Getting started with the STWBC wearable turnkey firmware

Introduction

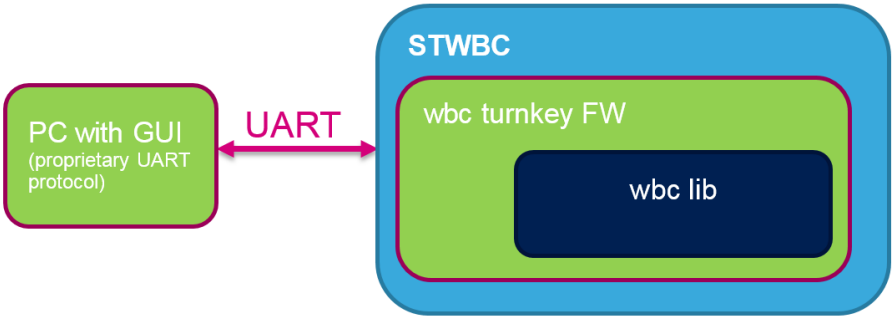
The STWBC turnkey firmware offers all the STWBC standard functionalities specific to the STEVAL-ISB045V1 wearable wireless charging kit.

It is delivered as a binary file directly downloadable into the STWBC Flash memory.

The firmware architecture is a standalone block which embeds a library (wbc lib) containing the STWBC core implementation. Some parameters are accessible by the user and can be tuned.

A UART is used as port for the PC GUI tool (STSW-STWBCGUI).

Figure 1. STWBC turnkey firmware architecture



1 APIs

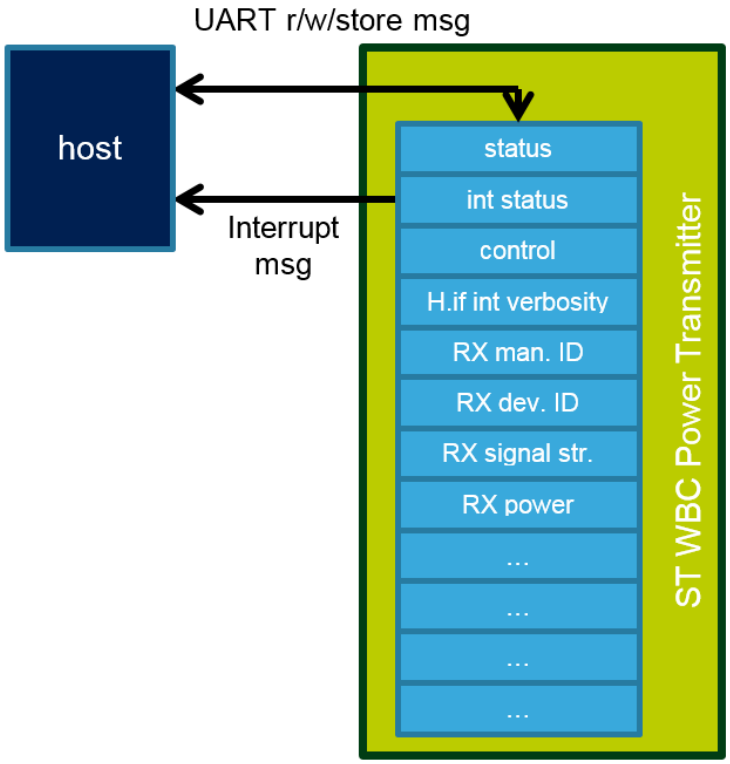
1.1 Host interface registers

The power transmitter controller interface is register-based.

The registers allow:

- getting the transmitter status
- getting event descriptions (such as errors)
- getting information about the attached receiver
- tuning some parameters

Figure 2. Host interface register architecture



1.2 Register map

Table 1. Register list values

Register list	Value
HOST_IF_STATUS	(0x00)
HOST_IF_INT_STATUS	(0x01)
HOST_IF_CONTROL	(0x02)
HOST_IF_DATA_W	(0x03)
HOST_IF_INT_VERBOSITY	(0x04)

Register list	Value
HOST_IF_EXT_ID_MSB	(0x09)
HOST_IF_EXT_ID_7	(0x0A)
HOST_IF_EXT_ID_6	(0x0B)
HOST_IF_EXT_ID_5	(0x0C)
HOST_IF_EXT_ID_4	(0x0D)
HOST_IF_EXT_ID_3	(0x0E)
HOST_IF_EXT_ID_2	(0x0F)
HOST_IF_EXT_ID_LSB	(0x10)
HOST_IF_MAN_CODE_MSB	(0x11)
HOST_IF_MAN_CODE_LSB	(0x12)
HOST_IF_DEVICE_ID_MSB	(0x13)
HOST_IF_DEVICE_ID_3	(0x14)
HOST_IF_DEVICE_ID_2	(0x15)
HOST_IF_DEVICE_ID_LSB	(0x16)
HOST_IF_SIGNAL_STRENGTH	(0x17)
HOST_IF_RECEIVED_PWR	(0x18)
HOST_IF_LOG_MSG	(0x19)
HOST_IF_VOLTAGE	(0x1A)
HOST_IF_DUTYCYCLE	(0x1B)
HOST_IF_CUR_ERROR	(0x1C)
HOST_IF_BOOTMODE	(0x1D)
HOST_IF_TESTMODE	(0x1E)
HOST_IF_COIL_RES_METRIC	(0x1F)
HOST_IF_LOG_ERROR	(0x20)
HOST_IF_FREQUENCY	(0x21)
HOST_IF_CONTROL_ERROR	(0x22)
HOST_IF_ADC_CURRENT_H	(0x23)
HOST_IF_ADC_CURRENT_L	(0x24)
HOST_IF_ADC_VOLTAGE_H	(0x25)
HOST_IF_ADC_VOLTAGE_L	(0x26)
HOST_IF_TUNING_PRES_DET	(0x27)
HOST_IF_TUNING_FOD1_DYN_THR	(0x28)
HOST_IF_TUNING_FOD1_METRIC	(0x29)
HOST_IF_TUNING_FOD2_CURR_H	(0x2A)
HOST_IF_TUNING_FOD2_CURR_L	(0x2B)
HOST_IF_TUNING_FOD2_VOLT_H	(0x2C)
HOST_IF_TUNING_FOD2_VOLT_L	(0x2D)

