Fig. 11.11.

You can indicate up to four axes. Select axis index using **Axis N** counter. Specify number of LEDs for this axis using **Num** counter. It is recommended to use odd number for axis with center. The middle LED will be On when axis will be centered. Select axis source, **Normal** or **Virtual**, from **Axis** combo box. Select axis type from **Type** combo box (table).

Table. 11.4.

Type	Description
UFC, Unipolar Full Scale	Full unipolar axis range indication.
U+, U–	Half (positive or negative) unipolar axis range indication.
U±	Unipolar combined
CFS	Centered Full Scale

Check **R** (Reverse order) to invert LED strip direction.

Set first LED in the strip using **Base** counter.

Set axis response range considered as center for axis with center or zero for axis without center using **Center, %** counter in percents of full range.

Set colours for axis response ascending (**Upward**), descending (**Downward**) and in center (**Center**). Both upward and downward values matter for axis with center.

Set color for response value exceeded assigned limit in percents of full range using **Overlimit** counter.

UFS
Most applicable for axis without center such as throttle control. LEDs indicate response from zero to max value.

U+
Applicable for any axis but indicates axis responce from zero of axis with center or middle response value for unipolar axis to maximum value.

U–
Applicable for any axis but indicates axis responce from zero of axis with center or middle response value for unipolar axis to minimum value.

You can use two groups of LEDs for same axis. Assign U+ for the first and U- for the second. Thus you will indicate full axis range.

U±
Similar to U+ and U-. Applicable for any axis but indicates axis responce from zero of axis with center or middle response value for unipolar axis to minimum value AND to maximum value using same LEDs in a strip. It’s reasonable to use different colours for downward and upward LEDs.

CFS

Applicable for axis with center. It's reasonable to use odd LEDs number. Central LED will show «Axis in center» state. LEDs on both sides will indicate response ascending or disowning.

Chapter 12.Network technologies

12.1. Overview

VKB devices can be combined to a network and use their axes and buttons together. There are two ways to combine devices:

- hardware,
- software.

Controller expansion ports allow to connect external devices:

- joysticks equipped with Njoy32 controllers – via BUS,
- Gladiator grip – 3-wire cable,
- combined devices such as Gunfighter base with MCG, SCG or F14 grips – 4-wire cable,
- GNX modules – 3-wire cable.

Gunfighter base with grips both have own controllers. Data packets from grip controller are transmitted to base controller via 3-wire digital interface. Data packets from the grip and base sensors are transmitted to BlackBox. BlackBox is connected to USB port. Base and grip are components of external device for BlackBox.

Devices may be used as *masters* and *slaves*. Slave transmits its controls to master and master receives them.

The same device may be used as master and slave simultaneously. For example GNX controller is master for FSM-GA and THQ modules but it is a slave for Gunfighter BlackBox. FSM-GA encoders, configured as virtual axes are used for Gunfighter axes.

12.2. Hardware connecting devices using connectors and cables

12.2.1. Connector types

BUS expansion ports realized as several connectors (table 12.1).

Table. 12.1.

Controller type	Connector	Note
Njoy32	Pins on PCB	
Mamba, ThrottleBox	RJ12 (6P6C)	
Gladiator, BlackBox	RJ12 (6P6C)	
BlackBox MkI	GX-12 4	
BlackBox MkII	GX-12 7	

BUS uses the following lines:

- VCC (+5B),
- Gnd,
- Tx1,
- Tx3.

Tx1 and Tx3 must have pull-up resistors. Gladiator and BlackBox controllers have preinstalled ones. If you want to use BUS with other controllers you must solder pull-up resistor in any circuit place.

External devices may be configured in two modes:

- all of them are visible for computer separately,
- single controller is visible while others are hidden. Controls (buttons, axes etc.) of hidden controllers belong to master controller.

12.2.2. Expansion port settings

Use controls of **Global – External – External devices** tab to configure BUS (Fig. 12.1).

Fig. 12.1.

SPI1 port controls internal button registers. Select desired SPI1 mode from **SPI1 port mode** combo box:

- **OFF** – not used (GF+MCG for example, buttons come from external device, grip),
- **S-but** – standard button registers, 8 buttons each, connected.

Set registers number in **RegN** field.

Configure SPI2 using **SPI2 port mode** combo box:

- **OFF** – not used,
- **S-but** – standard button registers, 8 buttons each, connected.
- **S-LED** – RGB LEDs connected (see section 11 on p. 143).

