EVLKST8500GH868, EVLKST8500GH915: Getting started with the ST8500 Hybrid PLC&RF connectivity development kit

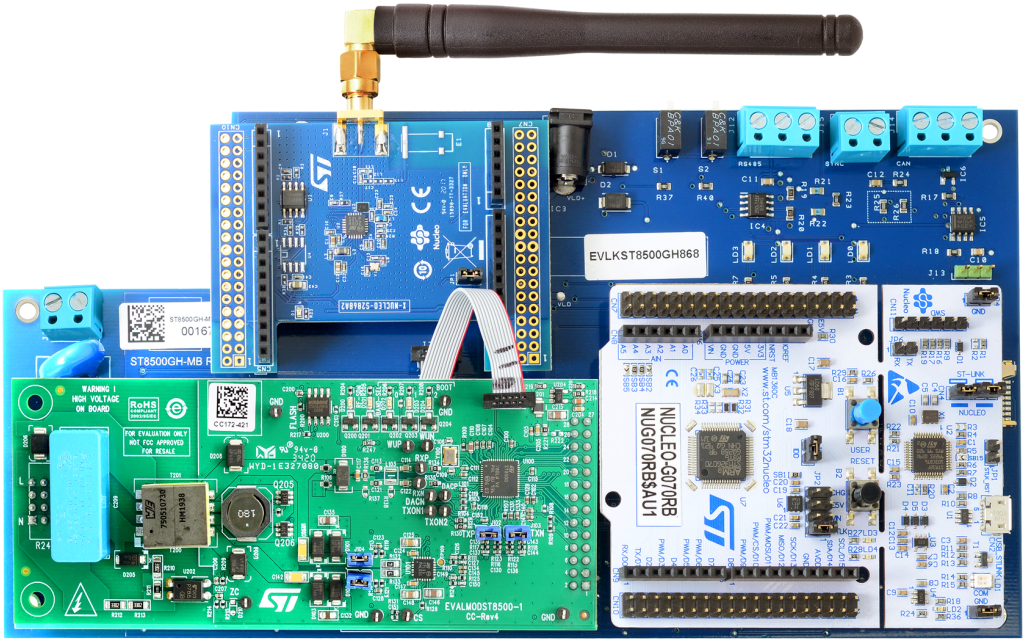
Introduction

This user manual explains the EVLKST8500GH868 and EVLKST8500GH915 hardware and software installation, and it details the evaluation and development possibilities offered by the kit. In particular it contains:

- General information on the EVLKST8500GH868 and EVLKST8500GH915 HW package
- Overview of the hardware configurations
- Short guide to the FW upgrade of the kit.

This user manual does not explain the functionalities of the various PLC protocols running on the ST8500. Detailed information can be found in protocol specific documentation, available within the Software packages, separately delivered under Software License Agreement by contacting your local ST sales office.

Figure 1. EVLKST8500GH868 picture



1 Safety precautions

The development kit must be used only by expert technicians.

The kit is intended for use on extra low voltage (ELV): <50 V AC, <75 V DC.

The kit is designed for evaluation only and not for resale.

Warning:

STMicroelectronics assumes no responsibility for any consequences that may result from the improper use of this tool.

2 Getting started

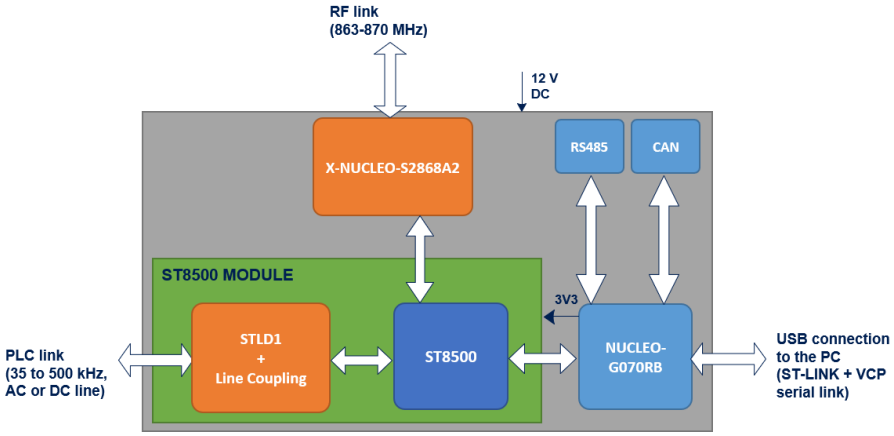
2.1 Included with the EVLKST8500GH868

The EVLKST8500GH868 package contains:

