



# **ECCU**

## **User's manual**

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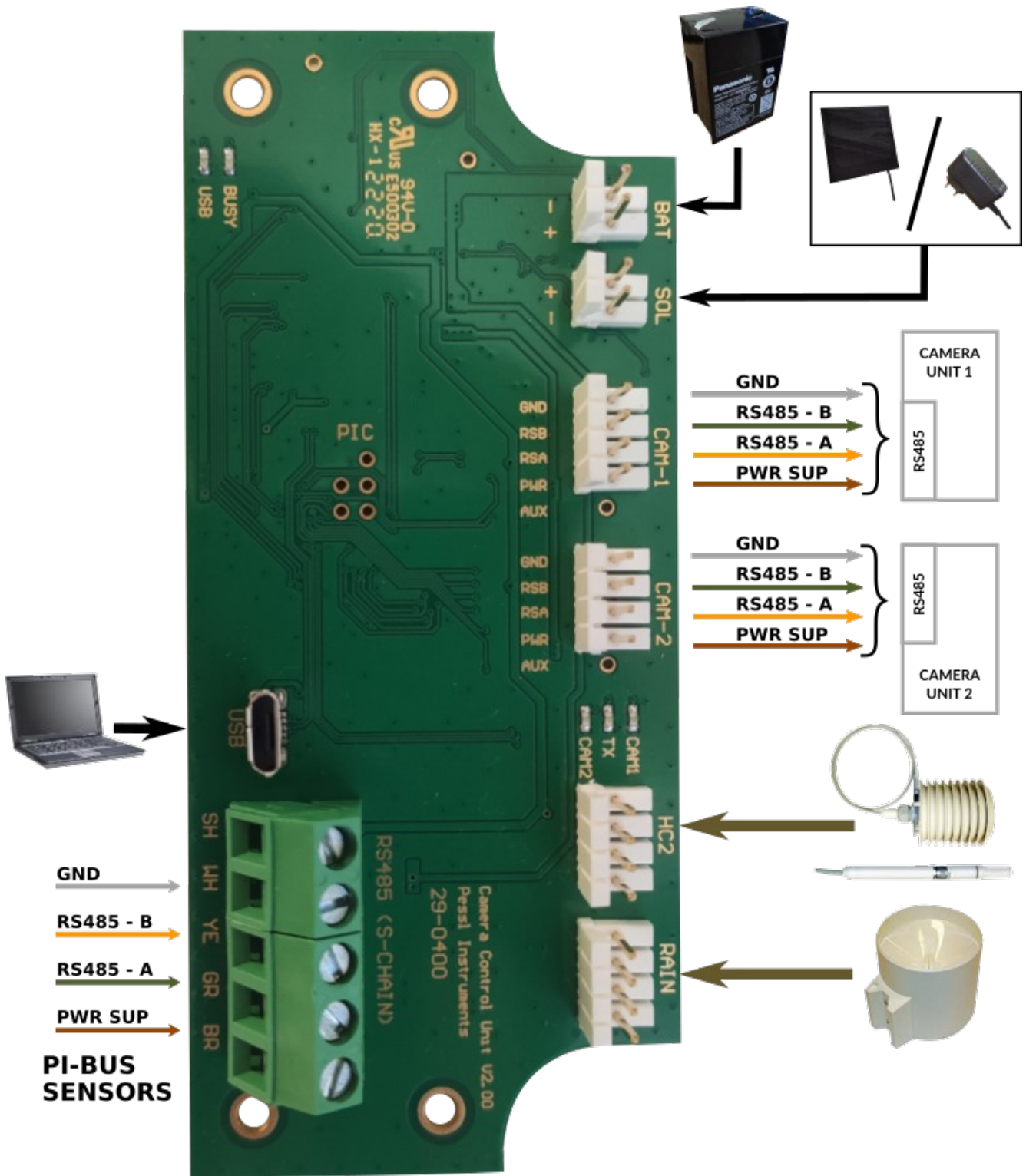
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## 1. ABBREVIATIONS

- ECCU** - External Camera Control Unit
- CU** - Camera Unit
- TRAP** - UV LED Trap device

