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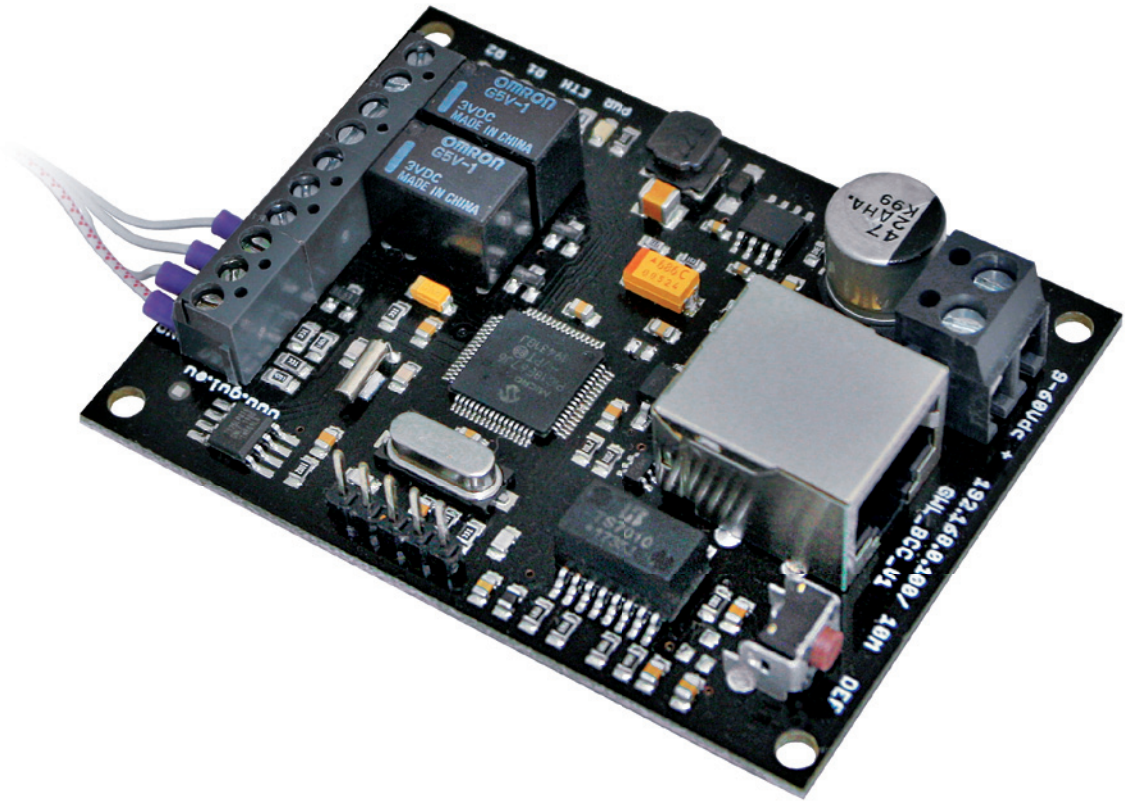
Your complete power solutions.

Technical manual

GWL/Modular
BCC

(Battery Communicator and Controller)



PRODUCT WEBPAGE

Module description

- BCC is an expanding, independent communication unit designed exclusively for the GWL CPM, which expands the protection options and enables remote management of batteries protected by the CPM.
- It contains a 10 Mbps LAN interface for remote reading and writing of parameters to the CPM and two programmable potential-free switching NO/NC relays max 30V / 1A AC/DC.
- It‘s configurable and controllable using any web browser on tablets, phones, or notebooks.

Potential use:

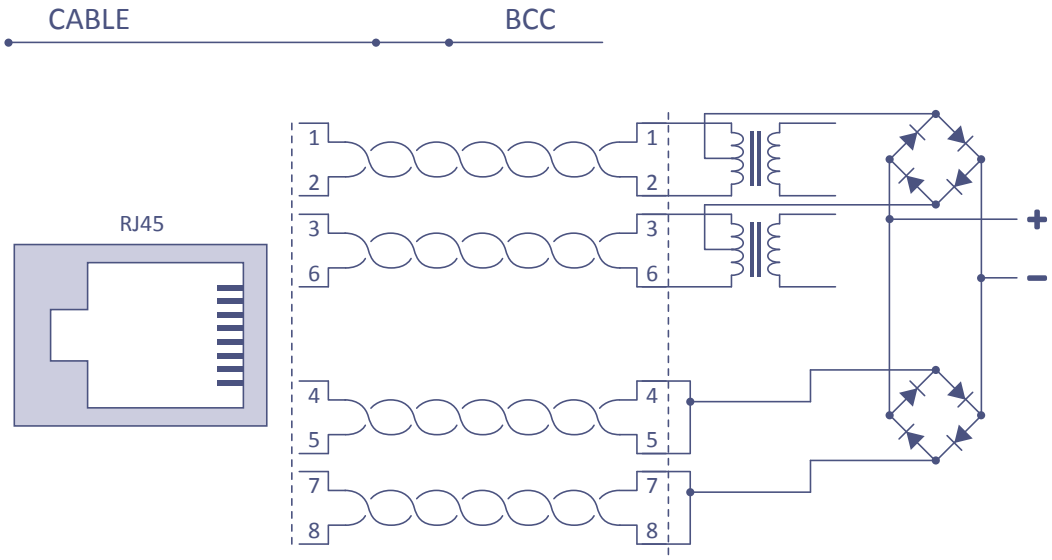
One-time or periodic reading and writing of values to and from CPM via LAN interface and TCP/IP protocol (HTTP + XML), in particular:

- Emergency shutdown, switching on and resetting the entire CPM.
- Reading the voltage of all cells connected to the CPM and the total battery voltage.
- Reading the Umax and Umin output conditions on the CPM (closed/open).
- Displaying the last event on the CPM (voltage Umin, Umax, Uemergency).
- Remote closing/opening of output Terminals 1 – 4 Umax and Umin and Emergency on CPM.
- Remote change of Umax and Umin voltage limits protecting the battery against deep discharging or overcharging.
- 2 additional programmable switching NO/NC potential-free relays, automatic state change possible according to battery voltage, according to the highest difference between cells or in the case of communication failure. Manual switching via www is possible at any time.
- Wide range of supply voltage 9 – 65V, also using passive PoE.

Technical Specifications

Specifications
Average consumption 1W
2 potential-free switching NO/NC relays, max. 30V / 1A AC/DC
1 ETH 10 mbps HD
Operating temperature: -20 to +70 °C
Dimensions:
Weight:

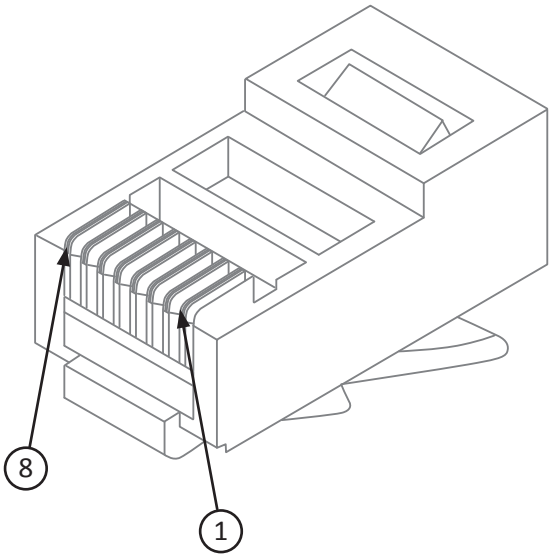
9 – 65V power supply via terminal block (max. diameter 1.5 mm²) or passive PoE (not compatible with IEEE 802.3af 48V standard):



Therefore, the DC supply voltage up to 65V can be applied to the pairs of UTP cable number 1 + 2 (orange and white-orange), 3 + 6 (green and white-green), 4 + 5 (blue and white-blue) and 7 + 8 (brown and white-brown) regardless of polarity.