- One EVLKST8500GH868 kit, based on 4 hardware boards :
  - EVALMODST8500-1: full PLC modem based on ST8500 and STLD1
  - X-NUCLEO-S2868A2: Sub-1 GHz 868 MHz RF expansion board based on S2-LP radio
  - NUCLEO-G070RB: STM32 Nucleo-64 development board with STM32G070RB MCU
  - ST8500GH-MB: connectivity base board including RS485, CAN, SD card and SPI FLASH options for STM32 application development
- One Micro-USB cable to connect the evaluation kit to PC
- One AC/DC universal adapter to provide 12 V - 1 A DC supply
- One bag with 4.7 µH coil for best performance in case of usage for PLC CEN-B band.

Figure 2 depicts the block diagram of the EVLKST8500GH868.

Figure 2. EVLKST8500GH868 block diagram



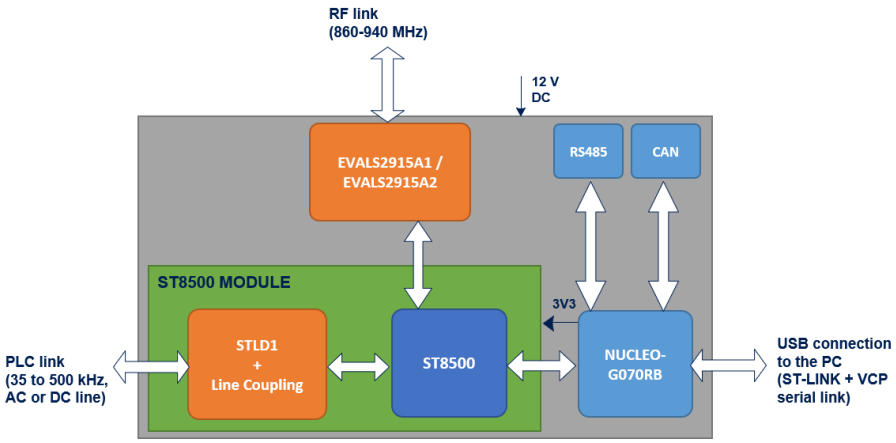
2.2 Included with the EVLKST8500GH915

The EVLKST8500GH915 package contains:

- One EVLKST8500GH915 kit, based on 4 hardware boards :
  - EVALMODST8500-1: full PLC modem based on ST8500 and STLD1
  - EVALS2915A1 / EVALS2915A2: Sub-1 GHz 915 MHz RF expansion board based on S2-LP radio
  - NUCLEO-G070RB: STM32 Nucleo-64 development board with STM32G070RB MCU
  - ST8500GH-MB: connectivity base board including RS485, CAN, SD card and SPI FLASH options for STM32 application development
- One Micro-USB cable to connect the evaluation kit to PC
- One AC/DC universal adapter to provide 12 V - 1 A DC supply
- One bag with 4.7 µH coil for best performance in case of usage for PLC CEN-B band.

Figure 3 depicts the block diagram of the EVLKST8500GH915.

Figure 3. EVLKST8500GH915 block diagram



2.3 Software packages

The ST8500 Hybrid PLC&RF connectivity development kit is fully programmable, including both the ST8500 modem and the STM32G070RB microcontroller. Please visit the EVLKST8500GH868 / EVLKST8500GH915 page on www.st.com or contact an ST sales representative to obtain the latest available SW packages.

The kit is delivered with a pre-programmed STM32 firmware implementing a UART pass-through for direct ST8500 host interface access from a PC and the G3-PLC hybrid PLC&RF library running on the ST8500 modem.

3 Hardware description and configuration

For up-to-date documentation including schematics, BOM and PCB layout please visit the dedicated page on www.st.com.

All the documentation related to NUCLEO-G070RB and X-NUCLEO-S2868A2 is available in the dedicated web pages on www.st.com.