## 2. CONNECTION SCHEMA



### 3. SUPPORTED SENSORS

- **Battery** - Voltage value [mV].
- **Solar panel / Charger** - Voltage value [mV].
- **Hygroclip2 (HC2)** - Ambient temperature and humidity [°C, %]
- **Rain gauge** - Rainfall amount [mm]
- **Leaf Wetness (PI bus)** - Leaf wetness time duration [minutes]
- **Leaf Temperature (PI bus)** - Leaf temperature [°C]

### 4. RS-485 INTERFACES

**CAM-1 Camera Interface:** Supports an RS-485 CU device through the ECCU bus protocol.

**CAM-2 Camera Interface:** Supports an RS-485 CU or TRAP device through the ECCU bus protocol.

**PI-BUS Interface:** Supports selected additional sensors through the custom Pessl Instruments sensors communication protocol.

### 5. USER'S COMMUNICATION INTERFACE

#### Port settings

- **Baud rate** 115200 bps
- **Data byte** 8 bits
- **Start bit** 1 bit
- **Stop bit** at least 1 bit
- **Parity** None

## Main Menu

Press the 'H' button to show the main menu items:

### MAIN MENU:

- 1 - Print ECCU system info
- 2 - Print last raw data of data memory
- 3 - Print all raw data of data memory
- 4 - Print sensors configuration set
- 5 - Sensor testing
- 6 - Print all control registers of data memory
- 7 - Print DataFlash memory organization
- 8 - Make a new sensors configuration set
- 9 - Reset the ECCU to factory settings
- A - Setup the measure/logging intervals
- B - Setup the system date and time
- C - Not assigned
- D - Data upload task only forcing
- E - Exit quick menu and continue to normal mode
- F - Force data upload and then photo upload tasks in that order
- P - Photo upload task only forcing on CAM\_1
- G - Photo upload task only forcing on CAM\_1; low res image
- Z - FW Upgrade

Press on any of these buttons on the keyboard input to execute the user menu functions.

## Print system info

Press the '1' button to print the current system info of ECCU.

### External Camera Control Unit - System info:

```

Device description:      External Camera Control Unit.
Hardware version:       v2.00
Hardware ID:            29-0400
Firmware version:       v3.40
Firmware revision date: 2023-03-17 09:18:00
USB-CDC stack version: 1.04 (Rev. 2020-10-13 11:52:00)
CU Device ID:           07D
CU Serial Number:       07D0F43C
Serial Number (CAM-1): 0701082F
Device ID (CAM-1):     070
Network date and time:  2023-03-20 14:25:09
Current date and time:  2023-03-20 15:25:09

Status of measurement:  running
Next alarm time:        15:30:00
Measure interval [sec.]: 300
Logging interval [sec.]: 600
Data Transmission:      0:00, 3:00, 7:00, 11:00, 17:00, 20:00
Photo Transmission CAM-1: 8:00, 11:00, 14:00, 23:00,

Bootloader version:     v1.03
Bootloader revision date: 2020-04-15 15:49:00
Bootloader description: B00T24_1024GB610
    
```

## Print last raw data of data memory

Press the '2' button to print the last stored data in a raw format from data memory. There are shown just the last records from the last occurred data transmission here.

Last raw data records from DataFlash memory:

Ord.Nm.	RECORD HEADER	RAW SENSOR DATA VALUES
-----	-----	----->
0000001	1C 2B 01 2021-06-29 20:20:00	1889 1BA3 0002 108A 1073 10A2 0B3F 0B3C 0B42
0000002	1C 5A 01 2021-06-29 20:30:00	188B 1B78 0002 107A 1073 1082 0B39 0B39 0B39
0000003	1C 69 01 2021-06-29 20:40:00	188E 1B97 0002 1061 105A 1069 0B38 0B38 0B39

Ord.Nm. - The ordinal number of record in a row.  
 RECORD HEADER - Record header in raw format.  
 RAW DATA - Sensor data of records in raw format.

## Print all raw data records from Data Flash memory

Press the '3' button to print all the raw data records in memory including data already sent to the server.

