



WB-CARRIER-BOARD 1.1 is an evaluation and development board for WHITE-BEET 1.1 modules. It contains WHITE-BEET 1.1 module populated on the carrier board and protected with a plastic cover.

**Available for purchase from CODICO GmbH*

WB-CARRIER-BOARD 1.1 can be used for both, the vehicle side (EV) and the charging station side (EVSE), but particular application depends on particular WHITE-BEET 1.1 module installed on the carrier board.

WB-CARRIER-BOARD 1.1 contains the WHITE-BEET 1.1 module with an STM32F745 microcontroller which runs the ISO15118 stack firmware.

The WB-CARRIER-BOARD 1.1 can be powered either by using USB-C cable or +5V DC input. The dimensions are 115 mm x 135 mm.

Main elements of WB-CARRIER-BOARD 1.1 are shown on the image below and described in the Table 1.

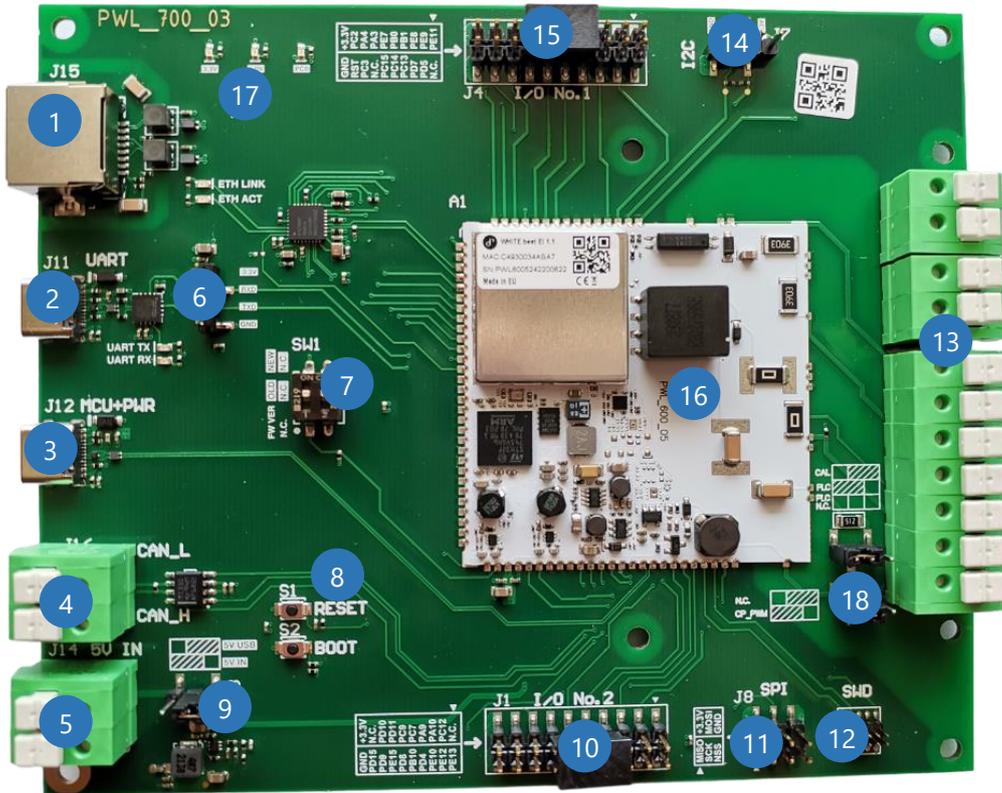


TABLE 1. WB-CARRIER-BOARD 1.1 MAIN ELEMENTS

Item number	Description
1	J15 Ethernet interface RJ45 connector
2	J11 USB-C connector for UART debugging console
3	J12 USB-C connector for +5V DC power supply
4	J16 CAN interface connector (not supported by WHITE-BEET 1.1 Firmware)
5	J14 Alternative +5V DC power supply connector
6	J10 4-pin UART debugging console header
7	SW1 Micro switch to select active QCA7005 firmware version
8	S1 RESET button and (S2) Boot button (required for software development)
9	J13 Jumper for +5V DC power supply source selection
10	J1 20-pin GPIOs header #2
11	J8 6-pin SPI interface header
12	J9 10-pin SWD interface header for programming and debugging
13	J19 Control Pilot / Protected Earth / Zero-cross input / Zero-cross digital input
14	J7 4-pin I2C interface header
15	J4 20-pin GPIOs header #1
16	WHITE-BEET 1.1 module (plastic cover not shown on the picture)
17	LEDs to indicate presence of +5V, +3.3V power and Heartbeat LED
18	J2 / J6 Jumper to select CP_PWM / CP_PLG / calibration mode