Register list	Value
HOST_IF_TUNING_FOD2_METRIC_H	(0x2E)
HOST_IF_TUNING_FOD2_METRIC_L	(0x2F)
HOST_IF_TUNING_FOD2_THR_H	(0x30)
HOST_IF_TUNING_FOD2_THR_L	(0x31)
HOST_IF_MSG_DECODED	(0x32)
HOST_IF_RX_POWER_MW	(0x35)
HOST_IF_FEATURE_DISABLED	(0x36)
HOST_IF_CHARGE_STATUS	(0x37)
HOST_IF_CURRENT_OFFSET_H	(0x38)
HOST_IF_CURRENT_OFFSET_L	(0x39)
HOST_IF_ADC_VOUT_FB_OFFSET_H	(0x3A)
HOST_IF_ADC_VOUT_FB_OFFSET_L	(0x3B)
HOST_IF_ADC_VIN_H	(0x42)
HOST_IF_ADC_VIN_L	(0x43)
HOST_IF_ADC_TEMPERATURE_H	(0x44)
HOST_IF_ADC_TEMPERATURE_L	(0x45)
HOST_IF_VOLTAGE_OFFSET_H	(0x46)
HOST_IF_VOLTAGE_OFFSET_L	(0x47)
HOST_IF_DEMOD_VOLTA_CMP_THR	(0x48)
HOST_IF_DEMOD_VOLTB_CMP_THR	(0x49)
HOST_IF_DEMOD_CURRENT_CMP_THR	(0x4A)
HOST_IF_COUNT_DEBUG	(0x4B)
HOST_IF_RX_VERSION	(0x4C)
HOST_IF_CURRENT_PRES_DET_DC_OFFSET	(0x4D)

Table 2. Host interface register description

Register	Description
HOST_IF_STATUS	Overall status of the Qi wireless battery charger (object detected, on-going identification or power transfer on-going)(1)
HOST_IF_INT_STATUS	Contains the interrupt sources, to be read after reception of the “int” message. (1)
HOST_IF_CONTROL	Type of command to execute. (1)
HOST_IF_DATA_W	Reserved
HOST_IF_INT_VERBOSITY	Contains the enabling/disabling status for the 2 “int” messages : INT_SRC_LOG_MSG and INT_SRC_LOG_ERROR. Bit0 corresponds to INT_SRC_LOG_MSG enabling/disabling and bit1 corresponds to INT_SRC_LOG_ERROR enabling/disabling. For each bit : value 0 means INT enabled, value 1 means INT disabled. By default, the 2 interrupts are enabled. It is up to the customer to disable them on the basis of the application used.

Register	Description
HOST_IF_EXT_ID_MSB	MSB of the extended ID code given by the Qi receiver (if the extended packet is received).
HOST_IF_EXT_ID_7	Ext ID word 7
HOST_IF_EXT_ID_6	Ext ID word 6
HOST_IF_EXT_ID_5	Ext ID word 5
HOST_IF_EXT_ID_4	Ext ID word 4
HOST_IF_EXT_ID_3	Ext ID word 3
HOST_IF_EXT_ID_2	Ext ID word 2
HOST_IF_EXT_ID_LSB	LSB of the extended ID code given by the Qi receiver.
HOST_IF_MAN_CODE_MSB	MSB of the manufacturer code given by the Qi receiver.
HOST_IF_MAN_CODE_LSB	LSB of the manufacturer code given by the Qi receiver.
HOST_IF_DEVICE_ID_MSB	MSB of 32 bit device ID sent by the Qi receiver
HOST_IF_DEVICE_ID_3	Device ID 2nd byte
HOST_IF_DEVICE_ID_2	Device ID 3rd byte
HOST_IF_DEVICE_ID_LSB	LSB of device ID sent by the Qi receiver
HOST_IF_SIGNAL_STRENGTH	Qi receiver signal strength
HOST_IF_RECEIVED_PWR	Qi received power
HOST_IF_LOG_MSG	Qi finite state status, to be read when an interrupt occurs with LOG_MSG bit set in the INT_STATUS register. (1)
HOST_IF_VOLTAGE	Input voltage (with a 140 mV resolution)
HOST_IF_DUTYCYCLE	Current output signal DC in percentage
HOST_IF_CUR_ERROR	Reserved
HOST_IF_BOOTMODE	Reserved
HOST_IF_TESTMODE	Reserved
HOST_IF_COIL_RES_METRIC	Reserved
HOST_IF_LOG_ERROR	Error logging, to be read when an interrupt occurs with LOG_ERROR bit set in the INT_STATUS register. (1)
HOST_IF_FREQUENCY	Current frequency used (in hertz/2048)
HOST_IF_CONTROL_ERROR	Indicate the control error obtained from the CONTROL_ERROR message (range [-128, 127]).
HOST_IF_ADC_CURRENT_H	Higher part of the ADC current sense measurement
HOST_IF_ADC_CURRENT_L	Lower part of the ADC current sense measurement
HOST_IF_ADC_VOLTAGE_H	Higher part of the ADC voltage measurement
HOST_IF_ADC_VOLTAGE_L	Lower part of the ADC voltage measurement
HOST_IF_TUNING_PRES_DET	Presence detection metric used during the analog ping phase.
HOST_IF_TUNING_FOD1_DYN_THR	Threshold used in the determination of the foreign object detection (FOD) algorithm during the selection state.
HOST_IF_TUNING_FOD1_METRIC	Metric used in the determination of in the determination of the FOD algorithm during selection state.
HOST_IF_TUNING_FOD2_CURR_H	Higher part of a metric based on the current measurement and used in the FOD algorithm during power transfer phase.

