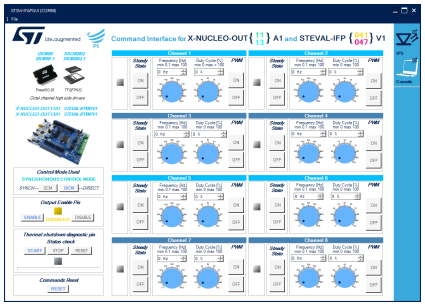
STSW-OUT11F4

Data brief

Demonstration firmware for NUCLEO-F401RE enabling STSW-IFAPGUI on X-NUCLEO-OUT11A1 and X-NUCLEO-OUT13A1 expansion boards



Features

- Full control of the X-NUCLEO-OUT11A1 and X-NUCLEO-OUT13A1 expansion boards via the STSW-IFAPGUI graphical user interface
- Control of:
  - output channel switching frequency and duty cycle configuration
  - visualization of diagnostic signal (common overtemperature/ communication error)
  - both Direct Control Mode and Synchronous Control Mode management

Description

The STSW-OUT11F4 firmware runs on the NUCLEO-F401RE development board and allows controlling the X-NUCLEO-OUT11A1 or X-NUCLEO-OUT13A1 expansion boards using the STSW-IFAPGUI graphical user interface.

The STSW-OUT11F4 contains the software routines that enable the USB-based communication between the NUCLEO-F401RE and the system where the STSW-IFAPGUI runs, and the control of the X-NUCLEO-OUT11A1 or X-NUCLEO-OUT13A1.

The firmware can control a single expansion board (X-NUCLEO-OUT11A1 or X-NUCLEO-OUT13A1).

The STSW-IFAPGUI is based on a common engine and several plug-ins designed to communicate through the USB connection with the application layer running on the NUCLEO-F401RE development board stacked with the expansion board.

Product summary	
Demonstration firmware for NUCLEO-F401RE enabling STSW-IFAPGUI on X-NUCLEO-OUT11A1 and X-NUCLEO-OUT13A1 expansion boards	STSW-OUT11F4
Industrial digital output expansion board based on ISO808 for STM32 Nucleo	X-NUCLEO-OUT11A1
Industrial digital output expansion board based on ISO808-1 for STM32 Nucleo	X-NUCLEO-OUT13A1
STM32 Nucleo-64 development board with STM32F401RE MCU, supports Arduino and ST morpho connectivity	NUCLEO-F401RE
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 with IFAPGUI

This application scenario is based on the default on-board switches and resistors configuration of the X-NUCLEO-OUT11A1 (or X-NUCLEO-OUT13A1).

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Step 1. Stack the X-NUCLEO-OUT11A1 (or X-NUCLEO-OUT13A1) on the NUCLEO-F401RE board flashed with the STSW-OUT11F4 firmware through the Arduino connectors.

Step 2. Connect the two stacked boards to your PC or laptop USB port through a mini-USB cable.

The STM32 is supplied via USB (3.3 V) and the flashed firmware starts running.
Press the black button on the NUCLEO-F401RE board to reset the firmware.

Step 3. Launch the STSW-IFAPGUI.