All raw data records from DataFlash memory:

Ord.Nm.	RECORD HEADER	RAW SENSOR DATA VALUES
0000001	1C 4A 01 2021-06-20 22:40:00	18B1 0000 0000 194F 194F 194F 0ABE 0ABE 0ABE
0000002	1C B4 01 2021-06-20 22:50:00	18BC 0000 0000 199D 1999 19A2 0AA8 0AA6 0AAA
0000003	1C 4A 01 2021-06-20 23:00:00	18BC 0000 0000 1995 197A 19B0 0AA2 0AA2 0AA3
0000004	1C 4F 01 2021-06-21 09:50:00	1821 0000 0002 14AA 14AA 14AA 0BC0 0BC0 0BC0
0000005	1C 03 01 2021-06-21 10:00:00	17C3 0000 0002 1403 1403 1403 0BC8 0BC8 0BC8
0000006	1C DD 01 2021-06-21 10:10:00	1771 0000 0002 1369 1369 1369 0BC9 0BC9 0BC9
0000007	1C 53 01 2021-06-21 10:20:00	179B 0000 0002 12F9 12AD 1346 0BD5 0BD5 0BD6
0000008	1C 34 01 2021-06-21 10:30:00	17B1 0000 0002 12DE 12B7 1305 0BDC 0BD8 0BE1
0000009	1C 79 01 2021-06-21 10:40:00	1773 0000 0002 125E 122D 1290 0BE3 0BE0 0BE7
0000010	1C EE 01 2021-06-21 10:50:00	1792 0000 0002 119B 1185 11B2 0BE0 0BDD 0BE3
0000011	1C 1C 01 2021-06-21 11:00:00	1785 0000 0002 114B 1149 114E 0BE3 0BDF 0BE7
0000012	1C 7A 01 2021-06-21 11:10:00	17BA 0000 0002 1199 116C 11C6 0BEB 0BE6 0BF0
0000013	1C D9 01 2021-06-21 11:20:00	17C5 0000 0002 11AA 1192 11C2 0BEA 0BE9 0BEB
0000014	1C F8 01 2021-06-29 19:40:00	1890 1B7C 0002 1064 1055 1074 0B4C 0B49 0B4F
0000015	1C 2B 01 2021-06-29 20:20:00	1889 1BA3 0002 108A 1073 10A2 0B3F 0B3C 0B42
0000016	1C 5A 01 2021-06-29 20:30:00	188B 1B78 0002 107A 1073 1082 0B39 0B39 0B39

## Print sensors configuration set

Press the '4' button to print the sensors configuration set.

Chan.	S.Code	Full Name	Short	Unit	Size	LST	SUM	AVG	MIN	MAX	TIM	USE	AXL	Div factor	Mul factor
1	0007	Battery voltage	BATTR	mV	2	1	0	0	0	0	0	0	0	1	1
2	0030	Solar Panel	SOLPN	mV	2	1	0	0	0	0	0	0	0	1	1
3	0768	Precipitation	PRECP	mm	2	1	0	0	0	0	0	0	0	10	1
12	0507	HC Relative humidity	HC-RH	%	2	0	0	1	1	1	0	0	0	100	1
13	0506	HC Air temperature	HC-TM	C	2	0	0	1	1	1	0	0	0	100	1

- Chan - The channel number of a configured sensor.
- S. Code - The unique sensor identifier code
- Full Name - The full name of the sensor
- Short - The short name of the sensor
- Unit - The units of measurement of the sensor data
- Size - The number of bytes occupied by the sensor's data
- LST - Whether the sensor has *last* attribute
- SUM - Whether the sensor has the *sum* attribute
- AVG - Whether the sensor has the *average* attribute
- MIN - Whether the sensor has the *minimum* attribute
- MAX - Whether the sensor has the *maximum* attribute
- TIM - Whether the sensor has the *time* attribute
- USE - Whether the sensor has the *custom user* attribute
- AXL - Whether the sensor has the *auxiliary* attribute



## Sensor testing

Press the '5' button to measure sensors.

Sensor testing:

Input	Full Name Of Sensor	Short	Value	Unit	Notes
	Battery voltage	BATTR	6125	mV	
	Solar Panel	SOLPN	7059	mV	
	Precipitation	PRECP	0.0	mm	, Counter = 2
	HC Relative humidity	HC-RH	40.53	%	
	HC Air temperature	HC-TM	27.88	C	
	PI Bus Leaf Wetness PLWET 0 Min , recognition signal: freq=750.00, duty=50.00				

Done .