Register	Description
HOST_IF_TUNING_FOD2_CURR_L	Lower part of a metric based on the current measurement and used in the FOD algorithm during power transfer phase.
HOST_IF_TUNING_FOD2_VOLT_H	Higher part of a metric based on the voltage measurement and used in the FOD algorithm during power transfer phase.
HOST_IF_TUNING_FOD2_VOLT_L	Lower part of a metric based on the voltage measurement and used in the Foreign Object Detection algorithm during power transfer phase.
HOST_IF_TUNING_FOD2_METRIC_H	Higher part of a computed metric used in the FOD algorithm during power transfer phase.
HOST_IF_TUNING_FOD2_METRIC_L	Lower part of a computed metric used in the FOD algorithm during power transfer phase.
HOST_IF_TUNING_FOD2_THR_H	Higher part of a threshold used in the FOD algorithm during power transfer phase.
HOST_IF_TUNING_FOD2_THR_L	Lower part of a threshold used in the FOD algorithm during power transfer phase.
HOST_IF_MSG_DECODED	Rx received message counter. Counter initialized to 0xFF and decremented each time a message coming from the RX is correctly decoded. When the GUI reads this register, the counter is re-initialized to 0xFF.
HOST_IF_RX_POWER_MW	Received power from the Qi receiver (in mW divided by 64)
HOST_IF_FEATURE_DISABLED	Reserved
HOST_IF_CHARGE_STATUS	Charge status indicated by the receiver though a **Charge Status** message (refer to the Qi standard). Default value is 0xFF.
HOST_IF_CURRENT_OFFSET_H	Higher part of the current offset value after ADC current auto-calibration.
HOST_IF_CURRENT_OFFSET_L	Lower part of the current offset value after ADC current auto-calibration.
HOST_IF_ADC_VOUT_FB_OFFSET_H	Reserved
HOST_IF_ADC_VOUT_FB_OFFSET_L	Reserved
HOST_IF_ADC_VIN_H	Higher part of the ADC Vin measurement.
HOST_IF_ADC_VIN_L	Lower part of the ADC Vin measurement.
HOST_IF_ADC_TEMPERATURE_H	Higher part of the ADC temperature measurement.
HOST_IF_ADC_TEMPERATURE_L	Lower part of the ADC temperature measurement.
HOST_IF_VOLTAGE_OFFSET_H	Higher part of the voltage offset value after ADC auto-calibration.
HOST_IF_VOLTAGE_OFFSET_L	Lower part of the voltage offset value after ADC auto-calibration.
HOST_IF_DEMOD_VOLTA_CMP_THR	Threshold above which a signal is detected by comparator A used in the voltage demodulation. This value is auto-calibrated at switch-on.
HOST_IF_DEMOD_VOLTB_CMP_THR	Threshold above which a signal is detected by comparator B used in the voltage demodulation. This value is auto-calibrated at switch-on.
HOST_IF_DEMOD_CURRENT_CMP_THR	Threshold above which a signal is detected by the comparator used in the current demodulation. This value is auto-calibrated at switch-on.
HOST_IF_COUNT_DEBUG	Reserved
HOST_IF_RX_VERSION	Indicates the receiver Qi version: • 0 if Qi v1.0 • 1 if Qi v1.1 • 2 if Qi v1.2

Register	Description
HOST_IF_CURRENT_PRES_DET_DC_OFFSET	Current presence detection DC offset values, used to tune the parameter pres_det_dc_offset_mean and can be observed via the FOD GUI when pressing the button **Monitor presence detection**: the value is named *DC canceller value*.
HOST_IF_PROPRIETARY_MSG	It allows reading received proprietary message FIFO

1. See Section 1.3 Register description

1.3 Register description

Table 3. HOST_IF_STATUS register possible values

HOST_IF_STATUS values	Description	Value
STATUS_OBJECT_DETECTED	Qi receiver detected	0x1
STATUS_QI_POWER	Power transfer on-going	0x2
STATUS_QI_DETECTED	Qi identification on-going	0x4
STATUS_QI_ACTIVE_COIL_INDEX	Index (from 0 to n) of the current active coil	0xF0

Table 4. HOST_IF_INT_STATUS register possible values

HOST_IF_INT_STATUS values	Description	Value
INT_SRC_QI_ID_RECEIVED	Reserved to the LIB	0x01
INT_SRC_REFILL	Reserved to the LIB	0x02
INT_SRC_EMPTY	Reserved to the LIB	0x04
INT_SRC_TX_DATA_TIMEOUT	Reserved to the LIB	0x08
INT_SRC_LOG_MSG	Set by the LIB when status is changed in HOST_IF_STATUS register.(1)	0x10
INT_SRC_LOG_ERROR	Set by the LIB when a new error occurred on WBC side (e.g. error in decoding packet or error in the Finite State Machine).(2)	0x20