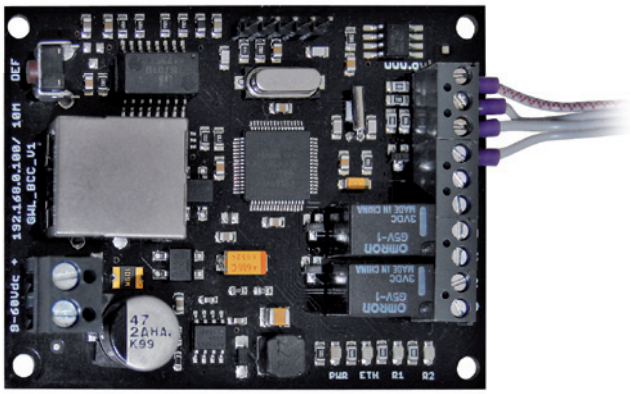
We recommend following the passive PoE habit, i.e., connecting the blue and white-blue wires in the UTP cable to the minus (-) pole and the brown and white-brown wires to the plus (+) pole:

RJ-45		
Pin number	Designation	Color
1	Tx +	
2	Tx -	
3	Rx +	
4	PoE -	
5	PoE-	
6	Rx -	
7	PoE +	
8	PoE +	

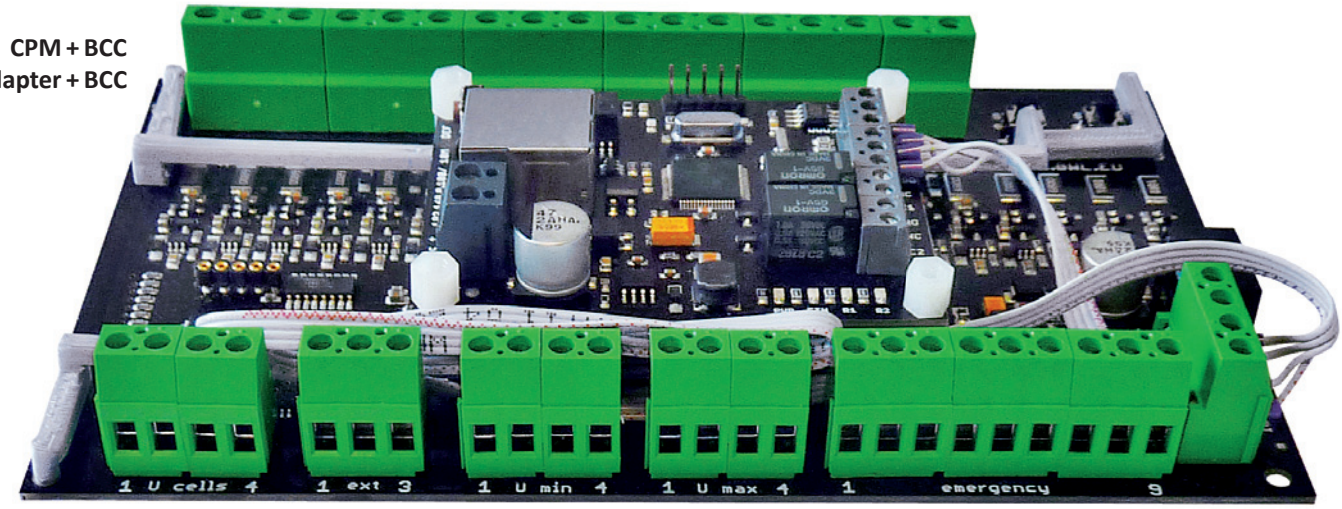


Installation

Attach the BCC unit to the CPM using the supplied plastic adapter and connect the supplied 4-core cable to the CPM's COM.i2c terminals so **the pin closer to the edge of CPM will be connected to the pin of BCC which is also closer to the edge.**



CPM + BCC adapter + BCC



If you use a wire other than the supplied wire, do not exceed the maximum wire length of 50 cm (I2C bus). All 4 COM.i2c terminals on the CPM are equipped with an optocoupler with galvanic isolation from the BCC, so there is no risk of potential difference damage if the BCC unit is powered, for example, by a switching power supply from a source other than the CPM.

1. Connect a DC voltage in the range of 9 – 65V with an input power >= 1W to the supply terminals in the correct polarity (plus to +, minus to -). Power supply to the terminals can be replaced by power supply via passive PoE (Power Over Ethernet); see above. You can supply the BCC unit from the protected monitored battery output or from a separate UPS, see diagram examples in the annexe to the manual. The device operation is signalled by one red PWR LED. If the red PWR LED is blinking, it means that communication with the CPM has been established.

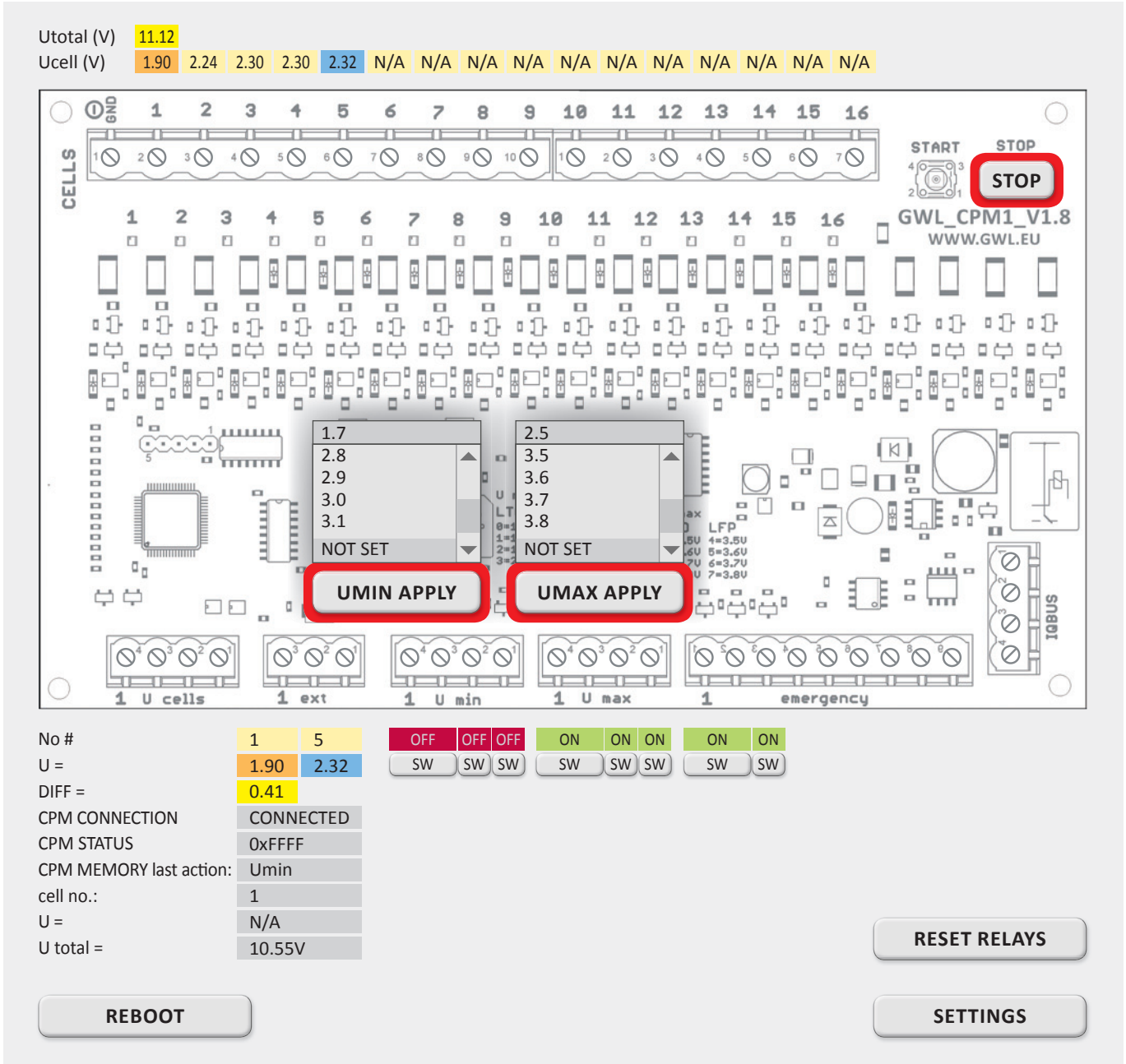
2. If you‘re not sure if the BCC is set by default, perform a reset:
   a) Press the DEF button (> 5s).
   b) Release the DEF button.
   c) All LEDs flash identically.
   d) Briefly press the DEF button once again.