Expansion devices are interconnected via BUS use USART #1 or USART #3 interfaces. Combined devises use USART #2. **USART #1**, **USART #2**, **USART #3 group controls** allow to configure interfaces. Select **Serial port mode** – **Master** or **Slave**, **Bus type** and **Speed** packets exchange rate.

12.3. Slave settings

Assign **Slave** (MCG, SCG, Gladiator grips, Njoy32-slave) high and low addresses, using **AdrH** and **AdrL** fields.

Do not use the same addresses for combined devices. Grip controllers have fixed addresses and can not be changed.

Check **External device encoders virtualization** to send encoder data via bus. Check **Global SHIFTs** or/and **Global SubSHIFTs** to use local modifiers for external devices. Check **Virtual BUS over USB** to use Zlink2 (see section 12.6 on p. 160) instead of cable connection.

Check **Ext** for all local controller axes you want to transmit to external devices on **Profile – Axes – Physical Axes** (Fig. 3.1 on p. 30) tab.

12.4. Master settings

Up to eight devices may be connected to master, #1...#8. Use controls on tabs with corresponding numbers to configure these devices.

12.4.1. Device types

Choose external device type from **Device** combo box (table. 12.2).

Table. 12.2.

Name	Description
Generic device	
ECS Throttle	Gametrix ECS Throttle
KG12 stick	KG12 grip
Gladiator Stick M	Gladiator grip, MARS twist.
Gladiator Stick R	Gladiator grip, potentiometer twist.
Gunfighter base	Gunfighter base
MCG	MCG grip
SCG	SCG grip

New devices will be added to list.

12.4.2. Device parameters

Device group types are listed in **Alt.Group** combo box. Several devices, for example NXT blocks, may belong to the same group. Group type assigns device presence analysis (table. 12.3).

Table. 12.3.

Group type	Device presence analysis
0 (....)	All group devices must be present. Absence of any device causes BUS Error.
1, 2	At least one device must be present.
3	No BUS errors even no device found.

Select the same value from **Port** combo box with group **USART #1**...**#3**.

Set port polling period in **Poll, ms** combo box.

Set high and low device addresses in **AdrH** и **AdrL** fields.

Custom addresses are available for Generic Device only.

Set count of axes received from slave using **AxN** counter. Set count of button registers received from slave using **RegN** counter and **Base** – register number in a common register array for the first received register. Set count of received encoders using **Enc N** counter. Set count of received LEDs using **LedsN** counter and **Base** – LED number in a common LED array for the first received LED.

12.4.3. Axes parameters

Up to 8 axes can be received from slave. They must be checked as **Ext** in this device. Set received axes parameters using **Axis #1**...**Axis #8** control groups. Received axes type names are listed in table (table. 12.4).

Table. 12.4.

Axis type	Description
None	Axis not received.
Virtual	Virtual axis.
Normal	Axis with full parameters processing.
Trimmer	Axis - trimmer of existing one.
V_Mars X, V_Mars Y	Analog trigger axis (MCG Pro), Gunfighter base sensors.
V_Mars	Analog brake axis (MCG Pro).

Set virtual controller of master devise number using **Bind extern axis to controller # (1–8)** for received axis, usually 1. Set master axis number that will receive axis from using **Bind extern axis to axes # (1–8)** counter.

Example.

All axes of slave-device allowed for transmission so **Ext** checked for all of them. Master device will use axes 4,5,6. Select **None** for Axes 1...3, 7 and 8

Select **Normal** for axes 4, 5 and 6 – additional axes data processing is not needed for them (Fig. 12.2).

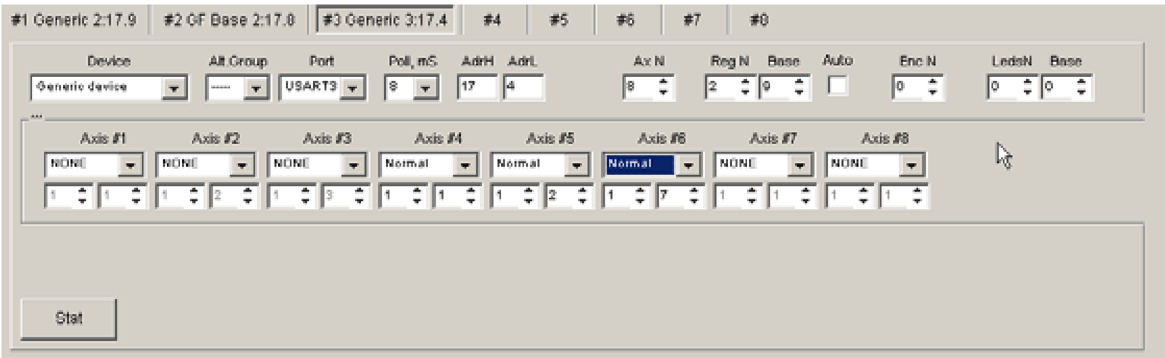


Fig. 12.2.