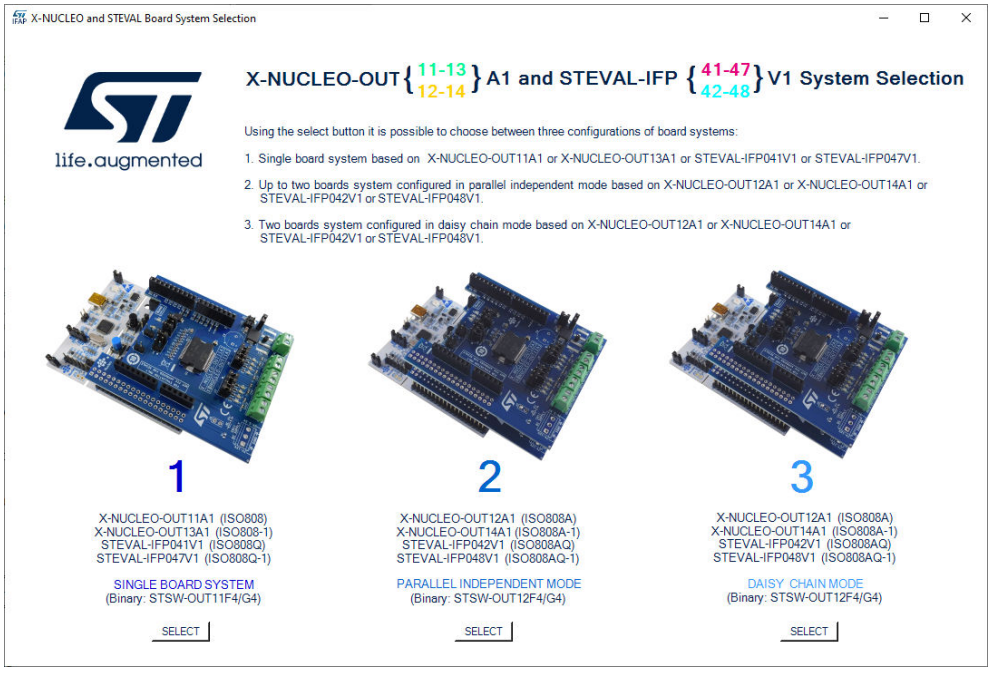
When the application starts, the firmware running on the STM32 is automatically detected and a COM port is opened for communication.

Figure 1. STSW-IFAPGUI COM port opened

Step 4. Click on the GUI STM32 Nucleo icon after it turns blue (it remains green until the firmware identification is complete).

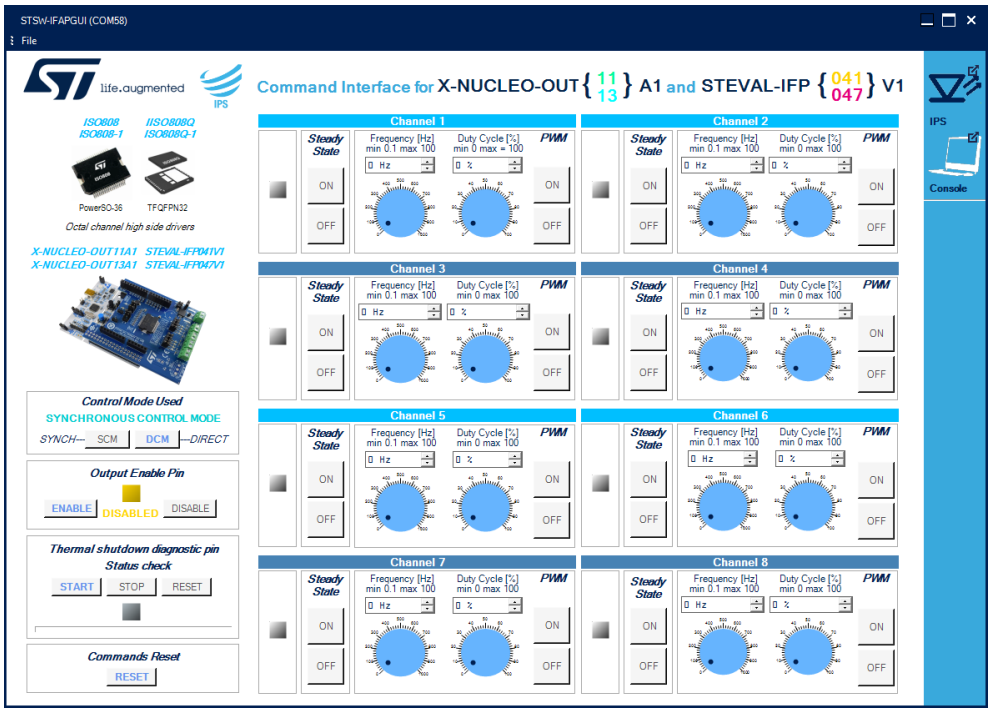
A popup window appears to choose the proper system configuration.

