Device overview

This project is a small remote controller for the SBGC32-based devices.

1	*LCD*
2	*Left incremental encoder*
3	*Right incremental encoder*
4	*Potentiometer*
5	*High-resolution absolute encoder*
6	*Operation mode toggle button*
7	*Enter button*
8	*Analog 2-axis joystick*
9	*3-position switch 1*
10	*3-position switch 2*
11	*Serial port interface*

Figure 1. Purpose of controls

MiniRemote works in two modes – menu navigation and gimbal control. It allows to perform operations such as gimbal control, changing run-time adjustable variables, making sensors calibrations, running scripts, switching profiles, executing actions, viewing real-time state.

User interface

An all periphery is showed on the *figure 1*:

1. **0.96 inch, 160x80 pixels RGB LCD** – main visual information output device;

2. **Left incremental (rotary) encoder** – its push button is used for saving settings.
   In the next versions it may be assigned to a various shortcut action

3. **Right incremental encoder** – its rotary action is used in the ***Control Mode*** to adjust a sensitivity of control handlers. Its push button serves as an <Exit> function in the menu navigation;

4. **Potentiometer** – one of the control handlers. See more in the "Control Configurations" and "Control Mode" sections;

5. **Absolute encoder** – is used for a parameter adjustment in the **Adjvar. Edit** and **Parameter Edit** windows.

6. **Operation mode toggle button** – implements system modes switching (menu navigation – gimbal control);

7. **Enter button** – an <Enter> function for menu navigation. See more about other function of this element in the "Adjustable Variables" and "Parameters Edit" sections;

8. **Analog 2-axis joystick** – realizes navigation in the menu navigation mode and acts as a control handler in the gimbal control mode. See more in the "Control Mode" and "Control Configurations";

9. **3-position switch 1** – switches the gimbal control profiles (down – 1, center – 2, up – 3). See more in the "Control Mode" and "Control Configurations";

10. **3-position switch 2** – not assigned to system function in this version

11. **Serial API connection** – a special LEMO connector to connect MiniRemote to the SBGC32 devices via serial port implementing Serial API protocol

Menus

Main Menu

Use the joystick's for directions to navigate to the next menu. To return back to the main menu, check the 'return arrow' icon if present, or use the Exit button. For example, Up goes to *Profiles* and Down returns back to the main menu.

Profiles

Choose a gimbal active profile. Move stick up to activate. Move stick left or right to choose another profile. The bottom text shows the actual name of the selected profile. Press the Exit button or move joystick down to return to the **Main Menu**.

Shortcuts

This window contains quick commands for a gimbal. Move the stick down to apply one. Move the stick left or right to choose another shortcut. Hold the Enter button to change shortcuts order. For calibration actions, follow the instructions on the screen. Move the stick down after running the script to abort it. Move the stick up or press the Exit button to return to the **Main Menu**.
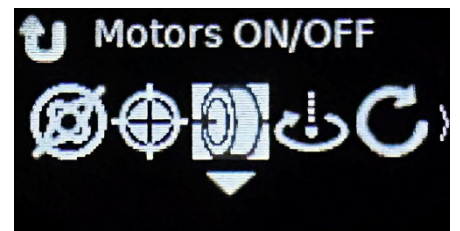
Gimbal

This is a menu to interact with the SBGC32 gimbal controller. To enter any sub-menu, move the stick right or press the Enter button. Move the stick right to return to the **Main Menu**. This menu has the following functions:

- **Board Info** – general controller information

- **Realtime Data –** system information displayed in real time

- **RC Inputs –** level of active RC inputs displayed in real time

- **Adj. Vars. Data** – manages adjustable variables of SBGC32. See more in the Adjustable Variables section

- **Control Profiles** – set 3 individual control profiles for the Control Mode. See more in the Control Configurations
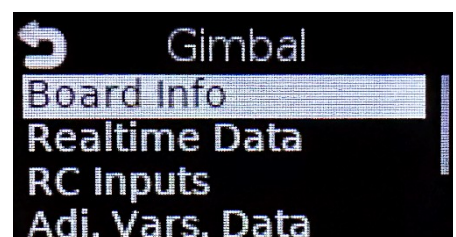
- **Debug Console** - emulates a debug console on the screen.

Remote

This menu contains the MiniRemote's system settings.

- **Communication Way –** select the communication method:

  - **UART** – connect a SBGC32 via UART interface

  - **RS-422** – a future prospect, not available on current hardware

- **Mixer Settings** – set the system mixers. A '*' sign shows that the mixer has an input configuration assigned, while '#' sign shows the presence of output configuration. The following parameters are available:

  - **Input** – assign a control element to the mixer

  - **Output** – assign a system function to the mixer

  - **Min, Max** – channel value alignment bounds

  - **Offset** – bias of mixer value

  - **Multiplier** – scale factor for channel value

  - **Inversion** – allows to reverse mixer value relative the min. and max. values

  - **Average** – arithmetic mean on mixer value

- **Joystick Calibration** – adjust origin and border values of the 2-axis joystick in this window

- **Potentiometer Calibration** – set zero point and bounds of the potentiometer

- **Backlight** – adjust display backlight

  - **Backlight Dimming –** set screen dimming factor when the backlight is off

  - **Backlight Dimming Time –** set backlight timeout

- **Adjustable Variables Synchronization** – choose where to save these values between sessions. Read more in the **Adjustable Variables** section.
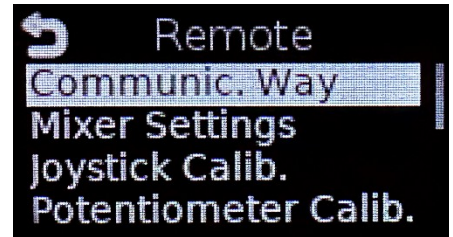
Adjustable Variables

