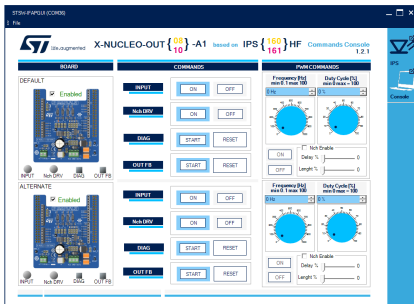


## Demonstration firmware for NUCLEO-G431RB enabling STSW-IFAPGUI on X-NUCLEO-OUT08A1 and X-NUCLEO-OUT10A1 expansion boards



### Features

- Full control of the X-NUCLEO-OUT08A1 and X-NUCLEO-OUT10A1 expansion boards via the STSW-IFAPGUI graphical user interface
- Control of:
  - single channel applications
  - dual channel applications
  - output fast discharge
  - output on/off status
- Output channel switching frequency and duty cycle configuration
- Visualization of diagnostic signals (open load, cut-off and thermal protection)

### Description

The STSW-OUT8G4 firmware runs on the NUCLEO-G431RB development board when connected to the X-NUCLEO-OUT08A1 or X-NUCLEO-OUT10A1 expansion boards using the STSW-IFAPGUI graphical user interface.

The STSW-OUT8G4 contains the software routines to allow full control of X-NUCLEO-OUT08A1 and X-NUCLEO-OUT10A1 via the STSW-IFAPGUI.

The firmware can control the single expansion board or two stacked shields (two X-NUCLEO-OUT08A1 or two X-NUCLEO-OUT10A1 expansion boards, or one of each).

The STSW-IFAPGUI is based on a common engine and several plug-ins designed to communicate with the application layer running on the microcontroller driving the shield board.

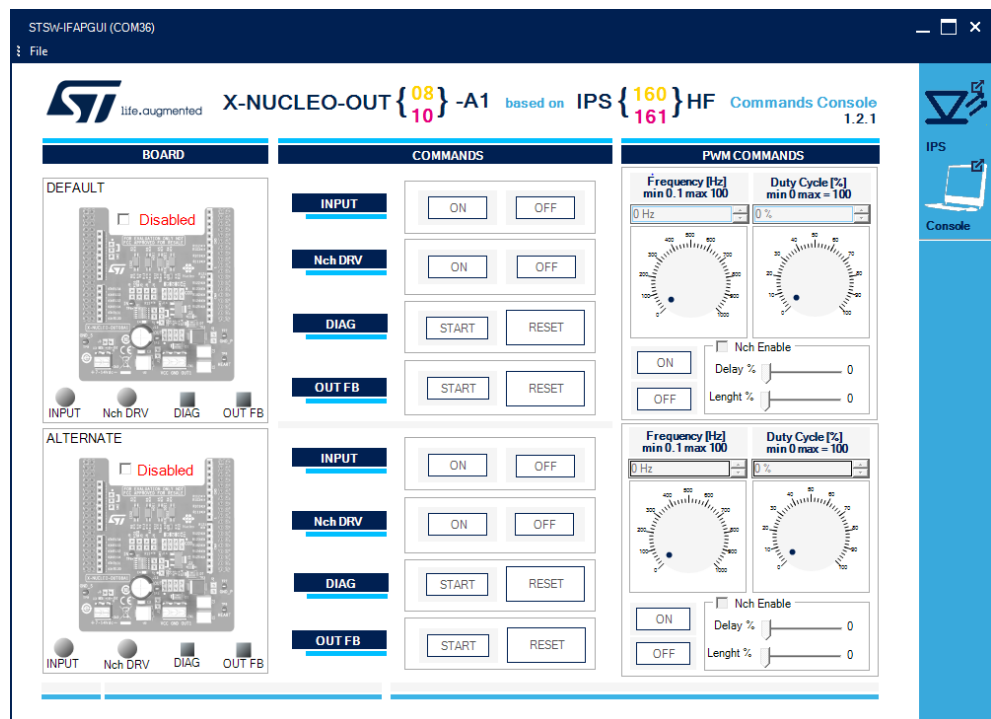
Product summary	
Firmware for NUCLEO-G431RB when connected to X-NUCLEO-OUT08A1 or X-NUCLEO-OUT10A1 expansion boards	STSW-OUT8G4
Industrial digital output expansion board based on IPS160HF for STM32 Nucleo	X-NUCLEO-OUT08A1
Industrial digital output expansion board based on IPS161HF for STM32 Nucleo	X-NUCLEO-OUT10A1
STM32 Nucleo-64 development board with STM32G431RB MCU	NUCLEO-G431RB
Graphical user interface for the industrial IPS evaluation boards based on STM32 Nucleo	STSW-IFAPGUI
Applications	Industrial Safety Industrial Tools