1. *This is set by the LIB only if bit0 of HOST_IF_INT_VERBOSITY has been reset.*
2. *This is set by the LIB only if bit1 of HOST_IF_INT_VERBOSITY has been reset.*

Table 5. HOST_IF_CONTROL register possible values

HOST_IF_CONTROL values	Description	Value
CONTROL_TX_DATA_MODE	Reserved to the LIB	0x01
CONTROL_LOG	Reserved to the LIB	0x02
CONTROL_LOG_I2C	Sets to activate UART protocol.	0x04
CONTROL_QI_FSM_START	Starts the Qi FSM	0x08
CONTROL_QI_FSM_STOP	Stops the Qi FSM	0x10
CONTROL_TUNING_MODE	Switches the Lib to tuning mode	0x20

Table 6. HOST_IF_LOG_MSG register possible values

HOST_IF_LOG_MSG values	Description	Value
NO_MSG	No change	0x00
STOP_MSG	FSM status changed to Stop phase	0x01
SELECTION_MSG	FSM status changed to Selection phase	0x02
PING_MSG	FSM status changed to Ping phase	0x03
IDENT_AND_CONFIG_MSG	FSM status changed to Identification and configuration phase	0x04
TX_DATA_STATE_MSG	Reserved to the LIB	0x05
POWER_TRANSFER_MSG	FSM status changed to Power Transfer phase	0x06

Table 7. HOST_IF_LOG_ERROR register possible values

HOST_IF_LOG_ERROR values	Description	Value
NO_ERROR	No error	0x00
AUTOCAL_TEST_DONE	Reserved	0x01
PING_TIMEOUT	Occurs when the digital ping phase is not completed on time (1).	0x02
RX_REMOVED	Occurs when the Qi Finite State Machine detects that the Qi Rx has been removed in a specific case as after a “sticky error”.	0x03
BAD_PACKET_SEQUENCE	Occurs when the Qi received messages do not come in the order specified in the Qi standard.	0x04
TOO_MANY_PROPRIETARY_PACKETS	Occurs when more than 7 optional configuration packets are received during the Identification and Configuration phase (1).	0x05
POWER_CTRL_HOLD_OFF_ERROR	Occurs when the Power Control Hold-off Time parameter received in the Power Control Hold-Off packet is not inside the range [5, 205] ms (1).	0x06
PACKET_TIMEOUT	Occurs during the Identification phase when the Power Transmitter does not detect the start bit of the header byte of a next Packet in the sequence within the time interval (after the end of the directly preceding Packet in the sequence (3).	0x07
POWER_TRANSFER_CTRL_ERROR	Occurs in case the received power (obtained from the RECEIVED_POWER packet) is above the allowed power.	0x08
CONTROL_ERROR_TIMEOUT	Occurs in Power Transfer state when the control error packets are not received in time as described in the Qi standard.	0x09
RECTIFIED_POWER_TIMEOUT	Occurs in Power Transfer state when the received power packets are not received in time as described in the Qi standard.	0x0A
VBUS_DROP_DOWN	Occurs when an undervoltage is detected and the power transmitter cannot provide the requested amount of power to the power receiver.	0x0B
OPTIONAL_PACKETS_MISMATCH	Occurs in identification and configuration phase when: • the number of optional configuration packets, received by the power transmitter, is equal to the value contained in the Count field of the configuration packet • after the [Ext] Identification packet the received packet is not a configuration packet, not a power control Hold Off packet nor a proprietary packet (1)	0x0C
CHECKSUM_ERROR	Occurs in the Identification and Configuration phase when the power transmitter does not receive a packet correctly.	0x0D

HOST_IF_LOG_ERROR values	Description	Value
EPT_RECEIVED	Occurs when a “End Power Transfer” packet has been received with a code different from “Reconfigure”, “Charge complete”, “EPT over voltage”, “EPT over current”, “EPT over temperature”, “EPT battery failure”, “EPT no response”.	0x0E
EPT_RX_OVER_CURRENT	Occurs when an “End Power Transfer” Packet has been received with a code equal to “Over Current”.	0x0F
COIL_OVER_TEMPERATURE	Occurs when an “End Power Transfer” packet has been received with a code equal to “Over Temperature”.	0x10
TRANSCEIVER_OVERTEMP	Occurs when an overtemperature defect is detected on the transmitter side (4).	0x11
EPT_CHARGE_COMPLETE	Occurs when an “End Power Transfer” packet has been received with a code equal to “Charge Complete”.	0x12
EPT_OVER_VOLTAGE	Occurs when an “End Power Transfer” packet has been received with a code equal to “Over Voltage”.	0x13
EPT_BATTERY_FAILURE	Occurs when an “End Power Transfer” packet has been received with a code equal to “Battery Failure”.	0x14
EPT_RX_PACKET_ERROR	Occurs when an error is detected during the oacket decoding.	0x15
EPT_RECONFIGURE	Occurs when an “End Power Transfer” packet has been received with a code equal to “Reconfigure”.	0x16
EPT_NO_RESPONSE	Occurs when an “End Power Transfer” packet has been received with a code equal to “no response”.	0x17
FOREIGN_OBJECT_DETECTED	Occurs when a foreign object has been detected.	0x18
CUST_ERROR	Occurs when an error comes from the customer code (4).	0x19
TX_OVER_CURRENT	Occurs when the transmitter cannot support the current required by the receiver (4).	0x1A
INTERNAL_WARNING	Reserved	0x1B
AUTOCAL_TEST_FAILED	Reserved	0x1C
RESERVED_ERROR	Reserved	0x1D