12.5. Combined devices parameters

12.5.1. Gunfighter base and MCG grip

Open **Global – External – External devices** tab (Fig. 12.3).

Fig. 12.3.

12.5.2. USART #2 parameters

Combined device components use **USART #2**. Set parameters as it is shown on Fig. 12.3.

- Serial port mode – Master,
- Bus type – S Bus,
- Speed – 500 kbps.

12.5.3. Base parameters

Select **Gunfighter base** for device #2 from combo box **Device**. Main parameters are locked for example, *Port=USART2*. Default parameter values are:

- Poll = 4 ms,
- Device addresses AdrH=17, AdrL=8,
- Axes count Ax N=4.
- Virtual controller =1 for all axes.
- Select V-Mars X and Y for Incoming axes 1&2. Own axis number = 1.
- Select V-Mars X and Y for Incoming axes 3&4. Own axis number = 2.

12.5.4. Grip parameters

Select **MCG** for device #1 from combo box **Device**. Main parameters are locked for example, *Port=USART2*. (Fig. 12.4).

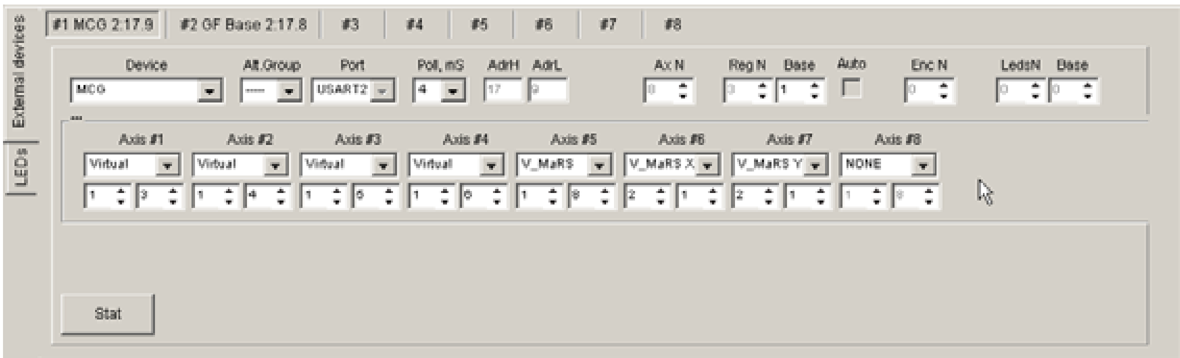


Fig. 12.4.

MCG Pro transmits 8 axes and 3 button registers. Default parameter values are:

- Poll= 4 ms,
- Device addresses AdrH=17, AdrL=9,
- Axes count Ax N=8. Select sensors as shown in table 12.5.

Table. 12.5.

Incoming axis number, Ax #	Sensor type	Virtual controller number	Own axis number	Note
1–4	Virtual	1	3–6	Analog ministick sensors
5	V-Mars	1	8	Analog break lever sensor
6–7	V-Mars	2	1	Analog folded trigger sensor. Pro version only.
8	V-Mars			Twist sensor (if exists).

Registers 1–3 are used for grip buttons. Register 4 is used for analog ministicks buttons and register 5 for analog brake lever buttons.

Open **Profile** – **Axes** – **Axes2Buttons** tab to configure folded trigger and break lever (Fig. 12.5).