# 1 How to control a single expansion board

In this application scenario, the default X-NUCLEO-OUT08A1 (or X-NUCLEO-OUT10A1) on-board switch and resistor configuration is applied.

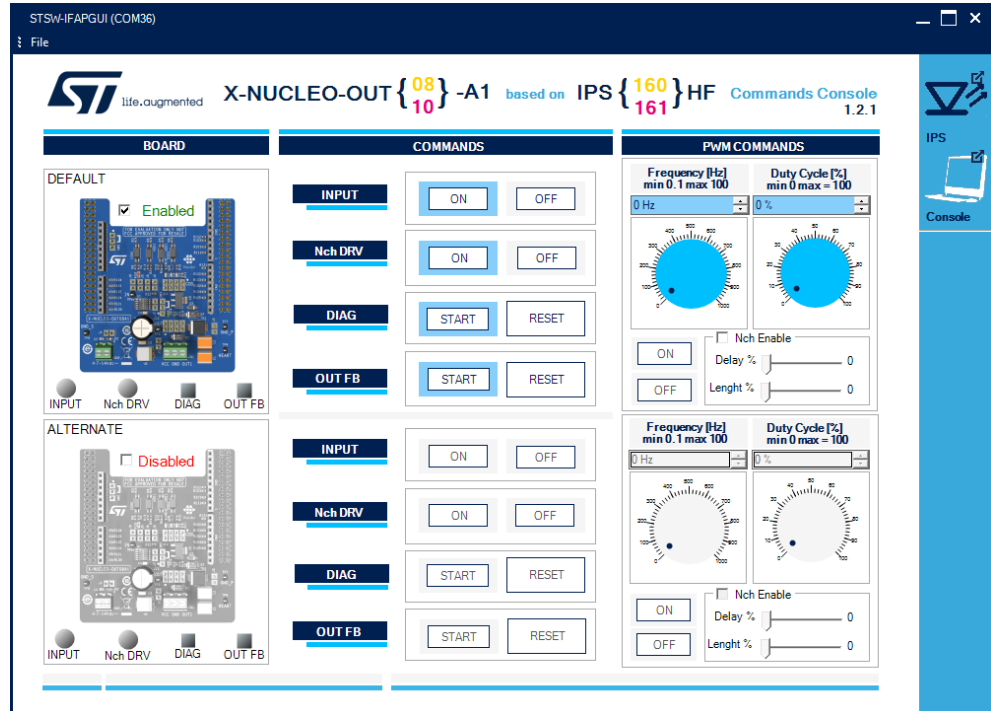
- Step 1.** Stack the NUCLEO-G431RB board flashed with the STSW-OUT8G4 firmware to the X-NUCLEO-OUT08A1 (or X-NUCLEO-OUT10A1) through the Arduino connectors.
- Step 2.** Connect the two stacked boards to your PC/laptop USB port through a micro-USB cable. The STM32 is supplied via USB (3.3 V) and the flashed firmware starts running.
- Step 3.** Launch the STSW-IFAPGUI.  
When the application starts, the firmware running on the STM32 is automatically detected and a COM port is opened for communication.
- Step 4.** Click on the GUI STM32 Nucleo icon after it turns blue (it remains green until the firmware identification has completed).

**Figure 1. STSW-IFAPGUI main control panel**



**Step 5.** Tick the box on the top left corner of the GUI to enable the DEFAULT board.

**Figure 2.** STSW-IFAPGUI single chip control panel



**Step 6.** Connect the load and supply the power stage of the X-NUCLEO-OUT08A1 (or X-NUCLEO-OUT10A1) with a 24 V rail via CN1 connector.

**Step 7.** Select the desired switching frequency and duty cycle of the output channel through the [PWM COMMANDS] on the top right side of the GUI.