The WB-CARRIER-BOARD 1.1 can be powered either by using J12 (#3) USB-C port or connector J14 (#5) +5V DC power input. Jumper J13 (#9) is used to select power supply source.

TABLE 2. J13 JUMPER - POWER SUPPLY SOURCE SELECTION

J13 jumper position	Description
1-2	+5V DC input J14 is used for power supply
2-3	USB-C connector J12 is used for power supply

Ethernet connector J15 (#1) provides 10/100 Mbps Ethernet connection (based on KSZ8081R ETH PHY). Used as one of major communication interfaces to control WHITE-BEET 1.1 module software and FW updates. Ethernet PHY utilizes WHITE-BEET 1.1 pins 3, 4, 5, 6, 7, 8, 9, 10, 11, 13.

USB-C connector J11 (#2) could be used for debug output and control purpose. It is connected to FTDI FT230X UART-to-USB converter.

It is also possible to use the UART directly on 4-pin header (#6), utilizes WHITE-BEET 1.1 pins 75, 76.

USB-C connector J12 (#3) also has a connection to USB port of STM32F745, utilizes WHITE-BEET 1.1 pins 46, 47.

CAN interface is found on J16 (#4) and based on TCAN330D transceiver (utilizes WHITE-BEET 1.1 pins 40, 41, 42). CAN-Interface is not supported by WHITE-BEET 1.1 Firmware.

Micro switch SW1 (#7) is used to switch between QCA7005 firmware versions OLD (FW v1.1.0-02) and NEW (FW v3.0). Connected to WHITE-BEET 1.1 pin 32.

Button S1 (#8) is RESET button, it connected to WHITE-BEET 1.1 pin 31.

Button S2 has no use with existing software and connected to BOOT pin of SFM32F745 MCU (WHITE-BEET 1.1 pin 51).

Pin header J1 (#10) has connection to WHITE-BEET 1.1 modules shown in the Table 3.

TABLE 3. J1 HEADER PINS CONNECTION

J1 pin	WHITE-BEET 1.1 module pin	J1 pin	WHITE-BEET 1.1 module pin
1	55 (PP_IN)	2	21 (PE13)
3	54 (PC12)	4	22 (PE12)
5	50 (PA10)	6	23 (PE10)
7	49 (PA9)	8	37 (PD4 / SPI_RX_READY)
9	44 (PC7)	10	25 (PB10)
11	43 (PC9)	12	26 (PD8)
13	38 (PD11 / SPI_TX_PENDING)	14	27 (PE15)
15	29 (PD10)	16	28 (PD9)
17	N.C.	18	30 (PD15)
19	+3.3V	20	GND

Pin header J4 (#16) has connection to WHITE-BEET 1.1 modules shown in the Table 4.

TABLE 4. J4 HEADER PINS CONNECTION

J4 pin	WHITE-BEET 1.1 module pin	J4 pin	WHITE-BEET 1.1 module pin
1	20 (PE11 / HCI_GPIO20)	2	71 (ZC_DIGITAL)
3	19 (PE9 / HCI_GPIO21)	4	73 (PD5 / HCI_GPIO22)
5	18 (PE8)	6	74 (PD7 / HCI_GPIO23)
7	17 (PB1 / HCI_GPIO24)	8	79 (PC13 / HCI_GPIO25)
9	16 (PB0 / HCI_GPIO26)	10	80 (PC14)
11	15 (PE7)	12	81 (PC15)
13	14 (PA3 / HCI_GPIO27)	14	82 (PA5 / AIN_0)
15	84 (PA4 / IF_SELECT_1)	16	83 (PC3)
17	85 (PC2 / IF_SELECT_0)	18	31 (RESETN)
19	+3.3V	20	GND

Pin header J8 (#11), also marked as SPI, gives access to STM32F745 SPI bus (internal SPI2) and has pinout shown in the Table 5.

