

### BACS GX R AUX Businterface

The „GX\_R\_AUX “devices will be connected via a separate bus communication cable to the BACS BUSCONVERTER / SPLITTINGBOX / BACSWEBMANGER. Do not use the „GX\_R\_AUX “on a bus communication cable which is also connected to BACS modules. The „BUS1 “RJ10 port of the „GX\_R\_AUX “device has to be connected to the „battery bus “port of the BACS CONVERTER/ SPLITTING BOX/ BACSWEBMANAGER via bus cable. Please reserve one of the two „battery bus “ports of the BACS BUSCONVERTER / BACSWEBMANGER or if occupied one port of the SPLITTINGBOX for the „GX\_R\_AUX “.

Up to Firmware 2.10: It is possible to connect up to 4 pcs. „GX\_R\_AUX” to the bus.  
 Firmware 2.12 onwards: It is possible to connect up to 8 pcs. „GX\_R\_AUX” to the bus.

Use the „BUS2” Rj10 port of the „GX\_R\_AUX “to connect more „GX\_R\_AUX “devices.

#### Assembling:

The „GX\_R\_AUX “is designed for DIN Rail mounting.

#### Addressing:

The „GX\_R\_AUX “will be addressed via the 4-pole dip switch „ADDRESS “. The switch setting defined the ID of the „GX\_R\_AUX “. The table below shows the possible switch settings and ID definition:

DIP1:	DIP2:	DIP3:	DIP4:	Device number:
off	off	off	off	GX_R_AUX 1
on	off	off	off	GX_R_AUX 2
off	on	off	off	GX_R_AUX 3
on	on	off	off	GX_R_AUX 4
off	off	on	off	GX_R_AUX 5
on	off	on	off	GX_R_AUX 6
off	on	on	off	GX_R_AUX 7
on	on	on	off	GX_R_AUX 8
off	off	off	on	GX_R_AUX 9
on	off	off	on	GX_R_AUX 10

If you change the switch settings during the operation mode a short disconnection of the power supply (bus cable) is necessary to activate the new configured ID.

#### Status LED:

The green status LED on the „GX\_R\_AUX “is blinking if the bus power supply is connected and lit static if the bus power supply is connected and the communication to the BACSWEBMANAGER has started (normal operation). If the communication will disconnect the LED start blinking after about 60 sec.

**The GX R screw terminal connectors:**



Screw Terminals 1-14	
1	Not Connected
2	Not Connected
3	Digital Input 1
4	+12V (supply for input 1)
5	Digital Input 2
6	+12V (supply for input 2)
7	Digital Input 3
8	+12V (supply for input 3)
9	Digital Input 4
10	+12V (supply for input 4)
11	Alternative BACS bus +12V power supply
12	Alternative BACS bus data input
13	Alternative BACS bus data output
14	Alternative BACS bus ground

Screw Terminals 15 - 28	
15	Relay Contact 1 NO
16	Relay Contact 1 NC
17	Relay Contact 1 Common
18	Relay Contact 2 NO
19	Relay Contact 2 NC
20	Relay Contact 2 Common
21	Relay Contact 3 NO
22	Relay Contact 3 NC
23	Relay Contact 3 Common
24	Relay Contact 4 NO
25	Relay Contact 4 NC
26	Relay Contact 4 Common
27	<b>Not connected</b>
28	<b>Not connected</b>

Alternative BACS bus: Pins 11 to 14 don't need to be connected, when the device is powered over "BUS1" or "BUS2" RJ-10 jack by BACS bus. If a connection through "BUS1" or "BUS2" is not wanted, you may use the alternative BACS bus connectors Pin 11-14 on this GX\_R\_AUX terminal.

NO: normally open  
 NC: normally close

**GX\_R\_AUX Configuration guide**

For this configuration step, navigate to the following menu:

- BACS	→ System tab: BACS
⚙ Setup	
⚙ Setup GX_R_AUX	→ <b>GX_R_AUX</b>
🔔 Events	→ <b>Event configuration of the GX_R_AUX</b>
🔧 Functions	
⚠ Alarm Thresholds	
🔥 Thermal Runaway	→ <b>Thermal Runaway configuration dialog</b>
🗑 String Names	
📁 Programmer	

**Step 1 - Setting up a mandatory GX\_R\_AUX ID**

Set up a corresponding ID - the ID's you choose hast to start with 1 and ends with a number according to the number of GX\_R\_AUX you wish to use. Please note the following conditions:

- An ID may only be assigned once
- The first device receives the ID 1, then it is consecutively numbered
- Do not use more than the maximum of 4 GX\_R\_AUX within one BACS installation.