## Control Registers

Press the '6' button to show control registers and pointer to the data memory.

Memory and Record Control registers:

The number of all records	= 47
The number of prev. rec.	= 11
The number of last records	= 22
Pointer to initial record	= 0
Pointer to prev. start rec.	= 14
Pointer to starting record	= 25
Pointer to next record	= 47
Pointer of Memory Ctrl.	= 47
Force data saving	= FALSE
Size of SD record	= 28
Max. number of rec. ptrs	= 308859
Max. number of SD rec.	= 308857
Number of SD values	= 9
Number of 1k thresholds	= 0

**The number of all records** - The total number of stored records in data memory.

**The number of prev. rec.** - The number of records that were last transmitted.

**The number of last records** - The total number of last records, which haven't been transmitted.

**Pointer to initial record** - The pointer to oldest record in data memory.

**Pointer to prev. start rec.** - The pointer to start record of previously uploaded sensor data.

**Pointer to starting record** - The pointer to first record of the group of records not transmitted.

**Pointer to next record** - The pointer to next data memory space for next record storing.

**Pointer of Memory Ctrl.** - The pointer to address of memory control records

**Force data saving** - If TRUE, the last stored data has to be resent (Reason: transmission failed)

**Size of current record** - Memory size of current record in Bytes.

**Max. number of rec. ptrs** - The max. possible number of records in whole data memory.

**Max. number of SD rec.** - The maximum possible number of sensor data records to store.

**Number of SD values** - The number of sensor data values in each record to be stored.

**Number of 1k thresholds** - The number of times records exceeded the 1000 records threshold.

## 6. PROGRAM FLOW

### Production program flow

- 1 Detect plugged in CU or TRAP devices. **NB: CAM-1 must be detected to continue.**
- 2 If CAM-1 CU device is detected:
  - Make new sensor's configuration, Make first measurements and two data logs.
  - Command: Getting the serial number.
  - Command: Getting the identifier number.
  - Command: Set the time.
  - Command: Set the sensor data into CU.
  - Command: Send the sensor data in XML file to server
  - Command: New settings (including RTC time) getting
  - Command: Take Preview and Send image to the server
  - Wait until photo upload is either complete or failed with response from CU
  - Command: Request for power down of CU
  - If no device on CAM-2, halt and wait for cold boot (power cycle)
- 3 If CAM-2 CU device is detected:

Send a dummy XML file, for the sake of uploading topology information to server about what CU device is plugged in.

  - Command: Getting the serial number.
  - Command: Getting the identifier number.
  - Command: Set the time.
  - Command: If device is CU and not TRAP, Set the dummy XML file into CU
  - Command: Send the dummy data in XML file to server
  - Command: New settings (including RTC time) getting
  - Command: If device is CU and not TRAP, Take Preview image and Send image to server
  - Wait until image upload is either complete or failed with response from CU
  - Command: Request for power down of CU or TRAP
  - Halt and wait for a system cold boot (power cycle)

## Program flow after restart (Single camera station)

- 1 Detect plugged in CU or TRAP devices.
- 2 Commands flow sending into CU:
  - Command: Getting the serial number.
  - Command: Getting the CU identifier number.
  - Command: Set the time.
  - Command: Set the sensor data (last stored and not yet transmitted, or no data) in XML code and transmitting into CU.
  - Command: Sensor data in XML file sending to server.
  - Command: New settings (including RTC time) getting.
  - Command: Request for power down of CU.
- 3 If RTC setting has been received successfully, go to the next step 4.  
If RTC setting hasn't been received successfully or any RTC received, next list of commands has to be sent into CU repeatedly (step 2) until the correct RTC setting will be received:
  - Command: Set the sensor data in XML code structure and transmitting into CU.
  - Command: Sensor data in XML file sending.
  - Command: New settings (including RTC time) getting.
  - Command: Request for power down of CU.
- 4 New sensors configuration set.
- 5 First sensor measurement.
- 6 Normal mode running of ECCU.