Figure 2. System configuration selection panel



Step 5. Select [**1**] [**SINGLE BOARD SYSTEM**] and the STSW-IFAPGUI appears on the screen.

Figure 3. STSW-IFAPGUI main control panel



Step 6. Use the dedicated section of the GUI for the desired channel of ISO808 (or ISO808-1) to:

- Manage channel steady state (the left part in each channel section).
- Manage channel PWM settings (the right part in each channel section).

Use the bottom left side of the GUI to:

- Select the Control Mode to be used (DCM or SCM, last one is the default).
- Enable/disable outputs, properly setting the Output Enable pin.
- Enable/disable and reset diagnostic pin polling activity.
- Reset all channel features to OFF state.

Step 7. Connect the load and supply the power stage of the X-NUCLEO-OUT11A1 (or X-NUCLEO-OUT13A1) with a 24 V rail via the CN1 connector.

Step 8. Select the desired switching frequency and duty cycle of the desired output channel through the [**Pulse Width Modulation**] controls in the right part of desired channel section.

Step 9. The desired output channel steady state can be activated/deactivated by clicking on the [**ON/OFF**] buttons in the left part of the desired channel section in the [**Steady State**] sub-section.

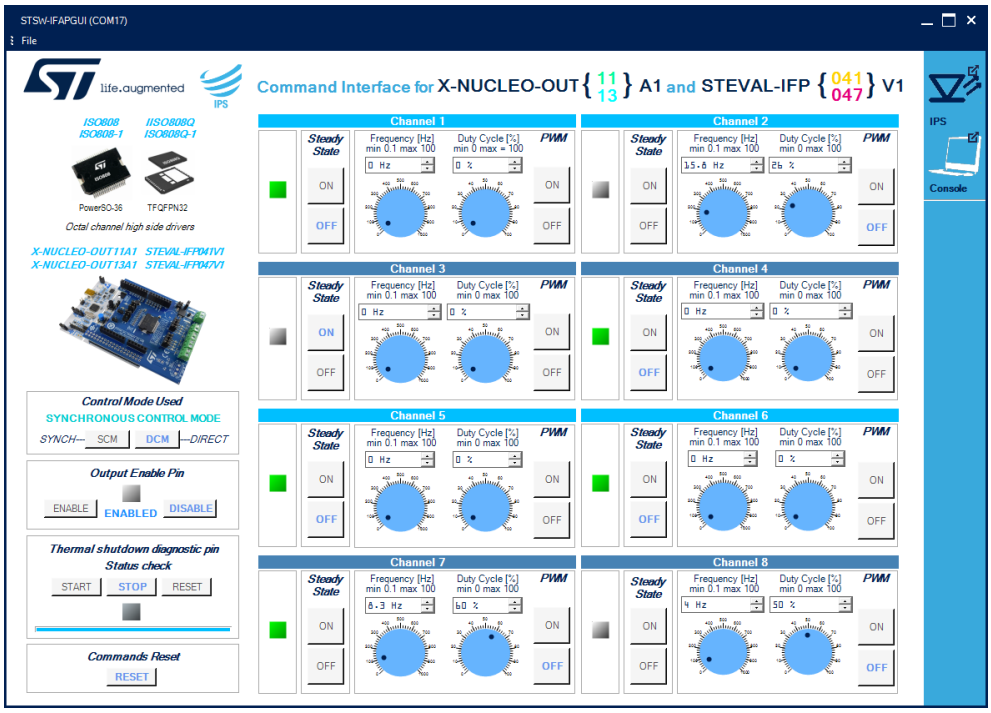
Step 10. Click on the [**START**] button in the [**Thermal shutdown diagnostic pin Status check**] area on the bottom left side of the GUI to monitor the on/off status on the FAULT pin on ISO808 (or ISO808-1).

You can stop monitoring the fault status by clicking on the [**STOP**] button in the same section. Press the [**RESET**] button to reset the fault status.

Step 11. Click on [**Enable**] button in [**Output Enable Pin**] section to drive the output pins. Click on [**Disable**] in the same section to turn off all output pins.