3. Following this procedure, the BCC module is reset to the factory default setting, where both relays are set to the NORMAL position. The Umin and Umax is set to „NOT SET“, the IP address is set to 192.168.0.100/24. Also, all switch conditions of relays 1 and 2 are cleared. Login name, password, and the memory of the last event are deleted.

4. Connect the UTP cable to the LAN port. Establishing communication via LAN is signalled by lighting and flashing of the second ‘ETH’ LED.

5. Set an IP address from the range 192.168.0.0./24 (netmask 255.255.255.0) on your computer and enter the IP address of the BCC module into the compatible web browser (Microsoft Edge, Chrome, FireFox) – default address is http://192.168.0.100. Secure HTTPS and DHCP clients are not supported, the device must always have a static IP address.

6. A schematic drawing of the CPM is displayed. Above the figure there are the voltage of all cells connected to the CPM and the total battery voltage:



Below the figure there is the maximum cell voltage and the order of this cell in the battery, the minimum voltage and the order of the cell in the battery, the difference between the maximum and minimum voltage, communication status with the CPM and any error code.
Next is displayed the last incident which caused the activation of outputs Umin, Umax or Uemergency. You can see the kind of incident, which cells caused it, what was the voltage of the cell and battery during the incident.

7. If ‘enable get file from URL’ isn‘t checked on the SETTINGS page (see below), it‘s possible to enter Umin and Umax values different from the values set by the hardware selectors on the CPM board using the drop-down list. The selection from the drop-down list takes precedence over the positions of HW selectors. The NOT SET position activates the value on the CPM board HW selector. Use the ‘UMIN APPLY’ and ‘UMAX APPLY’ buttons to activate the selected values (each separately). If the communication between the CPM and the BCC is interrupted for any reason, the Umin and Umax values set on the CPM‘s HW selectors will be activated 60 seconds after communication is lost.

8. The REBOOT button can be used to reboot the BCC module, the SW buttons can be used to temporarily control (close/open from GND) the CPM output terminals with a higher priority than the currently set Umax and Umin logic.
   Temporarily because the next time an event occurs (Umin or Umax or Uemergency), the terminals will open/close again according to the set logic.

Example: One of the cells reached Umin and terminal 3 on the Umin terminal block on the CPM was disconnected from GND and the battery discharging on the external relay was interrupted. Switch on terminal 3 again manually using the SW button via the web interface (connection to GND). Therefore, the battery keeps discharging even though one of the cells is already below Umin. Another event is when Uemergency is reached (i.e., Umin - 0.3V) and at this moment all outputs are switched off (disconnected from GND) and the entire CPM board is switched off.

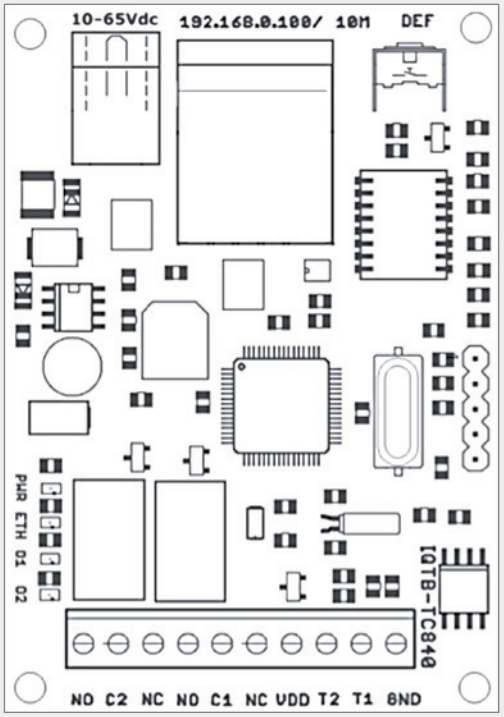
Take the utmost care when operating the Uemergency terminals manually. If you manually close terminals 1 – 3 on the Uemergency terminal block after they‘ve been opened by the Umin or Umax event, they will never open again and the battery will discharge/overcharge over time and be destroyed.

9. With the RESET RELAYS button, terminals 3 and 4 on Umin, Umax and Uemergency of the CPM are set to operating state (closed with GND) and GND appears on terminals 1 on Umin, Umax and Uemergency for 150 ms.

10. Press the SETTINGS button to go to the BCC module settings:

6□24Vdc

IP adress:	192.168.2.244
Mask:	255.255.255.0
Default gateway:	192.168.1.1
DNS server 1:	192.168.1.1
DNS server 1:	0.0.0.0
NTP server: for example pool.ntp.org	tik.cesnet.cz
Time zone:	+ 2
Actual time:	**Wed Jul 15 09:29:07 2020**
HTTP port:	80
FREE ACCESS bcc.xml file	☐
Enable get file from URL	☐
Outputs xml file	outputs.xml
TCP port:	80
Watchdog URL:	www.jablo.com
Watchdog download period:	10 **seconds**
Watchdog status:	**N/A**



NORMAL NORMAL
SW SW

Relay 1:
☐ switch to ON when (Umax - Umin) >
DIFF voltage: 60 milivolts
switch to OFF when (Umax - Umin) <
50 milivolts
Current: 272.0 mV
☐ switch to ON when communications with CPM is lost

Relay 2:
☑ switch to ON when battery voltage is
> 11800 milivolts
switch to OFF when battery voltage is
< 11700 milivolts
Current: 11226.0 mV
☐ switch to ON when communications with CPM is lost

API HTTP GET enable:	☑
API server:	api.thingspeak.com Success! Counts: 3
URL:	/update?api_key=CRE3Q2KTZ326VXA6
API PORT:	80
Interval:	10 seconds
Admin user:	admin **Remove user name and password** ☐
Password:	•••••••• min. 3, max 12 characters, no specials
Firmware Upload:	Choose a file Nevybrán žádný soubor Start upload

All changes was saved and activated!

← BACK SAVE & BOOT

SETTINGS:

11. Here you can change the IP address of the device, netmask, default gateway, DNS server addresses, NTP server (tested and functional: pool.ntp.org, tik.cesnet.cz), time zone and the port number on which the web interface will be available for configuration.