1. *Refer to Qi standard*
2. *A “sticky error” corresponds to 3 consecutive occurrences of the following errors: EPT_NO_RESPONSE, EPT_RECONFIGURE, EPT_CHARGE_COMPLETE, VBUS_DROP_DOWN or FOREIGN_OBJECT_DETECTED.*
3. *Refer to timing tnext in the Qi standard*
4. *This notification is internal to the transmitter, it is not part of Qi specification.*

2 UART host interface

2.1 UART communication

The UART configuration is:

- **Rate**: 57600 bauds
- **Data**: 8 bits
- **Parity**: none
- **Stop**: 1 bit

The UART communication is basically composed of four messages (read, write, interrupts and store) sent by/to the customer host controller through UART. Their body is built as:

- **Byte0**: header
- **Byte1**: address
- **Byte2**: data (optional)

Byte 2 is optional depending of the type of request, as shown it the table below.

Table 8. Description of the possible values for UART communication message

Type	Description	Format	Direction
Read	Allows reading the content of the host interface register.	Read message is composed of 2 consecutive bytes sent through UART as follows: • **Byte0**: “r” (=0x72) • **Byte1**: Host _if reg address	From host to STWBC
		STWBC sends back the corresponding data as **Byte0**: Data read	From STWBC to host
Write	Allows writing data inside the host interface register.	Write message is composed of 3 consecutive bytes sent through UART as follows: • **Byte0**: “w”(=0x77) • **Byte1**: Host _if reg address • **Byte2**: data	From host to STWBC
Interrupt	Allows sending an interrupt to the host (for example, to inform the host new data are available).	Interrupt message is composed of 1 byte sent through UART as **Byte0**: “i” (=0x69) At the reception of the interrupt command, the host reads the int status register to get interrupt source	From STWBC to host
Store	Allows copying RAM parameters into EEPROM parameters. This is used for tuning purpose only.	Store message is composed of 1 byte sent through UART as **Byte0**: “s” (=0x73)	From host to STWBC

Note: When using the UART, no low power mode is possible. To go back to low power mode (when UART is no more needed but still connected) the host has to send a “break” character.

2.2 Configurable parameters

The customer can tune some parameters that are used by the FW. Here is the list and the description of these parameters. The parameters are stored in EEPROM and copied into RAM at FW initialization.

The parameters can be configured by overwriting (via the GUI) the defined default values.

Table 9. List of configurable parameters

Parameter name	Description
hw_version	Version of the hardware (1)
Hw_sub_version	Sub-version of the hardware (1)
eeprom_version	Version of the EEPROM (1)
fw_version	Version of the firmware (1)
brg_freq_analog_ping	Specific power signal operational frequency used during object detection (analog ping) phase.
brg_freq_digital_ping	Specific power signal operational frequency used during Digital Ping state.
brg_freq_max	Maximum power signal frequency allowed by the transmitter.
brg_freq_min	Minimum power signal frequency allowed by the transmitter.
brg_direct_drive	Variable to indicate if the hardware uses direct drive bridge topology. This variable must be set to DIRECT_DRIVE or NO_DIRECT_DRIVE.
brg_bridge_topology	Variable to indicate if the HW is full or half bridge. This variable must be set to FULL_BRIDGE_ENABLE or HALF_BRIDGE_ENABLE.
pres_det_thr	Threshold above which an object is considered as detected (used during analog ping).
fod1_thr	Threshold used in the first part of the FOD algorithm to determine if a foreign object has been detected. If this parameter is set to 0, it disables the FOD feature which is used before power transfer.
sys_over_current_thr	Threshold on the ADC coil current measurement above which the TX_OVER_CURRENT error occurs.
temp_high_meas_thr	If, during coil temperature check, the average of several ADC measurements is below temp_high_meas_thr, an overtemperature error is assumed.
temp_low_meas_thr	After an overtemperature error, if the ADC measurement is above temp_low_meas_thr, the overtemperature issue is considered as solved.
sys_red_led_mode	Red LED mode management: • Normal mode: LED blinking for all errors • Demo mode: LED blinking for FOD error only.
qi_version	Version of Qi specification: • 0=v1.1.2 • 1=v1.2
pres_det_dc_offset_mean	Mean value of the raw presence detection metric for DC offset compensation.
force_high_power	Parameter to force CPU high power mode (No HALT, NO WFI state), to avoid troubles in debugging in the IAR environment: • force_high_power = 1→ Force high power mode • force_high_power = 0→ Restore old power mode
sys_over_current_thr	Threshold on the ADC coil current measurement above which the TX_OVER_CURRENT error occurs.
pid_smoothing	Allows tuning the power regulation convergence speed. The more this parameter is set the slower is the regulation loop.
half_period_comma	This parameter is not used on this platform.
checksum	Checksum of the EEPROM values.