Step 12. Click on [**RESET**] button in [**Commands Reset**] section to reset any channel setting and also the diagnostic pin status monitoring.

Figure 4. STSW-IFAPGUI in action



2 How to control a single expansion board with Command Line Interface

This application scenario is based on the default on-board switches and resistors configuration of X-NUCLEO-OUT11A1 (or X-NUCLEO-OUT13A1).

Step 1. Plug the X-NUCLEO-OUT11A1 or X-NUCLEO-OUT13A1 expansion board on top of the NUCLEO-F401RE board, flashed with the STSW-OUT11F4 firmware, through the Arduino connectors.

Step 2. Connect the two stacked boards to your PC or laptop USB port through a mini-USB cable. The STM32 is supplied via USB (3.3 V) and the flashed firmware starts running. Press the black button on the NUCLEO-F401RE board to reset the firmware.

Step 3. Launch the serial communication terminal application (TeraTerm in our notes). When the application starts, the serial communication must be configured as follows:

Figure 5. Tera Term: select serial communication method

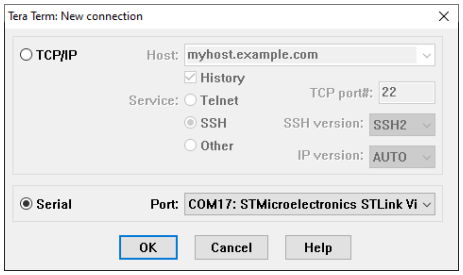


Figure 6. Tera Term: Setup / Terminal…

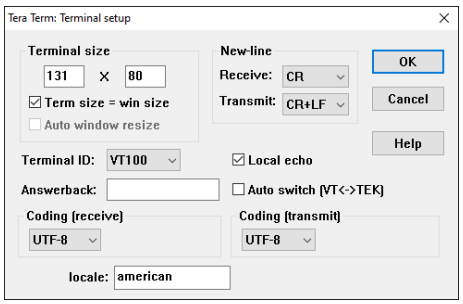
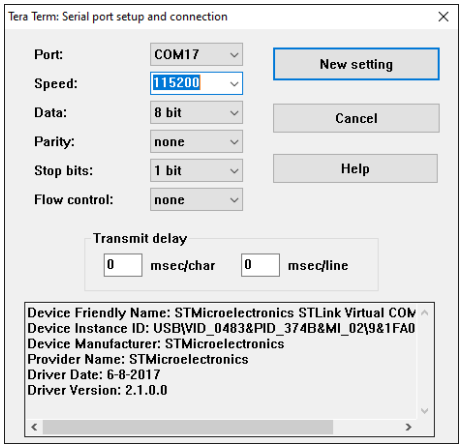
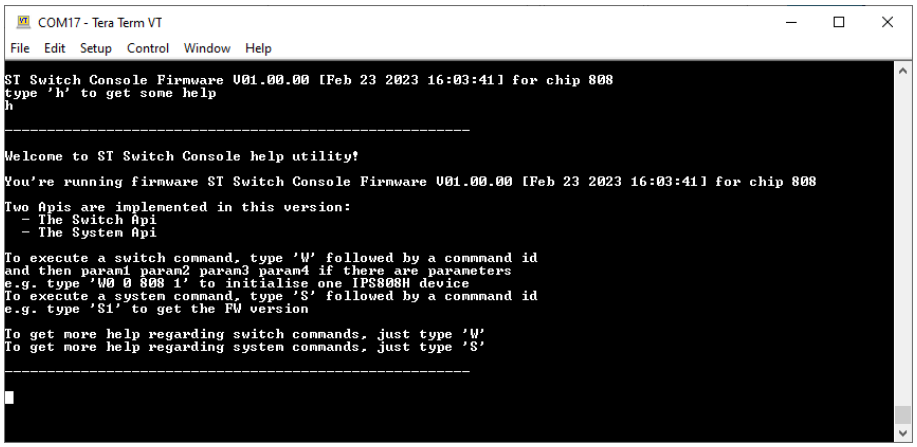