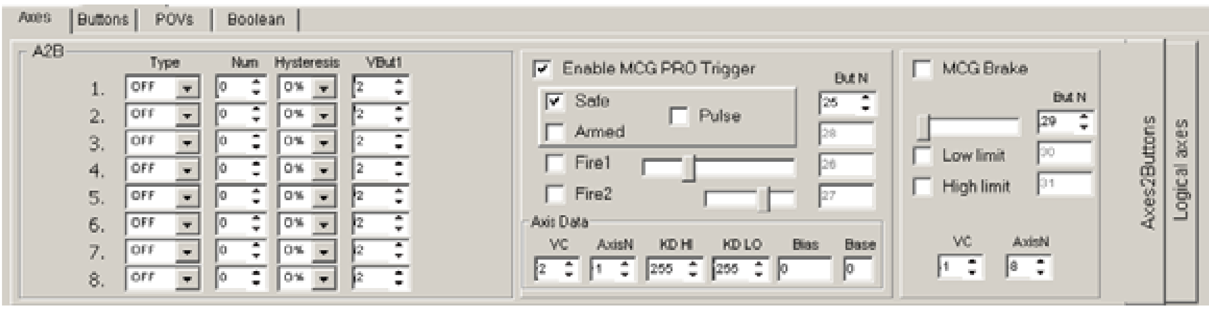


Fig. 12.5.

Folded trigger

Trigger is an axis. Assign virtual controller number using **VC** counter, and axis number using **AxisN**. **KDHi**, **KDLo**, **Bias**, **Base** parameters allow to fine tune axis.

Trigger has physical button. Check **Enable MCG Pro Trigger** to enable additional virtual buttons that are pressed on trigger path. Check **Safe** for unfolded trigger state button, **Fire2** – pressed. Sliders **Fire1** and **Fire2** set trigger positions for corresponding buttons. Use counter **But N** to set virtual button number for pressed position. Other number will follow. Check **Pulse** to use virtual buttons as toggle switches (see section 4.3.10 on p. 62). Button press duration is equal to **T_Tgl** value regardless of real trigger time in button position.

Break lever

Drake lever is an axis. Assign virtual controller number using **VC** counter, and axis number using **AxisN**. Check **MCG brake** to enable additional virtual buttons that are pressed on lever path. Check **Low limit** for default lever position, **High limit** – pressed. Use slider to tune intermediate button position. Use counter **But N** to set intermediate virtual button number. Other number will follow.

12.6. Software connecting devices using Z-Link

Z-Link program allows to connect devices without wires. The following example shows connection between GNX controller with NXT modules as slave and Black Box (Gunfighter MCG Pro) as master.

12.6.1. Z-Link2 parameters

Launch Z-Link2 executable. Fig. 12.6 shows Z-Link2 window.

Fig. 12.6.

Select slave controller that will transmit controls to master (Fig. 12.7).

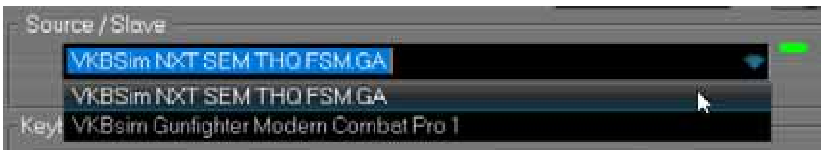


Fig. 12.7.

Remember pair of addresses in brackets (34.52 for GNX controller). Select master controller in the same manner.

12.6.2. Controllers setup in VKBDevCfg

Launch VKBDevCfg.exe.

Slave parameters

Select slave controller in the list, Fat Мамба, and open **Global – External** tab. Set **AdrH** и **AdrL** values taken from Z-Link, 34 and 52 (Fig. 12.8).

Fig. 12.8.

Check **Virtual BUS over USB**. Controller light will become green in Z-Link window, controller registered in the net. Check **Global Shifts** or/and **Global SubShifts** to use corresponding modifiers from master.

Master parameters

Select master controller in the list, GunFighter, and open **Global – External** tab. Configure device #3 as external virtual (Fig. 12.9).