12. Checking the 'FREE ACCESS bcc.xml file' option will cause the file at http://IP-address-BCC/bcc.xml the web interface. If you leave the box unchecked and set the name and password at the bottom of the SETTINGS page, you'll need to call the file as follows:

    http://name:password@IP-address-BCC/bcc.xml

CAUTION

Entering the name and password in an unencrypted URL isn't safe and is used only for very basic protection. Anyone with physical access to a local area network can very easily eavesdrop on the name and password.

CAUTION

Never place the device on a public IP address or redirect a publicly available TCP/IP port to it. Hacking robots will soon detect the BCC module or open port and flood it with meaningless HTTP requests so that you can no longer connect to it. For remote access to the BCC, use only a VPN or a local network separated from the Internet.

XML file format:

Value in XML:	Explanation of meaning:
<data>	beginning of the XML file
<utotal>12.61</utotal>	total battery voltage is 12.61V
<ucell1>3.12</ucell1>	Cell 1 voltage is 3.12V
<ucell2>3.28</ucell2>	Cell 2 voltage is 3.28V
<ucell3>3.24</ucell3>	Cell 3 voltage is 3.24V
<ucell4>3.19</ucell4>	Cell 4 voltage is 3.19V
<ucell5>N/A</ucell5>	Cell 5 not detected
<ucell6>N/A</ucell6>	Cell 6 not detected
<ucell7>N/A</ucell7>	Cell 7 not detected
<ucell8>N/A</ucell8>	Cell 8 not detected
<ucell9>N/A</ucell9>	Cell 9 not detected
<ucell10>N/A</ucell10>	Cell 10 not detected
<ucell11>N/A</ucell11>	Cell 11 not detected
<ucell12>N/A</ucell12>	Cell 12 not detected
<ucell13>N/A</ucell13>	Cell 13 not detected
<ucell14>N/A</ucell14>	Cell 14 not detected
<ucell15>N/A</ucell15>	Cell 15 not detected
<ucell16>N/A</ucell16>	Cell 16 not detected
<trimmer-0>3.0</trimmer-0>	position of HW selector Umin on CPM is set to 3.0V
<trimmer-1>3.5</trimmer-1>	position of HW selector Umax on CPM is set to 3.5V
<UMINset>3100</UMINset>	selected Umin value on BCC web is 3.1V
<UMAXset>N/A</UMAXset>	Umax value on BCC web not set, 3.5V from HW selector applies
<Umincell>3.12</Umincell>	minimum cell voltage is 3.12V
<Umaxcell>3.28</Umaxcell>	maximum cell voltage is 3.28V
<UmincellID>1</UmincellID>	Cell 1 has minimum voltage
<UmaxcellID>3</UmaxcellID>	Cell 3 has maximum voltage
<Udiff>0.16</Udiff>	voltage difference between Cells 1 and 3 is 0.16V
<lastcellevent>Umax</lastcellevent>	the last event caused by the change in the state of Umin or Uemergency outputs
<lastcellno>1</lastcellno>	The number of the cell that caused the change
<lastcellU>3.51 V</lastcellU>	The voltage of the cell that caused the change
<lastbattU>12.61 V</lastbattU>	The voltage of the whole battery at the moment of change
<connection>CONNECTED</connection>	I2C communication with CPM is running
<status>0xFFFF</status>	CPM board status (FFFF = fully functional)
<relay1>SWITCHED</relay1>	Relay 1 on BCC is closed (N-O = connected)
<relay2>NORMAL</relay2>	Relay 2 on BCC is open (N-O = disconnected)
</data>	end of XML file

13. Selecting ‘Enable get file from URL’ will cause BCC to query the URL/IP address entered in the ‘Watchdog URL’ field for the period set in the ‘watchdog download period’ field, and if it finds a file with the name specified in the ‘Outputs XML file’ field here, it sets all terminals and Umin and Umax voltages according to the values in this XML file. Structure and example of XML file function:

Value in XML:	**Explanation of meaning:**
<IO>	(XML file beginning mark)
<UMIN>5</UMIN>	(CPM HW selector position, option 0 to 7. This example sets Umin to 2.90V)
<UMAX>6</UMAX>	(CPM HW selector position, option 0 to 7. This example sets Umax to 3.70V)
<R1>ON</R1>	(options ON, OFF or NA, this example sets Relay 1 on BCC module to SWITCHED, i.e., the opposite of the description on PCB)
<R2>OFF</R2>	(options ON, OFF or NA, this example sets Relay 2 on BCC module to NORMAL, i.e., the status as described on PCB)
<UMIN12>ON</UMIN12>	(options ON, OFF or NA, this example sends a 150 ms GND pulse to Terminal 1 of terminal block Umin)
<UMIN3>NA</UMIN3>	(options ON, OFF or NA, this example leaves Terminal 3 of CPM terminal block Umin unresponsive)
<UMIN4>OFF</UMIN4>	(options ON, OFF or NA, this example disconnects Terminal 4 of CPM terminal block Umin from GND)
<UMAX12>OFF</UMAX12>	(options ON, OFF or NA, this example sends a 150 ms GND impulse to Terminal 2 of terminal block Umax)
<UMAX3>OFF</UMAX3>	(options ON, OFF or NA, this example disconnects Terminal 3 of CPM terminal block Umax from GND)
<UMAX4>ON</UMAX4>	(options ON, OFF or NA, this example connects Terminal 4 of CPM terminal block Umax with GND)
<EMER12>NA</EMER12>	(options ON, OFF or NA, this example leaves Terminals 1 and 2 of CPM terminal block Uemergency without impulse/response)
<EMER3>ON</EMER3>	(options ON, OFF or NA, this example connects Terminal 3 of CPM terminal block Uemergency with GND)
</IO>	(end of file structure)

The Umax and Umin limits set using this XML are valid for 60 s (seconds) or until the XML is loaded a second time with a different value. The Umax and Umin values read from XML take precedence over the values set by the HW selectors on the CPM, and if 'enable get file from URL' is checked and the BCC read XML correctly, the values from the web interface drop-down list are ignored.

The last value read from XML is valid for 60 seconds. If the BCC does not reload XML within this time, the values in the drop-down menu in the web interface are activated. If they are not set (NOT SET) or the I2C connection of BCC and CPM is lost, the values set by the HW selector on the CPM are activated.

If 'enable get file from URL' is not checked, the values entered in the drop-down list on the home page apply. These take precedence over the HW selector positions. If they are set to 'NOT SET', the HW selector values apply.

If the communication between the CPM and the BCC is interrupted for any reason, the values of Umin and Umax set on the HW selectors of the CPM will be activated after 60 seconds.

If Umin or Umax or both values in XML have invalid values or one or both values are missing in XML, the values entered in the drop-down list on the home page apply and the values from XML are ignored.

BCC activates only those values from XML that it finds in XML and that have the correct syntax. That is, for example, there can be only one line with Umin in XML. Then only Umin is set via XML and the other values remain according to the logic or according to the settings in the web interface.

If NOT SET is selected here, the values on the HW selectors on the CPM apply.