**Step 8.** Click the [ON/OFF] button (just below the Frequency Selection area) to activate or deactivate the output channel.

*Note:* The output channel steady state can be activated by clicking on the [ON] button on the right of the [INPUT] label.

**Step 9.** Click on the [START] button on the right of the [DIAG] and [OUT\_FB] labels to monitor the on/off status of the DIAG pin on IPS160HF (or IPS161HF) and the output voltage status (if activated by setting J13 appropriately).

You can stop monitoring these feedback signals by clicking on the [STOP] button.

*Note:* In some cases it may be necessary to supply the board 30 V for proper activation of the signals on the GUI.

**Step 10.** Use one of the following options to test Q1 and the on-board circuit for the fast discharge of high capacitive load:

- Click on the [ON/OFF] button on the right of the [NchDRV] label to activate Q1 in steady state.
- Tick the box on the left of the [Nch Enable] label and then select its activation delay after the output gets inactive and its activation length during the output deactivation window.

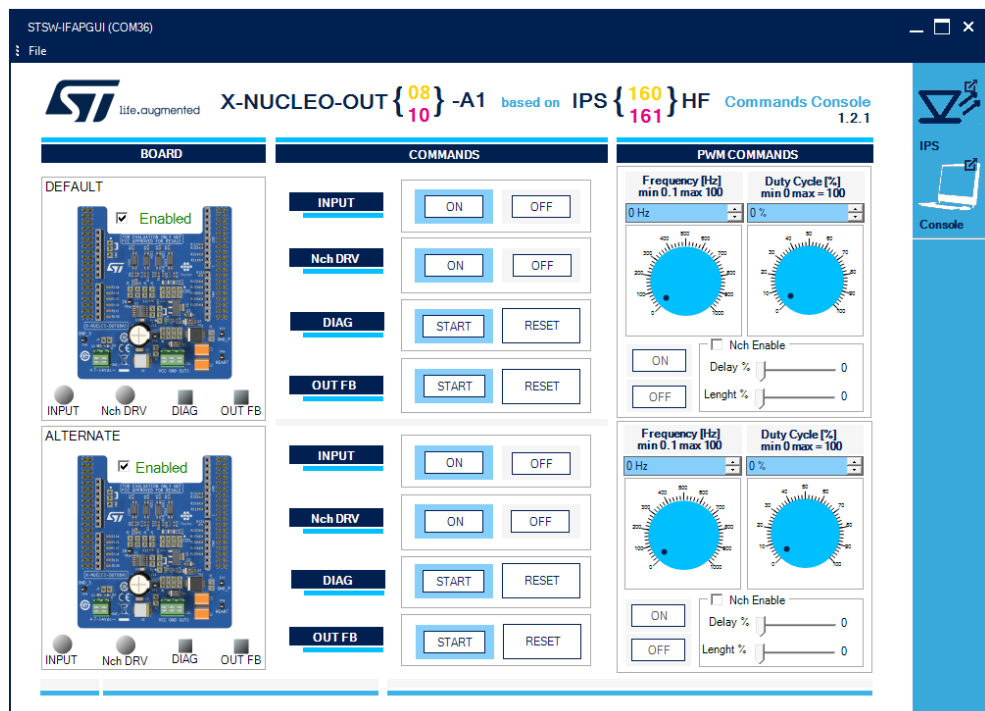
Both timing parameters are defined as a percentage of the deactivation window of the output channel by the [Delay %] and [Length %] selectors.

## 2 How to control two expansion boards

The STSW-IFAPGUI and the STSW-OUT8F4 firmware can also control two stacked shields (two X-NUCLEO-OUT08A1, or two X-NUCLEO-OUT10A1 expansion boards, or one of each).

- Step 1.** Configure the jumper and resistors of the second (ALTERNATE) board as described in UM2715 (for X-NUCLEO-OUT08A1) and UM2716 (for X-NUCLEO-OUT10A1), freely available on [www.st.com](http://www.st.com).
- Step 2.** Tick the [Enable/Disable] boxes of the DEFAULT and ALTERNATE board on the GUI.

Figure 3. STSW-IFAPGUI dual chip control panel



The control panel of the ALTERNATE board is a clone of the DEFAULT one, so you can follow the steps described in Section 1.

## Revision history

**Table 1. Document revision history**

Date	Version	Changes
12-Jun-2020	1	Initial release.

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