## Program flow after restart (Two camera station)

- 1 Detect plugged in CU or TRAP devices.
- 2 Commands flow sending into CAM-2 CU if not TRAP:
  - Command: Getting the serial number.
  - Command: Getting the CU identifier number.
  - Command: Set the time.
  - Command: Set the sensor data (dummy XML for topology) and transmitting into CU.
  - Command: Sensor data in XML file sending to server.
  - Command: New settings (including RTC time) getting.
  - Command: Request for power down of CU.
- 3 If RTC setting has been received successfully, go to the next step 4.  
If RTC setting hasn't been received successfully or any RTC received, next list of commands has to be sent into CU repeatedly (step 2) until the correct RTC setting will be received:
  - Command: Set the sensor data (dummy XML) and transmitting into CU.
  - Command: Sensor data in XML file sending.
  - Command: New settings (including RTC time) getting.
  - Command: Request for power down of CU.
- 4 Commands flow sending into CAM-1 CU:
  - Command: Getting the serial number.
  - Command: Getting the CU identifier number.
  - Command: Set the time.
  - Command: Set the sensor data (last stored and not yet transmitted, or no data) in XML code and transmitting into CU.
  - Command: Sensor data in XML file sending to server.
  - Command: New settings (including RTC time) getting.

- Command: Request for power down of CU.
- 5 If RTC setting has been received successfully, go to the next step 6.  
If RTC setting hasn't been received successfully or any RTC received, next list of commands has to be sent into CU repeatedly (step 4) until the correct RTC setting will be received:
- 6 New sensors configuration set.
- 7 First sensor measurement.
- 8 Normal mode running of ECCU.

## Commands flow in normal mode

- Command: Getting the serial number.
- Command: Getting the CU identifier number.
- Command: Set the last stored sensor data in XML code and transmitting into CU.
- Command: Sensor data in CU sending to the server.
- Command: New settings (including RTC time) getting.
- Command: Photo in higher quality taking, if photo schedule is activated that hour.
- Command: Photo sending, if photo schedule was activated that hour.
- Command: Request for power down of CU.

## Commands flow in detecting CU/TRAP devices

- Command: Test Port. Retry once if no response, then jump to power down.
- Command: Getting the serial number, if device responded.
- Command: Getting the device identifier number, if device responded.
- Command: Request for power down of CU/TRAP device.

## 7. LED STATUS

- **BUSY LED is on** - During the sensor measure and data logging.
- **TX LED is on with irregular blinking** - The communication with CU or TRAP is OK. LED is irregularly blinking if there is a command or response being transmitted.
- **USB LED is on** - The USB cable is plugged in and user terminal is available to run commands.
- **CAM-1 LED is on** - The camera device plugged into CAM-1 port is supplied with power from the battery (powered on).
- **CAM-2 LED is on** - The camera or UV LED trap device plugged into the CAM-2 port is supplied with power from the battery (powered on).

## 8. XML DATA

### Sensor data

Sensor data is transmitted from ECCU to CU in XML coded string through the ECCU-BUS command “!SET\_SDATA” (See document: “*ECCU-BUS Protocol - datasheet.pdf*”). This XML coded string (file) should be sent on a web server to be managed in database.

XML code format of sensor data is described in document: “*ECCU Sensor Data - XML Code.pdf*”.

### Settings data

Settings data are transmitted from CU to ECCU in XML coded string through the ECCU-BUS command “!GET\_SETTINGS” (See document: “*ECCU-BUS Protocol - database.pdf*”). At first this XML coded string (file) should be received from a web server administering a database into the CU before XML will be sent to ECCU device.

XML code format of settings data is described in document: “*ECCU Settings - XML Code.pdf*”.

## 9. REVISIONS

MANUAL VERSION	MODIFICATIONS
1.00	- First release of the manual.
1.12	- Added UV LED Trap details.
1.13	- Update user menu changes - Update connection schema to reflect changes in firmware and support of TRAP or two CUs

## 10. RELEASE NOTES

ECCU V2 User's manual, Version **1.00** - New ECCU , Firmware **3.31**  
 ECCU V2 User's manual, Version **1.12** - New ECCU , Firmware **3.32** with UV LED Trap support  
 ECCU V2 User's manual, Version **1.13** - New ECCU , Firmware **3.40** with UV LED Trap support