The Umin, Umax values, and relay states R1 and R2 written to the BCC and CPM via the loaded XML file „outputs.xml" are not reflected back to the web interface. To verify that the values from the file „outputs.xml" were loaded correctly into the BCC and CPM, generate a status XML file by entering the URL: http://ipadresabcc/bcc.xml

CAUTION

Please note that the BCC does not check whether the set values via the web interface or via the outputs.xml file are logically correct. This exceeds the capabilities of the CPU and memory used. For example, setting the voltage to Umin > Umax, which is logical nonsense, will lead to completely unpredictable behaviour of the entire 'BCC + CPM' assembly and therefore, in the extreme case, to the destruction of the connected battery.
Before entering values, please double-check that the values are selected correctly and that they make logical sense. Incorrect value settings can, in extreme cases, destroy the connected battery.

14. Check ‘Switch to ON / OFF when Umax - Umin >’ for Relay 1 if you want to switch the potential-free Relay 1 in case of difference in the voltage of the weakest and strongest cells higher than the value set in the ‘millivolts’ field (OFF = idle state, ON = switching. If it’s already in the selected state, the position will not change).
    For example, this is suitable for switching on an external balancer (not part of the BCC or CPM modules) if the voltage difference between the strongest and weakest cells exceeds the specified value.
    Similarly, you can define the second (smaller) difference Umax and Umin one line below, when Relay 1 is to be switched to the opposite state again. This allows you to set almost any hysteresis.
    Enter the voltage value in millivolts, e.g., 0.1V = 100 mV.
    The following line shows the current value of the difference between the two voltages.

15. Check ‘Switch to ON / OFF when communication with CPM is lost’ if you want to switch potential-free Relay 1 on the BCC module to the ON or OFF state when I2C communication with the CPM is lost (can be selected, if it‘s already in position, nothing happens).
    Before switching, a 20s pause is counted down verifying that the loss is permanent. This option takes precedence over the condition of the voltage difference between the cells Umax and Umin, so the relay will switch even if the condition from point 10 is set, but not met. If communication with the CPM board is re-established, the relay switches to the position specified in the next field after a 20s delay (communication stability check).
    For example, this is suitable for remotely informing the operator that there is something wrong with the battery via various GSM communicators.

16. Check ‘Switch to ON / OFF when battery voltage...’ for Relay 2 if you want to switch potential-free Relay 2 to a certain position if the total battery voltage exceeds or falls below or above the value entered in the ‘millivolts’ fields. If the relay is already in position, nothing happens. Any hysteresis can be set.
    Make sure the condition makes sense. The BCC accepts any logic, including faulty logic, in which the relay loops. For example, the following faulty logic could theoretically be set:

    ~~*Switch to ON when battery voltage is> 12800 mV and switch to OFF when battery voltage is <13200 mV.*~~

    Example of correctly entered condition:
    Switch to OFF when battery voltage is < 10500 mV and switch to ON when battery voltage is > 11800 mV.

17. Check ‘Switch to ON / OFF when communication with CPM is lost’ for Relay 2 if you want to switch potential-free Relay 2 on the BCC module to the required ON or OFF state in the event of a failure/loss of I2C communication with the CPM. If the relay is already in the required position, nothing happens. Before switching, a 20s pause is counted down verifying that the loss is permanent. This option takes precedence over the total battery voltage condition, i.e., the relay will switch even if the condition from point 17 is set, but not met. If communication with the CPM board is re-established, the relay switches to the position set in the next field after a 20s delay (communication stability check).

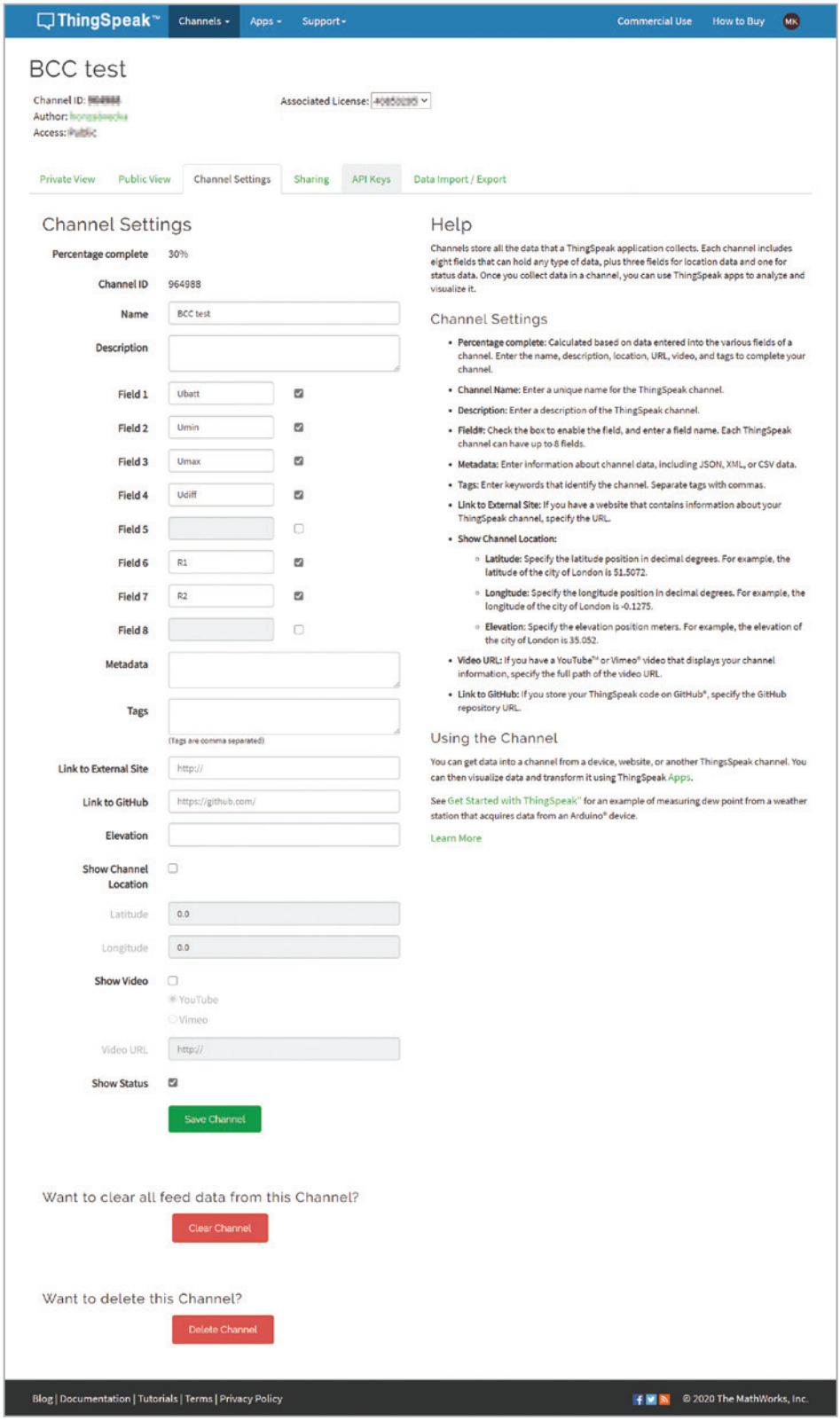
18. 18. The ‘API HTTP GET enabled’ option is used to periodically send values read from the CPM board to a remote web server, e.g., www.thingspeak.com.
    Enter an address in the API server field, such as ‘api.thingspeak.com’.
    Any value (constant) that should appear after the server address can be entered in the ‘URL’ field.
    For thingspeak.com, it‘s typically the channel ID and the name of the script that writes the data.
    For example, ‘/update?api_key=CZE3W2KT1326XXQ1’.
    API Port is a TCP/IP port number, usually 80. The interval is the sending period in seconds.
    BCC will also automatically add the following variables after the ‘API server’ and ‘URL’ (the name, structure and order of the variables can‘t be customised):