1. *Read-only parameter.*

3 Parameter tuning GUI

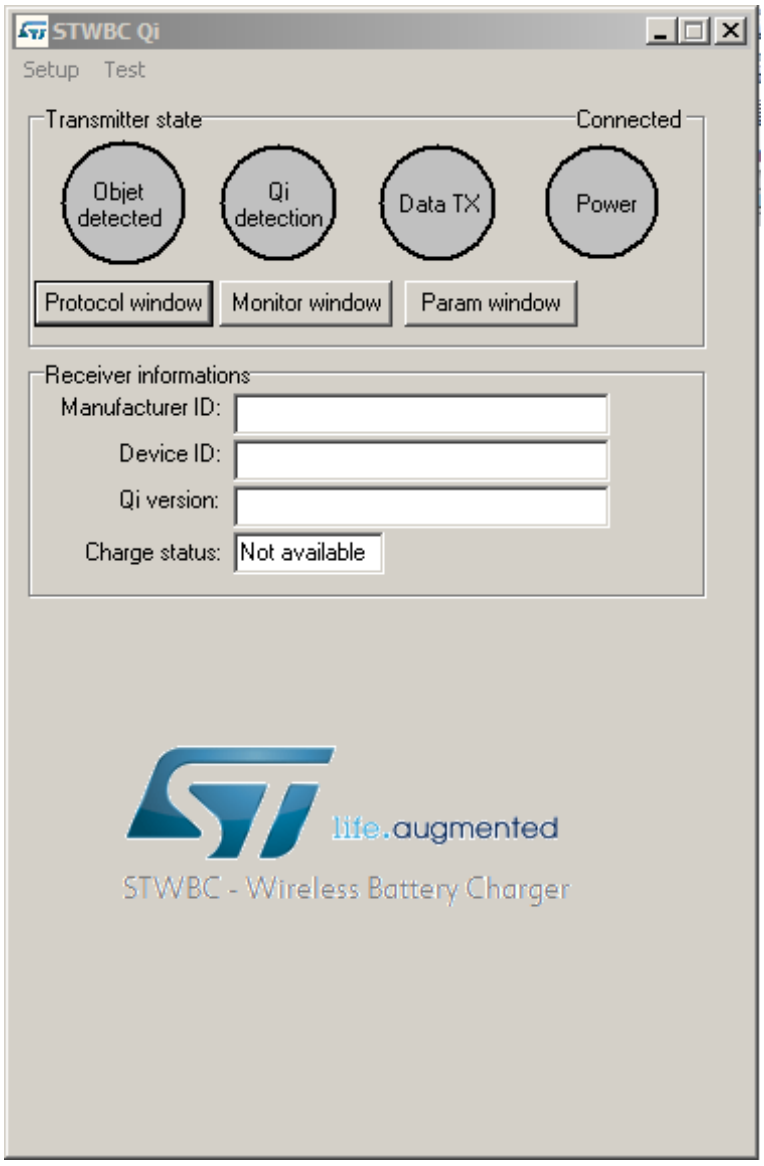
The parameter tuning GUI tool (STSW-STWBCGUI) allows accessing registers used by the firmware.
You can modify the default parameters and push the new values into EEPROM.
The list of available registers is given directly in the GUI.

3.1 Launching the GUI

To launch the STSW-STWBCGUI:

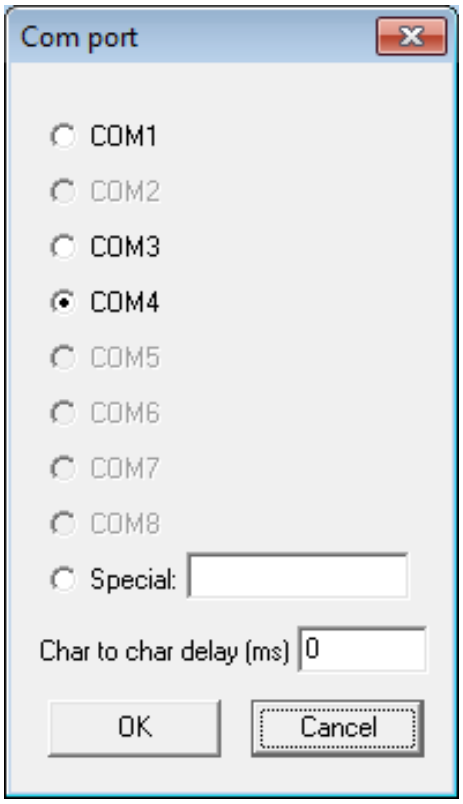
Step 1. Switch the board on
Step 2. Plug the UART jack connector
Step 3. Launch the executable program

Figure 3. STSW-STWBCGUI main panel



Step 4. Select the UART COM port in the Setup→COM menu to connect the board.

Figure 4. **STSW-STWBCGUI COM setup panel**



3.2 Modifying the registers

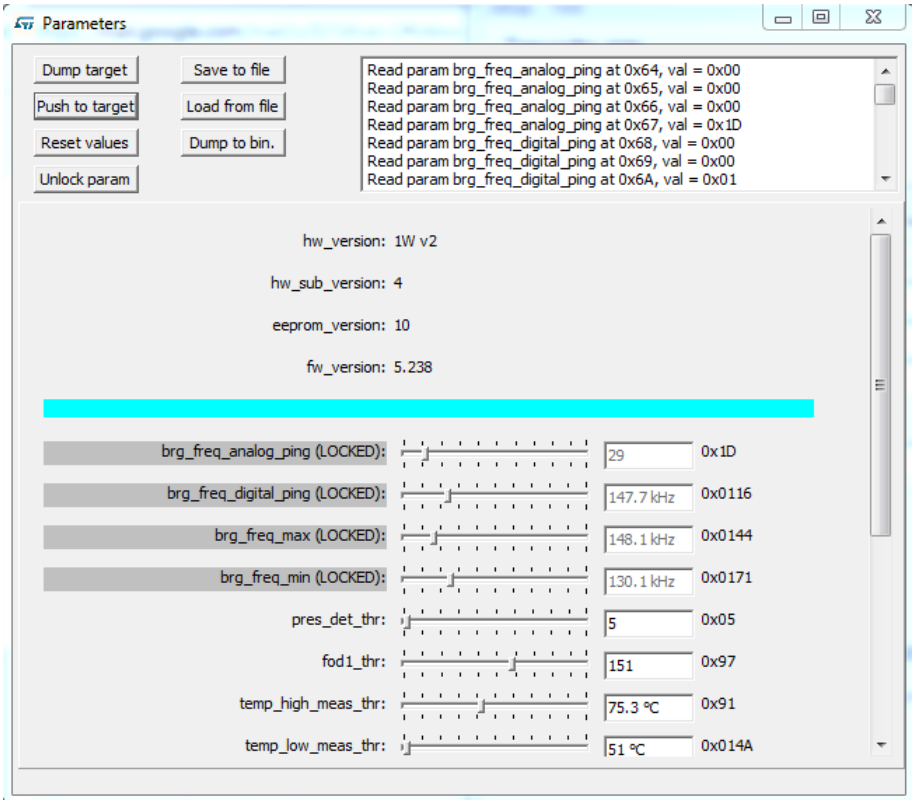
Step 1. Click on the **Param window** in the STSW-STWBCGUI main panel.