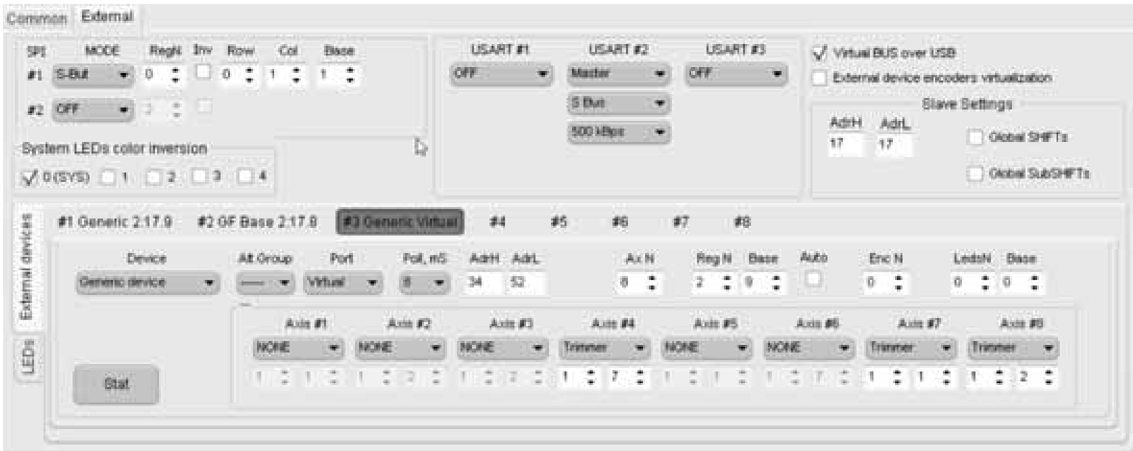


Fig. 12.9.

Select device type – **Generic device**, **Port** – **Virtual**, **Poll** = 8 ms. Enter pair of slave addresses from Z-Link2, 34 and 52. Set received axes count, 8 for this example, Button registers count (2) and base register (9).

In this example axes 4, 7 and 8 of all eight are used. On GNX side they are virtual axes controlled by encoders of FSM-GA. Set virtual controller #1 for all axes. Select **Trimmer** type for axis #4 and own axis number 7 (yaw). Select **Trimmer** type for axis #7 and own axis number 1 (roll). Select **Trimmer** type for axis #8 and own axis number 2 (pitch). Press **Set**.

12.6.3. Z-Link2 work

When program is launched controls of slave controller are transmitted to master one. See axes transmission on Fig. 12.10.

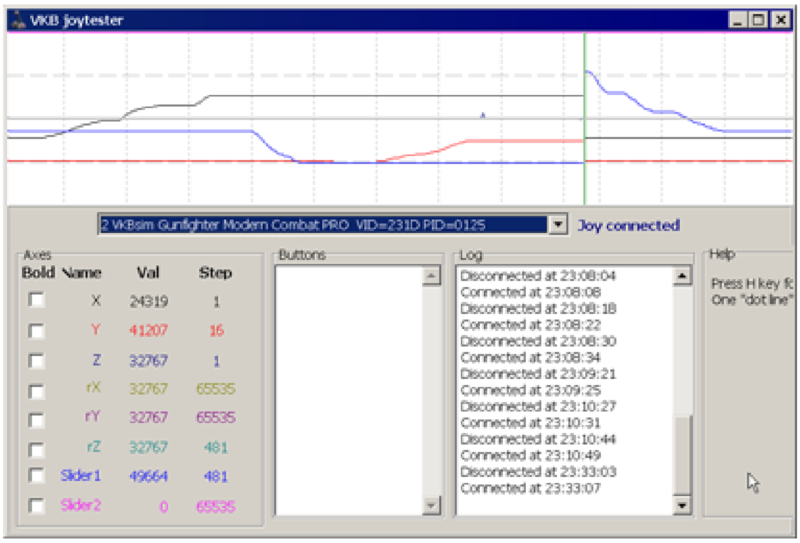


Fig. 12.10.

If **Use global shifts** for slave controller (see sect. 12.3 on p. 155) is checked and Master button, configured as Shift is pressed, corresponding indicator of Zlink2 window flashes. Similarly for Subshifts.

Appendix I.Zconfig.ini file description

Overview

When you launch configuration utility for the first time configuration file *zconfig.ini* will automatically be created in the same folder with *VKBDevCfg.exe* file. It contains miscellaneous utility parameters. Some of them MUST be appended by user because of they are not created automatically. See description of certain parameters in Table 12.6.

Table. 12.6.

Section name	Parameter	Description
[Common]	Use matrix=1	Allows **Row**, **Col**, **Base** fields on **Global** – **External** tab.
[Common]	PageControlTop=1/0	Tab positions on top/bottom.
[Common]	SwapPL=1	Axes panels position. For this value Physical axes panel is on top.
[Common]	Release_DI=1	Buttons and axes testing is enabled after parameters activation. In case of some problems set Release_DI=0
[User]	ForcedWriteID=1	Enables to load profiles created for firmware versions that are not current.
[User]	User=Developer	Enables Macro, LEDs, virtual mouse using.
[Common]	Test Misc Enabled=1	Enables MARS sensors and LEDs testing.