This menu contains the active adjustable variables, selected by the user. Also, it has functions:

- **Other Adjustable Variables –** list of variables that are not included in the number of selected
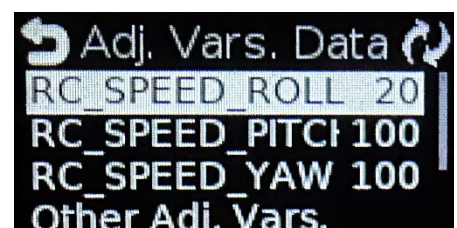
- **Save to EEPROM** – save all adjustable variables of current session to gimbal EEPROM

- **Reset Adjvars –** return these variables to their original values

A widget on the top-right of the screen shows a synchronization status between the values in the MiniRemote and the gimbal's EEPROM. It's possible to select the values you want to work with, when starting a session – are they contained in the gimbal's persistent memory or in the MiniRemote's memory. This setting is in **Remote – Adj. Vars. Sync.**

The **Adjvar. Edit** is a menu where you can change the adjustable variables value. Additionally, it is possible to correct minimum and maximum of these variables. To do this, move the stick to the right. Briefly press the Enter button to change the setting sensitivity. With a long press, you can delete a variable or add it to the active. Move the joystick up or down to switch between variables. Press the Exit button or move the stick left to return to the **Adj. Vars. Data** (or **Other Adj. Vars.**) menu.
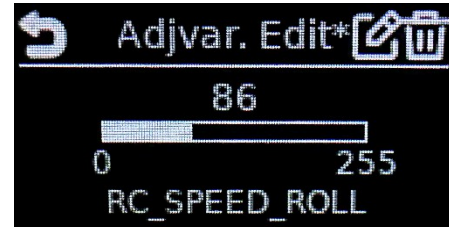
Control Configurations

It holds a configuration for the **Control Mode** window. It's possible to set up to 3 individual profiles. Each profile consists of settings for 3 physical control handlers: joystick X, Y axes and potentiometer. The following parameters are available:

- **Speed –** for the "Incremental" mode adjusts the rate factor

- **Low Pass Filter –** smooths out sharp joystick commands

- **Sensitivity** – multiplier applied to the input signal

- **Inversion –** allows to reverse the direction

- **Attached Axis –** choose a gimbal axis to be linked with this handler. If it's already used by another handler, then it will be swapped. Select <Not Assigned> if this handler is not used.

- **Control Mode –** allows switching between modes of control:

  - **Absolute –** camera angle is proportional to the joystick angle

  - **Incremental –** camera turning speed is proportional to the joystick angle

  - **RC control –** it sends a filtered joystick position to the gimbal, which uses its internal RC settings to translate it into the motion (see "RC settings tab" in GUI)
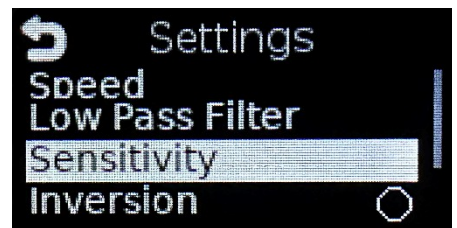
Parameters Edit

Edit various parameters using this window. It works like the **Adjvar. Edit** window with slightly reduced functionality. A '*' sign shows that this parameter has changed. Move the joystick left to return to a previous menu.
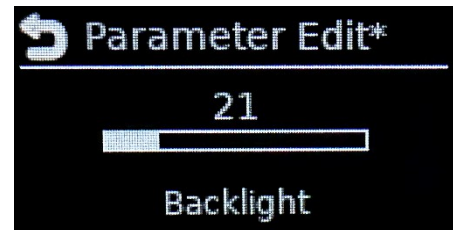
Control Mode

This is an alternative state of the MiniRemote, when it controls a gimbal movements. The gimbal behavior depends on the parameters adjusted in the **Control Profiles** menu. The GPx and CPx labels show a current gimbal profile and an active control profile. CP0/1/2 may be switched by the 3-position switch 1.
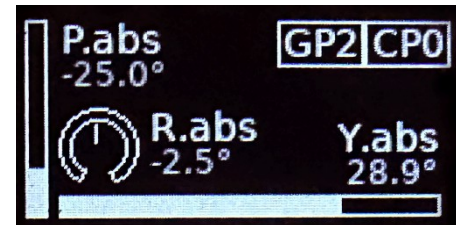
The axis assigned to the physical handlers is shown by the first letter on labels (R - ROLL, P - PITCH, Y – YAW), supplemented by the control mode (abs/inc/rc). The bottom label shows the actual angle of the axis. The circle and the horizontal and vertical bars display a state of the control handlers. Use the Right incremental encoder to adjust a sensitivity of these handlers. Press its push button to switch between handlers.

Code features

This project uses the following third-party libraries: HAL, uGFX, FreeRTOS, SBGC32 Serial API Library and Tiny printf, sprintf and snprintf implementation by Marco Paland (PALANDesign). It may be customized by corresponding configuration files: LowLayer/Drivers/stm32f4xx_hal_conf.h, Middleware/uGFX/gfxconf.h, Middleware/FreeRTOS/FreeRTOSConfig.h and HighLayer/Gimbal/serialAPI_Config.h. The project also has its own settings. See the initialConfig.h file in the LowLayer folder to adjust the common settings. Also check out the projectConfig.h file in the HighLayer folder. This code contains specific settings for each module in the project, such as the MiniRemote GUI or its system settings and SBGC32 communication.