    ?field1=##### (total battery voltage [mV])
    &field2=#### (voltage of cell with minimum voltage [mV])
    &field3=#### (voltage of cell with maximum voltage [mV])
    &field4=### (difference between strongest and weakest cell voltages [mV])
    &field5=0x######## (time set on BCC module, hex GAUGE 32 NTP timeticks)
    &field6=# (1 if Relay 1 on BCC is closed, 0 if not)
    &field7=# (1 if Relay 2 on BCC is closed, 0 if not)

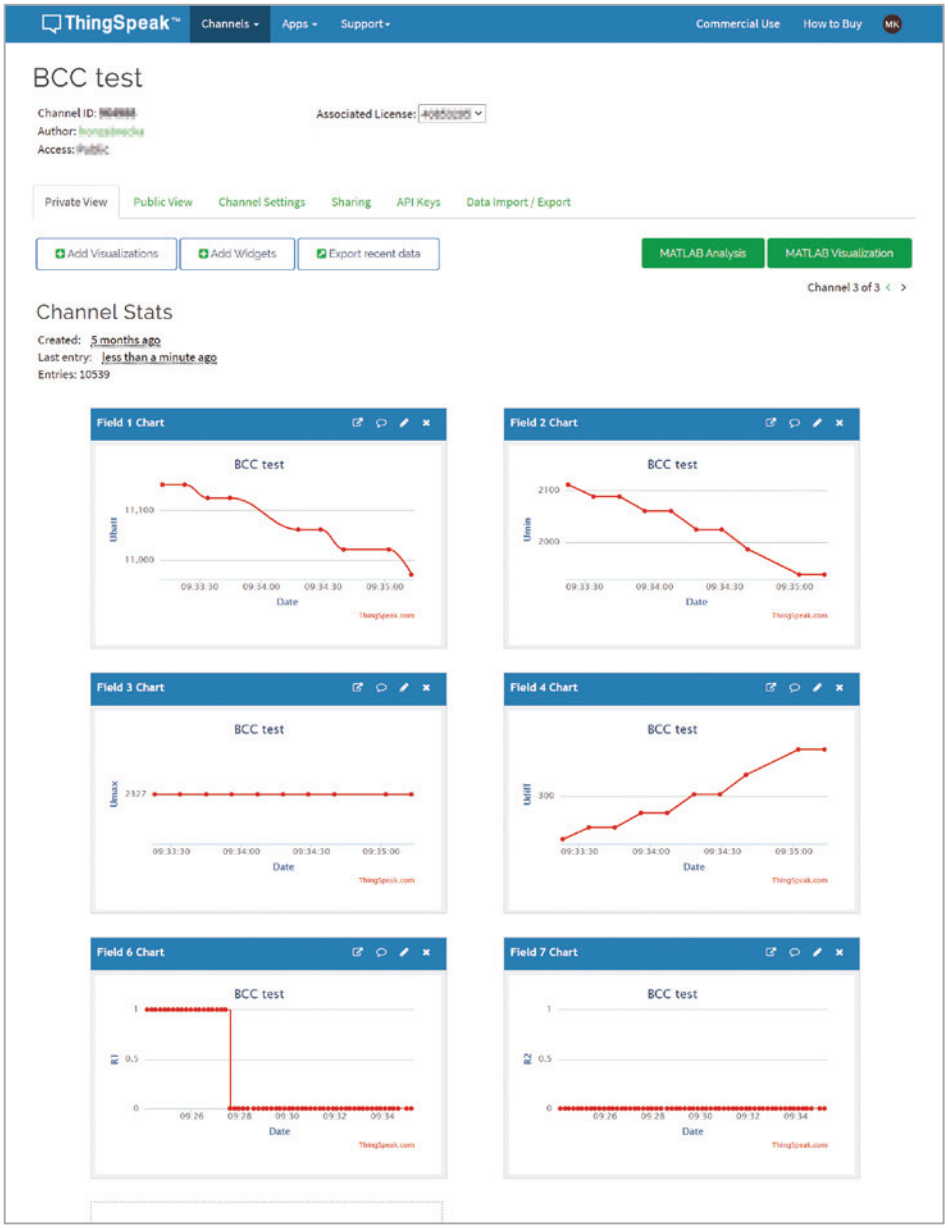
    Example of called URL:
    http://api.thingspeak.com/update?api_key=CZE3W2KT1326XXQ1?field1=13450&field2=3150&field3=3350&field4=200&field5=0xE1EAEF04&field6=1&field7=0

    Battery voltage = 13.45V
    Weakest cell voltage: 3.15V
    Strongest cell voltage: 3.35V
    Difference Umax - Umin: 0.2V
    HEX timestamp: E1EAEF04 (number of seconds that have elapsed since midnight on January 1st, 1900 in the hexadecimal HEX system)
    Relay 1: SWITCHED (closed) position
    Relay 2: NORMAL (idle) position

Second example of channel configuration:



Second example of channel configuration:



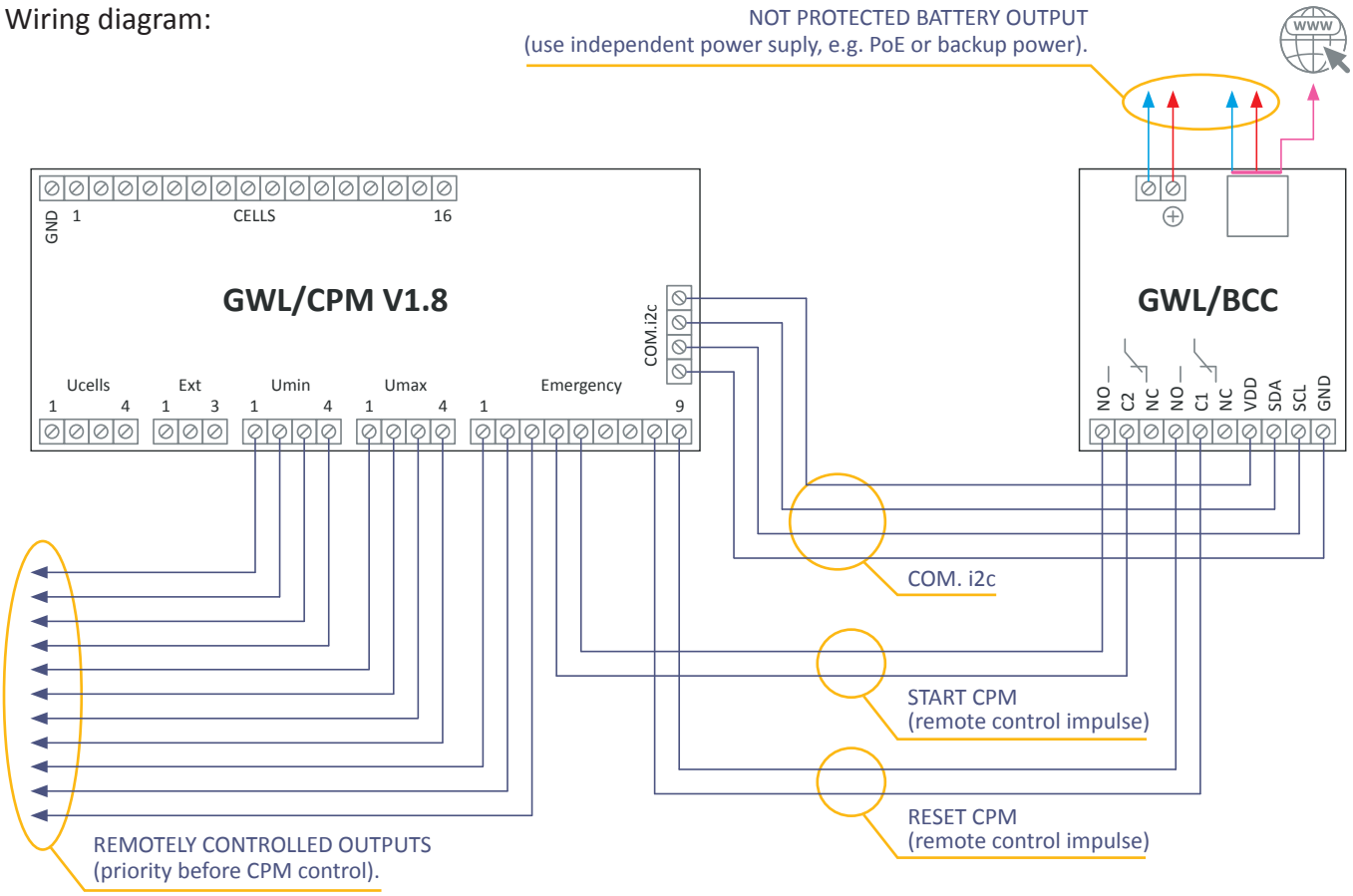
19. Setting the name and password for http authentication and access to the configuration web interface.
    You can enter login data in the Name and Password fields to protect the BCC settings. You will need to enter this name and password for each access to the BCC web interface unless you have checked the 'FREE ACCESS bcc.xml file' field. In this case, the bcc.xml file is available without authentication. The name and password can be deleted by checking the 'Remove user name and password' field and confirming this option with the 'Save & Reboot' button, or by HW reset using the DEF button.