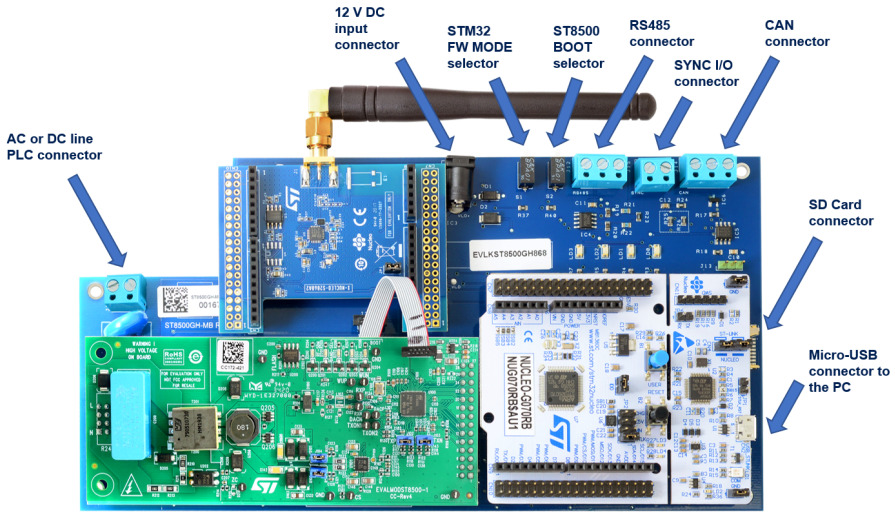
3.1 External connectors and switches

The kit includes:

- A DC jack connector to supply the kit with a 12 V, 1 A DC adapter (provided with the kit)
- A two-line PLC connector for wiring the kit to an AC or DC bus, or even directly to another ST8500 board for lab communication tests
- Two DIP switches to select STM32 FW mode and ST8500 BOOT mode
  - S1 selects the STM32 FW mode:
    - Down (default) = UART pass-through mode (for ST8500 host interface direct access from the PC)
    - Up = STM32 normal mode
  - S2 selects the ST8500 BOOT mode:
    - Down (default) = ST8500 boots from SPI FLASH on the ST8500 module
    - Up = ST8500 boots from host interface
- Connectivity to the PC via the ST-LINK integrated into the NUCLEO-G070RB, for FW development and communication tests
- Several features that can be used for STM32 application development:
  - RS485 and CAN connectors to develop industrial communication connectivity applications (*NOTE: CAN interface not available on NUCLEO-G070RB – if needed, it can be replaced by a different NUCLEO board by the user*)
  - SD card and SPI FLASH to develop data storage solutions for any application
  - A SYNC I/O connector providing access to an STM32 GPIO or, alternatively, to an ST8500 pin for test purposes

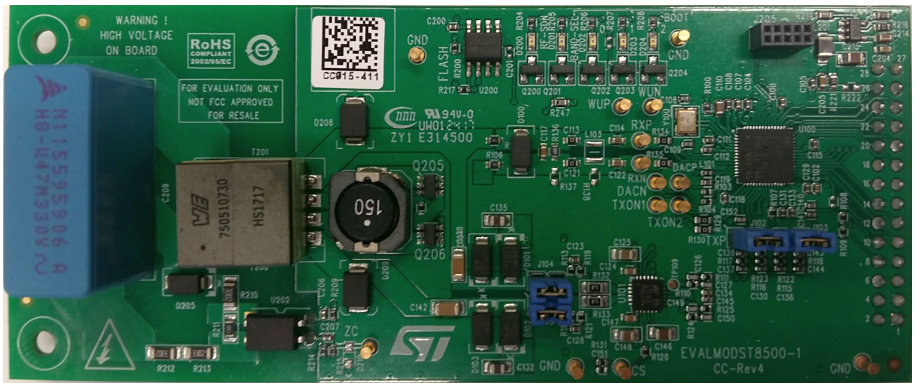
Figure 4 shows the position of the EVLKST8500GH868 connectors and switches. The same holds valid for the EVLKST8500GH915.