When you open the panel, all parameters are transferred from the board to the GUI. The parameters free to be modified are highlighted in green, whereas the more critical ones are highlighted in grey and tagged as "LOCKED".

Step 2. To update the grey parameters, press the **Unlock param** button.

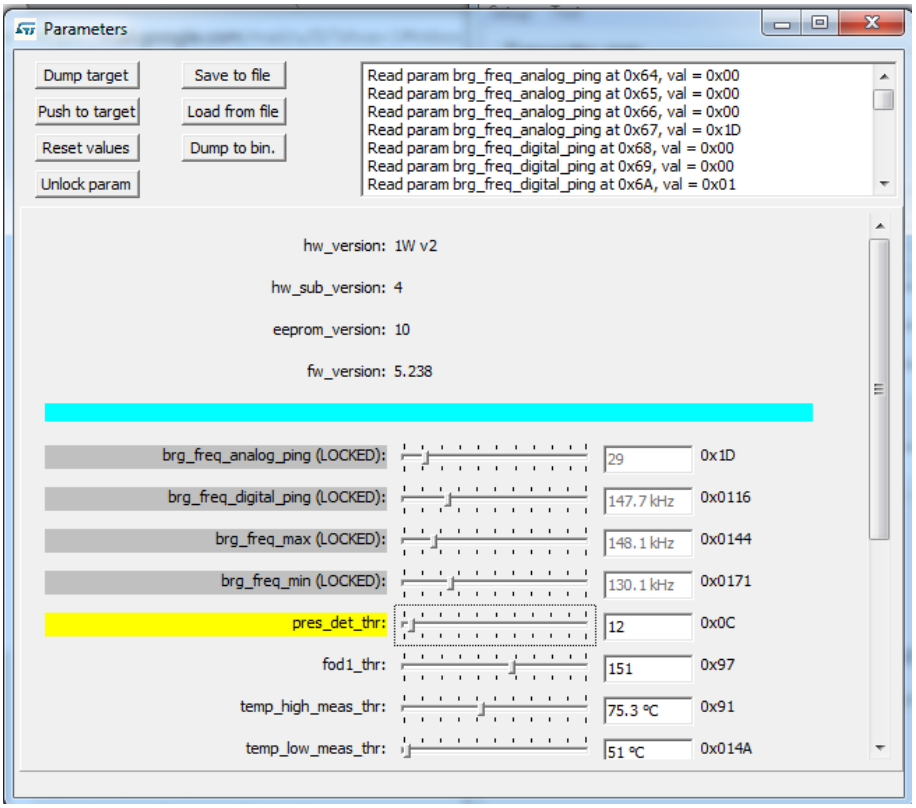
Note: The parameters that remain grey cannot be modified.

Figure 5. **STSW-STWBCGUI parameter tuning window**



Step 3. Press the value you want to update and press enter on your keyboard.
The values modified are highlighted in yellow.