Figure 7. Tera Term: Setup / Serial port…



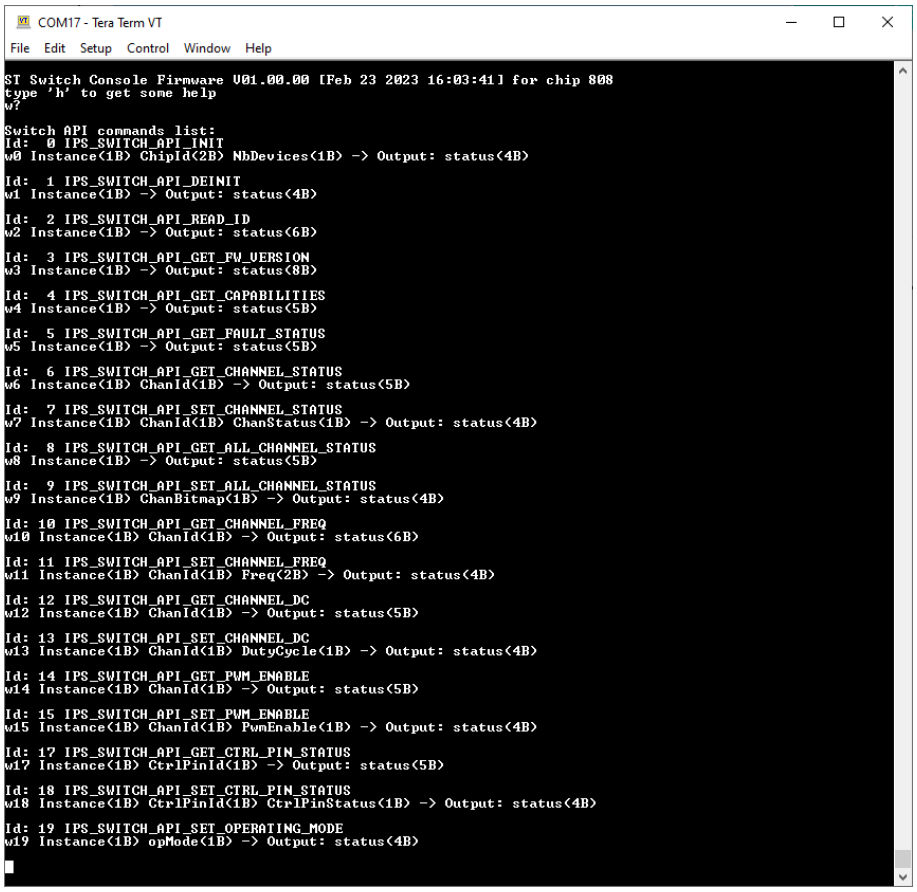
Step 4. Press Enter and then type ‘h’ for help:

Figure 8. CLI help



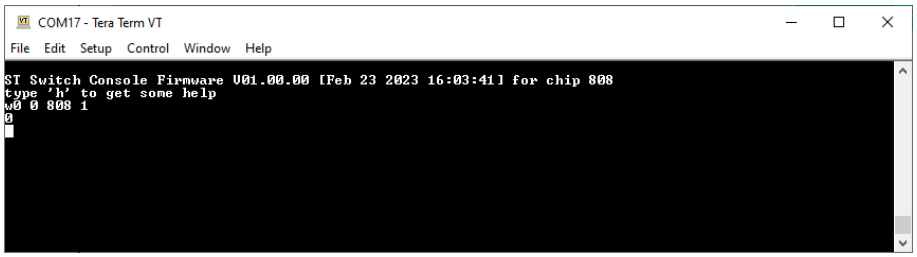
Step 5. Type ‘w?’ for a list of commands available:

Figure 9. Command list



Step 6. Initialize the device as first action using **w0** command:

Figure 10. Device init



Step 7. Continue to interact with the device using commands from the available command list (see above).

Revision history

Table 1. **Document revision history**

Date	Revision	Changes
23-May-2023	1	Initial release.