Figure 4. EVLKST8500GH868 connectors and switches



3.2 ST8500 module

Figure 5. **EVALMODST8500-1 image**



The EVALMODST8500-1 is connected to the base board through 2 connectors:

- J201 line connector to interface the PLC to the AC or DC line
- J200 digital and supply connector to interface the module to the STM32 microcontroller.

The basic interface between the STM32 host controller and the ST8500 includes the following lines:

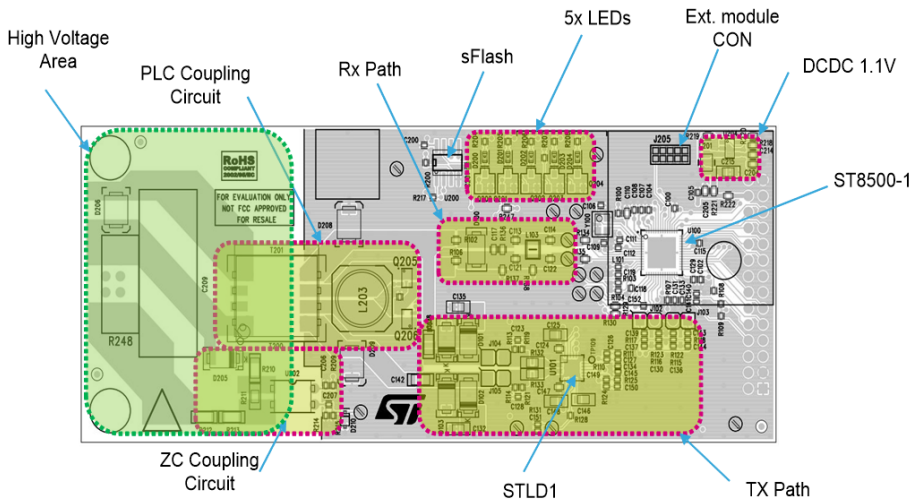
- UART RX/TX as ST8500 host interface
- RESETn signal (active low)
- BOOT1 to control the ST8500 boot mode
- LPMODEn to control the ST8500 low power mode (active low)
- UART Trace TX to output firmware binary traces for debug.

Two DC voltages are provided to the ST8500 module:

- 12 V to supply the STLD1 line driver
- 3.3 V to supply the ST8500 section (including 1.1 V on-board DCDC input and 2.5 V integrated LDO input).

Figure 6 indicates the main sections on the ST8500 module.

Figure 6. **EVALMODST8500-1 overview**



3.3 Interconnection details

3.3.1 NUCLEO-G070RB interconnections

Table 1. NUCLEO-G070RB – ST8500 interconnections

	Function	NUCLEO-G070RB				EVALMODST8500-1		
		Connector name	Connector pin	STM32 pin	Signal	Connector name	Connector pin	Signal
ST8500 interface	PLC_Host_TX	CN10	21	PA9	USART1_TX	JP200	14	GPIO00_4
	PLC_Host_RX	CN10	33	PA10	USART1_RX	JP200	11	GPIO00_5
	PLC_DBG_TX	CN10	35	PC4	USART3_TX	JP200	18	GPIO01_4
	PLC_DBG_RX	CN10	37	PC5	USART3_RX	JP200	15	GPIO01_5
	ST8500_RSTn	CN7	38	PB12	GPIO	JP200	10	RESETn
	ST8500_LPMODEn	CN7	36	PB11	GPIO	JP200	8	LPMODEn
	ST8500_Boot0	CN7	34	PB1	GPIO	JP200	25	BOOT0
	ST8500_Boot1	CN10	24	PB2	GPIO	JP200	23	BOOT1
	ST8500_Boot2	CN7	31	PF1	GPIO	JP200	24	BOOT2
	Reserved1	CN7	28	PA0	GPIO	JP200	12	GPIO00_6
	Reserved2	CN7	30	PA1	GPIO	JP200	9	GPIO00_7