Figure 6. **STSW-STWBCGUI parameter update**

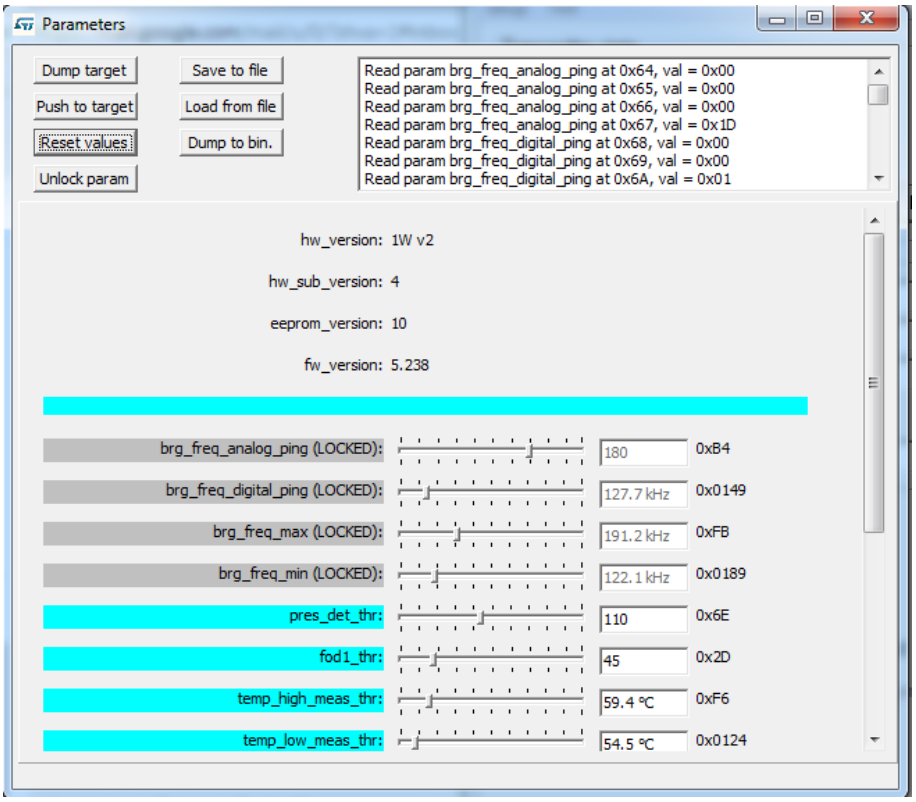


Step 4. Click on **Push to target** button to send updated parameter(s) to the board EEPROM parameter table.
All parameters are highlighted again in green.

3.3 Restore default values

Step 1. Click on the **Reset values** button.
The reset paramaters are highlighted in light blue.

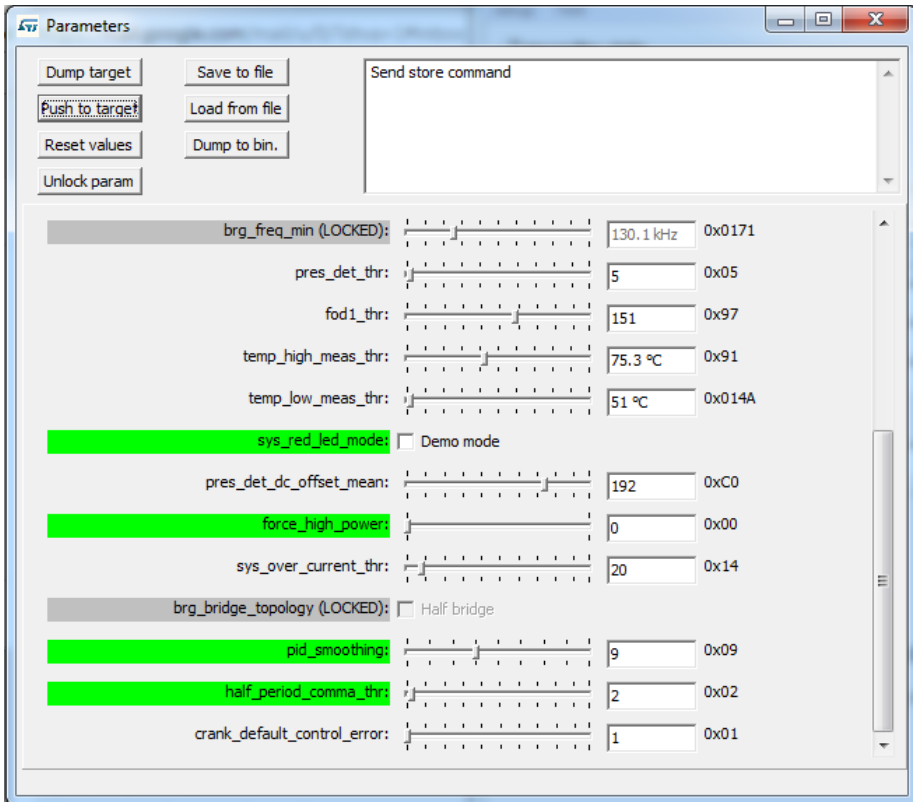
Figure 7. **STSW-STWBCGUI parameter tuning window: restore default values**



Step 2. Click on **Push to target** to send updated parameter to the board EEPROM parameter table. All parameters are highlighted again in green.

Step 3. Click on the parameter and then **Reset** to restore the default value of a single parameter.

Figure 8. **STSW-STWBCGUI parameter tuning window: restore default value of a single parameter**



3.4 Save and load parameter values

Step 1. Click on **Save to file** to save all the parameter values in the GUI to a file.

Step 2. Click on **Dump to bin** to dump the parameters into a bin file.

Step 3. Click on **Load from file** to reload all the parameter values in the GUI from a saved parameter file.

3.5 Status LEDs

The LEDs status gives the state of the charge:

- **At startup**
  - Red short blinking: when the auto-calibration of the board is on-going. You have to wait for the LED to switch off before putting a receiver on the surface.
  - Red and Green blinking once: a watchdog reset occurred.
- **In steady state**
  - Green blinking: power transfer in progress
  - Green steady state: the charge is complete
  - Red blinking: an error has been detected. It includes bad end of charge like battery fault, overvoltage, overcurrent, etc.
  - Red steady state: the transmitter remains stuck until the receiver is removed, as mentioned in the Qi standard (power transfer stopped three times in a row due to the amount of power not provided to the receiver, End Power Transfer due to Reconfigure, No Response code)
  - Red and Green Steady state: Firmware/STWBC chip mismatch

Revision history

Table 10. **Document revision history**

Date	Version	Changes
27-Feb-2018	1	Initial release.
18-Jun-2018	2	Updated Table 9. List of configurable parameters, Figure 5. STSW-STWBCGUI parameter tuning window, Figure 6. STSW-STWBCGUI parameter update, Figure 7. STSW-STWBCGUI parameter tuning window: restore default values and Figure 8. STSW-STWBCGUI parameter tuning window: restore default value of a single parameter.

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