Examples of using the BCC unit

1) REMOTE REBOOT OR TURNING ON OF THE CPM BOARD

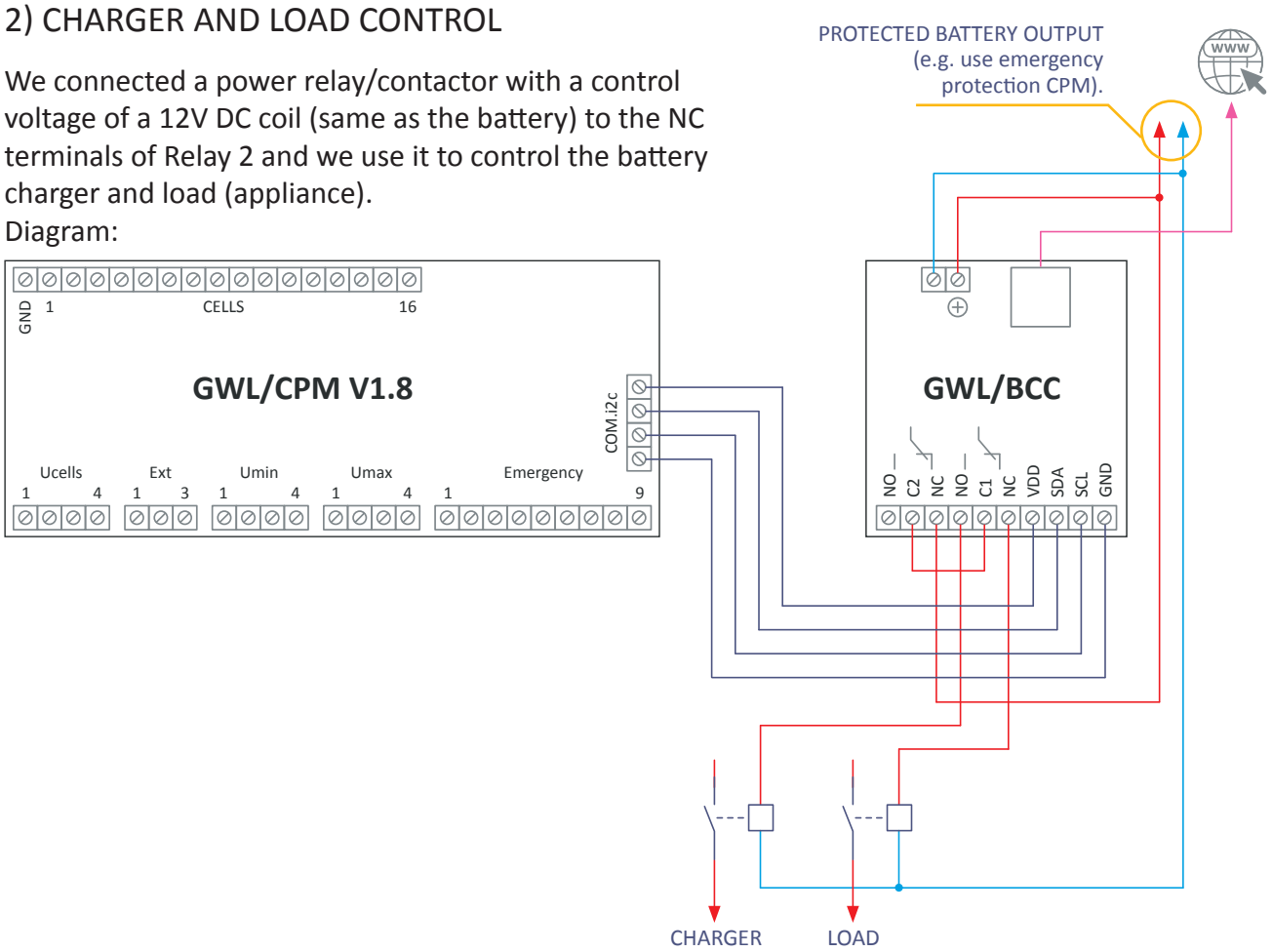
The CPM BMS module has no hysteresis intentionally implemented on Terminals 1 – 3 Umin or Umax. Therefore, if the battery is deeply discharged or overcharged, the CPM BMS will disconnect the battery from the appliances/charger to prevent damage.
Using the BCC unit, it‘s possible to remotely diagnose the battery and, if necessary, switch on or reboot the CPM BMS module, i.e., reconnect the load and/or charger. It isn‘t necessary to switch off the CPM via relays and terminals, because it‘s a direct function of the STOP button on the web interface on the title page.

Wiring diagram:



2) CHARGER AND LOAD CONTROL

We connected a power relay/contactor with a control voltage of a 12V DC coil (same as the battery) to the NC terminals of Relay 2 and we use it to control the battery charger and load (appliance).
Diagram:



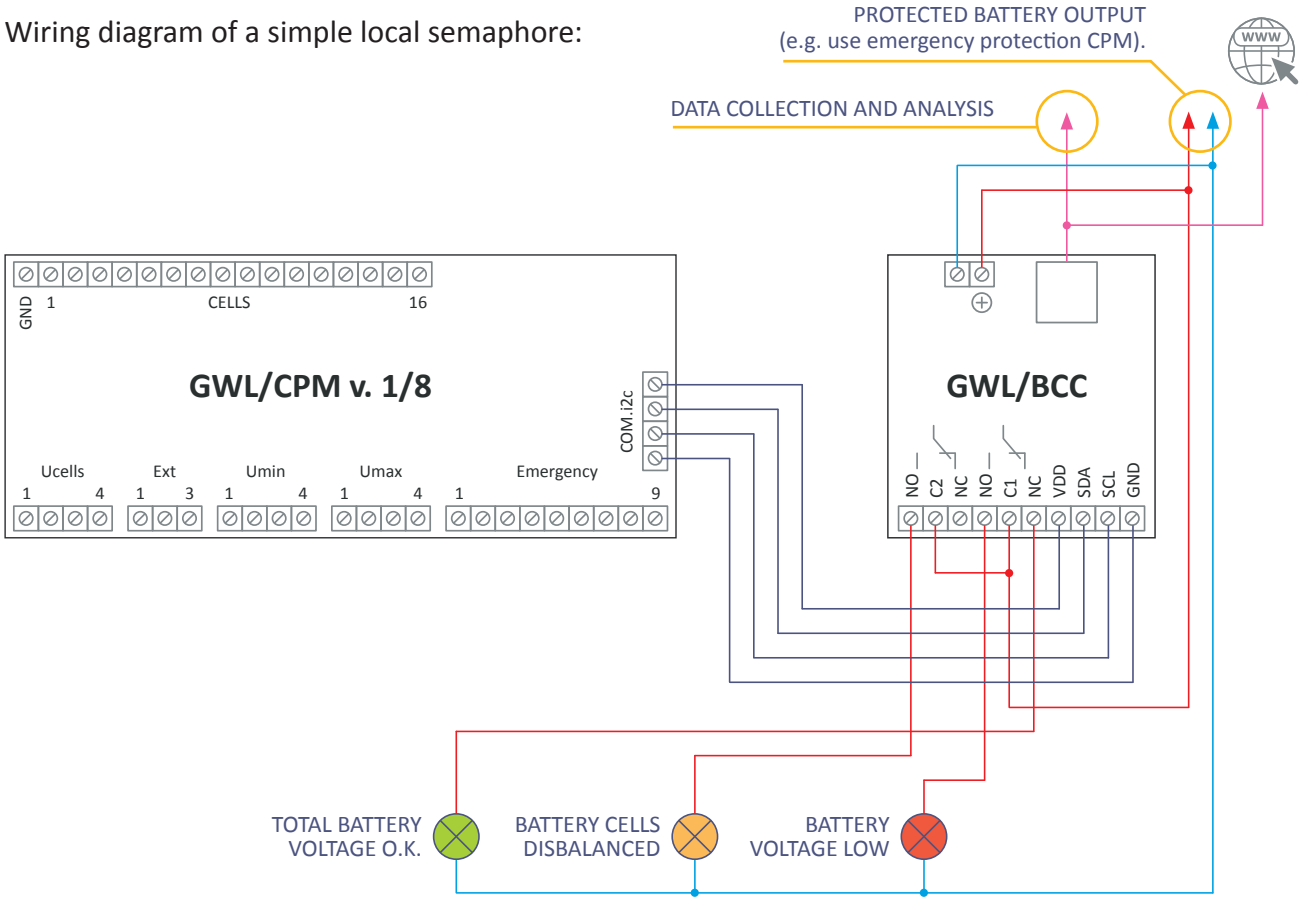
Relay no. 2 was setup as follows:
Switch to ON when battery voltage is < 12400 mV and switch to OFF when battery voltage is > 14000 mV.

Therefore, the charger switches on automatically if the battery voltage drops below 3.10 V/cell (= 12.4V with a 4-cell battery) and switches off if the voltage reaches 3.5 V/cell (= 14.0V/4 cells).
Conversely, a load switched by the same relay (but connected to NC) automatically turns off if the LiFePO4 battery voltage drops below 3.10 V/cell (= 12.4V with a 4-cell battery) and turns on when the voltage reaches 3.5 V/cell (= 14.0V/4 cells).
Next, we set the logic of Relay 1 to: Switch to OFF when (Umax – Umin) > 100 mV; switch to ON when (Umax – Umin) < 30 mV.
The effect is additional battery protection when balancing it.
If we would like to turn on the appliance before the battery voltage reaches 14V or even when the battery is unbalanced, it‘s possible to do so via the BCC web interface or by editing XML on a remote server.
These commands take precedence over the internal BCC logic.
We recommend solving the switching of the charger and load by software. It isn‘t advisable to interrupt a live DC circuit directly with power contactors, it can have a negative effect on the service life of all elements.
By connecting BCC to the thingspeak.com server, we can record the battery voltage and the status of both relays, and we can be sure that the charging and discharging cycle is in progress.

3) LOCAL SEMAPHORE AND VOLTAGE RECORD AT THINGSPEAK.COM

To maintain the warranty and the possibility of remote battery diagnostics, it‘s advisable to continuously monitor and evaluate the voltage of all cells. Any HTTP server is great for this purpose; the thingspeak.com portal is suitable for the default-supported data structure. In addition, it can inform the user about the battery status by email based on the entered rules and logic.
Simultaneously with voltage monitoring and logging, the BCC and CPM set can also signal the state of the battery by the so-called ‘semaphore’, turn on cell balancing, etc.

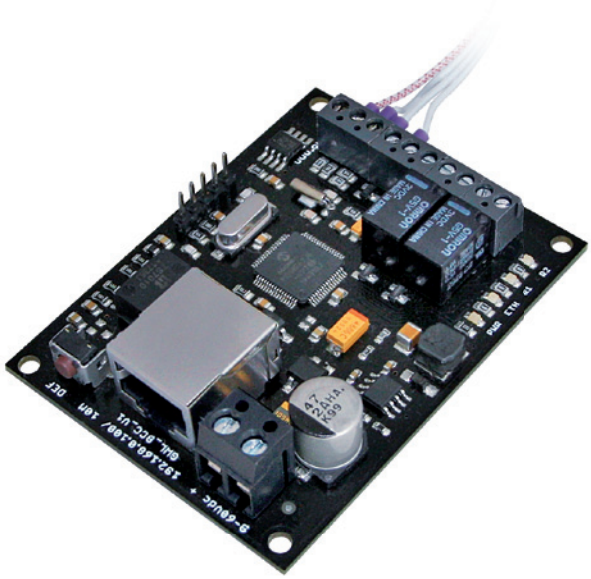
Wiring diagram of a simple local semaphore:



Set the logic of Relay 1 to:
Switch to ON when (Umax – Umin) > 100 mV; switch to OFF when (Umax – Umin) < 30 mV.
Set the logic of Relay 2 to: Switch to ON when battery voltage is < 11600 mV and switch to OFF when battery voltage is > 12000 mV.
As a result, if the battery voltage is low (<= 2.9V/cell), the green LED goes out and the red LED lights up. In addition, if the difference between the strongest and weakest cell is > 0.1V, the orange LED on the semaphore comes on and it is clear to the operator that battery balancing is necessary. The red LED goes out and the green one comes on if the battery voltage rises above 12V again. Independently, the orange LED can still be on if the battery is being balanced.
We then protect the battery against deep discharging at the CPM level, see the separate manual.

General and safety instructions:

The product is not intended for medical applications, it must be installed by a qualified person, in accordance with the relevant regulations for the installation site, and provided with a suitable cover providing its protection against short circuits and contact with other conductive parts of the set. It‘s designed for indoor use, and it‘s necessary to use a mounting box with appropriate protection and ensure that operating temperatures are maintained when installed outdoors.
The product does not contain repairable parts and is factory-tested for full functionality. Do not repair the damaged product yourself, send it to the manufacturer for diagnostics. Improper wiring or short circuits at the terminal block can lead to permanent damage to the product, which is not covered by the manufacturer‘s warranty.
The manufacturer reserves the right to change this manual or firmware without notice and assumes no responsibility for damage, injury, loss, or expenses resulting from an error or omission in the manual or software.



PRODUCT WEBPAGE

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