Table 2. NUCLEO-G070RB – other interconnections

	Function	NUCLEO-G070RB			
		Connector name	Connector pin	STM32 pin	Signal
SD Card connector (J11)	SDC_MOSI	CN10	26	PB15	SPI2_MOSI
	SDC_MISO	CN10	25	PB14	SPI2_MISO
	SDC_SCK	CN10	30	PB13	SPI2_SCK
	SDC_CSn	CN10	16	PC1	GPIO
	SDC_Detect	CN10	18	PC0	GPIO
SPI Flash (IC1)	eFlash_MOSI	CN10	15	PA7	SPI1_MOSI
	eFlash_MISO	CN10	13	PA6	SPI1_MISO
	eFlash_SCK	CN10	11	PA5	SPI1_SCK
	eFlash_CSn	CN7	32	PA4	GPIO
RS-485 connector (J12)	RS485_TX	CN7	1	PC10	UART4_TX
	RS485_RX	CN7	2	PC11	UART4_RX
	RS485_DE	CN7	17	PA15	UART4_DE
CAN connector (J14)	CAN_TX	CN10	12	PA12	GPIO
	CAN_RX	CN10	14	PA11	GPIO
LEDs	LED0	CN10	4	PC6	GPIO
	LED1	CN10	2	PC8	GPIO
	LED2	CN10	1	PC9	GPIO
	LED3	CN10	23	PA8	GPIO
STM32 Mode switch (S1)	STM32_FWMODE	CN7	37	PC3	GPIO

	Function	NUCLEO-G070RB			
		Connector name	Connector pin	STM32 pin	Signal
ST8500 Boot Mode switch (S2)	ST8500_FWMode	CN7	35	PC2	GPIO
SYNC connector (J15)	STM32_SYNC	CN10	19	PC7	TIM3_CH2

3.3.2 X-NUCLEO-S2868A2 interconnections

Table 3. X-NUCLEO-S2868A2 interconnections

	X-NUCLEO-S2868A2			EVALMODST8500-1			Function
	Connector name	Connector pin	Signal	Connector name	Connector pin	Signal	
S2-LP interface	J3	4	SCLK	J205	5	GPIO00_0	SPI2_CLK
	J3	8	SDN	J205	3	GPIO00_7	S2-LP_SDN
	J5	4	SDI	J205	7	GPIO00_1	SPI2_MOSI
	J5	5	SDO	J205	10	GPIO00_3	SPI2_MISO
	J6	1	GPIO0	J205	1	GPIO01_6	S2-LP_IRQ
	J6	2	CSn	J205	9	GPIO00_2	SPI2_CS

3.3.3 EVALS2915A1/A2 interconnections

Table 4. EVALS2915A1/A2 interconnections

	EVALS2915A1/A2			EVALMODST8500-1			Function
	Connector name	Connector pin	Signal	Connector name	Connector pin	Signal	
S2-LP interface	J3	4	SCLK	J205	5	GPIO00_0	SPI2_CLK
	J3	8	SDN	J205-3	3	GPIO00_7	S2-LP_SDN
	J5	4	SDI	J205	7	GPIO00_1	SPI2_MOSI
	J5	5	SDO	J205	10	GPIO00_3	SPI2_MISO
	J6	2	CSn	J205	9	GPIO00_2	SPI2_CS
	J6	6	GPIO3	J205	1	GPIO01_6	S2-LP_IRQ

4 Firmware upgrade

4.1 How to upgrade the STM32 Firmware

The kit supports STM32 FW upgrade through the ST-LINK USB by using the STM32CubeProgrammer software available on www.st.com (STM32CubeProg).

The ST-LINK USB connection can be used for FW debug and development while at the same time acting as Virtual COM port (VCP). The related driver is available on www.st.com (STSW-LINK009).

4.2 How to upgrade the ST8500 firmware

Please refer to the documentation and tools that come with the latest ST8500 software package available from the EVLKST8500GH868 / EVLKST8500GH915 page on www.st.com or through an ST sales representative.

5 Formal notices required by the U.S. Federal Communications Commission ("FCC")

FCC NOTICE: This kit is designed to allow:

1. Product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product.
2. Software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accepts harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of the FCC Rules.

The kit is designed for evaluation only and not for resale.

5.1 Antenna requirements

Since the kit is destined for professional users, a standard connector has been used for the antenna.

The kit must be used with the antenna already provided in the package.

It can be replaced only by an identical one: LPRS ANT-900MS / ANT-900MR 868-915MHz Flexible ¼ Wave Whip Antenna

Revision history

Table 5. **Document revision history**

Date	Version	Changes
15-Feb-2021	1	Initial release.

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