TABLE 5. J8 HEADER SPI BUS PINS

J8 pin	WHITE-BEET 1.1 module pin	J8 pin	WHITE-BEET 1.1 module pin
1	35 (MISO / PB14)	2	+3.3V
3	24 (PD3 / SPI_CLK)	4	36 (MOSI / PB15)
5	77 (RST or NSS / PB9)	6	GND

Pin header J9 (#12), also marked as SWD, provides access to Serial Wire Debug interface and could be used for programming STM32F745 and 32Mbit NOR flash on WHITE-BEET 1.1 module (e.g. using programmer ST-Link/V2). J9 pin header has 1.25 mm pitch unlike the other pin header on the board with 2.54 mm pitch. Pinouts is shown in the Table 6.

TABLE 6. J9 HEADER SWD PINS

J9 pin	Description	J8 pin	WHITE-BEET 1.1 module pin
1	+3.3V	2	52 (SWDIO)
3	GND	4	53 (SWCLK)
5	GND	6	N.C.
7	N.C.	8	N.C.
9	GND	10	31 (RESETN)

Connector J19 (**#13**) marked as CP and PE have to be connected to Control Pilot and Protected Earth lines and used for HomePlug AV/GreenPHY powerline communication in EV-charging applications (for WHITE-BEET-P 1.1 and WHITE-BEET-E 1.1 modules).

ZC_D and GND could be connected to a digital zero-cross detector input used for WHITE-BEET-E 1.1 modules.

TABLE 7. J19 HEADER PINS

J19 pin	WHITE-BEET 1.1 module pin	WB-CARRIER-BOARD-EI/EO	WB-CARRIER-BOARD-PI/PO
1	CP – Control Pilot	X	X
2	PE – Protected Earth	X	X
3	PP – Proximity Pilot	N.C.	X
4	N.C.	X	X
5	ZC_L – Zero Cross Detector AC Line Input	X	N.C.
6	N.C.	X	X
7	ZC_L – Zero Cross Detector AC Neutral Input	X	N.C.
8	GND	X	X
9	ZC_D – Zero Cross Detector Digital Input	X	N.C.
10	GND	X	X
11	N.C.	X	X

Pin header J7 (**#15**), also marked as I2C, provides access to I2C bus of STM32F745 and has pinout shown in the Table 8. Please note that SDA and SCL lines are pulled-up to +3.3V with 5.1k Ohm resistors on the carrier board.

TABLE 8. J7 HEADER I2C PINS

J7 pin	WHITE-BEET 1.1 module pin
1	+3.3V
2	78 (SCL / PB8)
3	72 (SDA / PB7)
4	GND

There are 3 LED populated on the carrier board (**#17**). They are marked as 3.3V (to indicate +3.3V DC presence), 5V (to indicate +5V DC presence) and PC0 (it is connected to pin 1 of WHITE-BEET 1.1 module and used for SW Heartbeat function).

WB-CARRIER 1.1 boards have 2 hardware options (dependent on WHITE-BEET 1.1 module configuration) and could be ordered using the part numbers in the Table 9.

TABLE 9. WB-CARRIER-BOARD 1.1 ORDERING OPTIONS

Part number	Description
WB-CARRIER-BOARD-EI 1.1 #308191	Carrier board contains WHITE-BEET-E 1.1 module with EVSE side e-mobility HW with ISO 15118 / DIN 70121 / SAE J2847/2 software stack (support of V2G, EMI, PnC, BPT)
WB-CARRIER-BOARD-PI 1.1 #308194	Carrier board contains WHITE-BEET-P 1.1 module with PEV side e-mobility HW with ISO 15118 / DIN 70121 / SAE J2847/2 software stack (support of V2G, EMI, PnC, BPT)

TABLE 10. Revision table

Revision	Description
1.02	Last Version of WB-CARRIER-BOARD 1.0
1.10	First Version of WB-CARRIER-BOARD 1.1
1.11	Corrected Version of WB-CARRER-BOARD 1.1

More PEV / EVSE - configured eMobility related products can be found in CODICO Sample Shop:
<https://www.codico.com/en/products/powerline-communication>