**Step 2 - At BACS WEBMANAGER, open the GX\_R\_AUX configuration dialog**

In the configuration dialog, you can use the BACS Webmanager to specify the number of installed modules:



**Number of Connected GX\_R\_AUX**

Enter "0" to disable the function. Otherwise, set the number of used GX\_R\_AUX modules and click Apply. Due to the fact new devices have been added to the BACS bus, the web manager must reboot BACS to find and initialize the new devices accordingly. This procedure will only restart required services, neither the WEBMANAGER itself nor the UPS will reboot.

## Note

The BACS WEBMANAGER will program the ID of a GX\_R\_AUX - the ID will be set by the DIP switch bank. After setting up the hardware ID of the GX\_R\_AUX, the WEBMANAGER will be configured to search for the specific number of GX\_R\_AUX that are placed inside the BACS installation. If the estimated number of GX\_R\_AUX is not found, a corresponding error message will occur.

You can follow the success of the initialization in the upper task bar.

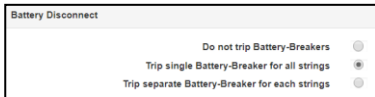
BACS:  Restarting → BACS is starting / initializing  
GX\_R\_AUX:  → GX\_T\_AUX is ready to use

## How to set up the outputs of a GX\_R\_AUX as battery breaker

### Under Thermal Runaway, activate the battery breaker functionality

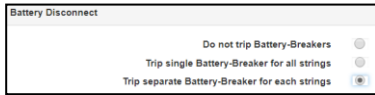
Before configuring the GX\_R\_AUX outputs and associated events, you need to decide if and how many battery breakers you need. Open the Thermal Runaway configuration dialog - the battery breaker configuration is mostly done automatically, which manifests itself in subsequent configurations:

1. According outputs will be labelled automatically
2. Events and jobs assigned to a Thermal Runaway are automatically entered



The total number of required battery breaker depends on the number of strings you configured at BACS general setup.

If you want to use one battery breaker for the complete installation, select the option *Trip single Battery-Breaker for all strings* “.



If you want to use a single battery breaker for each string installed in your BACS System, select the option „Trip separate Battery-Breaker for each string  
Press *Apply* when ready.

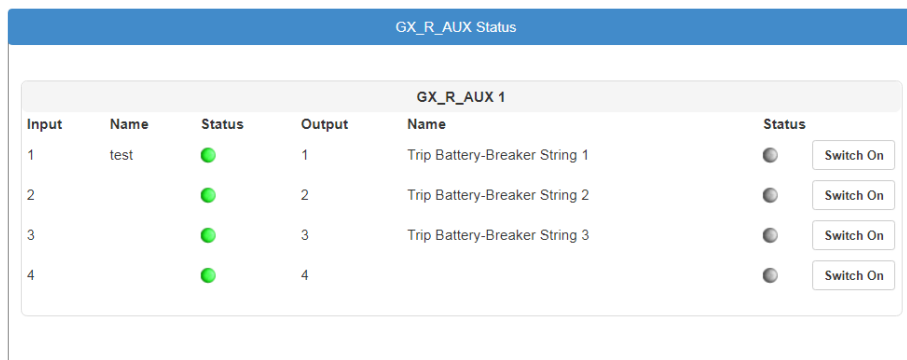







### Under Setup GX\_R\_AUX, you will find new entries:

As you can see, BACS auto-labelled your GX\_R\_AUX Outputs according to your settings. You cannot re-label them - they are reserved for the battery breakers. Please note: If you use battery breaker, ensure, the NC Contact Flag is not set! Again, press *Apply* when ready

Output	Name	NC Contact
1	<input type="text" value="Trip Battery-Breaker String 1"/>	<input type="checkbox"/>
2	<input type="text" value="Trip Battery-Breaker String 2"/>	<input type="checkbox"/>
3	<input type="text" value="Trip Battery-Breaker String 3"/>	<input type="checkbox"/>
4	<input type="text"/>	<input type="checkbox"/>

### How the BACS WEBMANAGER will count the battery breaker:

The first battery breaker will be associated with output 1. From there onwards, all battery breaker will be counted one by one. If several AUX are in use, the 5th battery interrupter is configured on the 2nd AUX, Port 1. The classification as battery breaker will exclude any existing configuration - the configured output can only be used for the according battery breaker. Furthermore, depending on the number of GX\_R\_AUX devices, an individually configured additional configuration dialog will appear: Name the inputs and outputs in free text. These labels can be found next to the inputs and outputs at the GX\_R\_AUX - Monitor:

GX_R_AUX Status					
GX_R_AUX 1					
Input	Name	Status	Output	Name	Status
1	test		1	Trip Battery-Breaker String 1	 <input type="button" value="Switch On"/>
2			2	Trip Battery-Breaker String 2	 <input type="button" value="Switch On"/>
3			3	Trip Battery-Breaker String 3	 <input type="button" value="Switch On"/>
4			4		 <input type="button" value="Switch On"/>

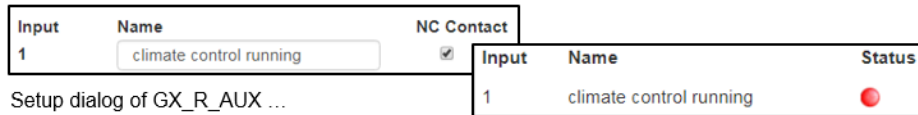
### Normally Open / Normally Closed

If you do not use battery breaker you may use the outputs freely. Depending on your settings, the behaviour of the BACS WEBMANAGER changes when dealing with contacts:

#### *NC / NO input configuration*

The inputs provide to connect any potential-free switch contacts. It can be distinguished whether a contact must normally be closed (NC) or open (NO). By Changing from NO to NC behaviour, it is possible to harmonize the contacts to third party devices.

A switching state in opposition to the configuration is provided with a red alarm marker:



BACS GX\_R\_AUX monitor

In this case, the climate control will close the contact if running. Otherwise, the Status is marked red – the climate control is off.

*NC / NO output configuration*

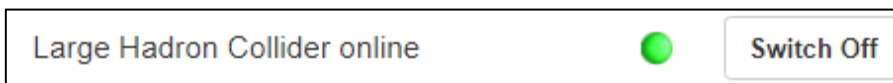
The outputs can be assigned via the terminal strips 15-26. This option defines if a contact is generally closed and needs to be opened or open and has to be closed. During the BACS initialization, the switches automatically take the correspondingly configured switching states.

Please note:

A NO - normally open - contact is open at system start-up and **must be closed /turned on** accordingly:



An NC - normally closed - contact is closed at start up and **must be switched to off / open** accordingly



Depending on the configuration, the marker is green (active) or grey (disabled).

**Defining jobs to GX\_R\_AUX input events**

BACS use a stand-alone event and job management.

This allows to use a BACS system completely without a UPS connection in stand-alone operation and use its own sensors.

To define a job, open the events menu in the BACS configuration menu and search for the following entry:

>	<input type="checkbox"/>	+	<input type="checkbox"/>	BACS GX_R_AUX 1 Input 1 Alarm Off	3	1	0	1	0
>	<input type="checkbox"/>	+	<input type="checkbox"/>	BACS GX_R_AUX 1 Input 1 Alarm	3	1	0	1	0
>	<input type="checkbox"/>	+	<input type="checkbox"/>	BACS GX_R_AUX 1 Input 2 Alarm Off	3	1	0	1	0
>	<input type="checkbox"/>	+	<input type="checkbox"/>	BACS GX_R_AUX 1 Input 2 Alarm	3	1	0	1	0

BACS GX\_R\_AUX 1 defines the module assigned with the ID 1 via the DIP bank. If you have more modules in use, they will be listed automatically as AUX 2, AUX 3, and AUX 4 inside the event menu. The current alarm ON/Off state will be determined by NO / NC contacts definition at GX\_R\_AUX setup. At the event handling, it is possible to configure what will happen at the current contact state.

**Note**  
The word "alarm" itself is relative meaning in this context. You can also communicate with other devices through the inputs and, for example, get switching confirmations - you are not forced to use this as an "alarm" notification.

*Setting up a job*

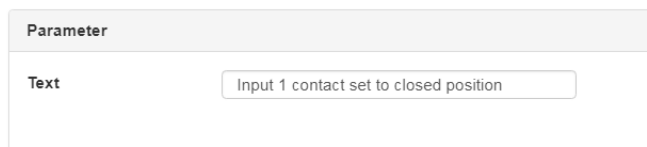
In this example, a log entry job is set to Input Port 1.

To enter a new job, select + at Input 1 Alarm – this will open the job configuration dialog:

1. As Job, choose „Log “:



With the job type, the parameters will be adapted automatically. In this case, you can type a free text messages that will appear at the event log if GX\_R\_AUX 1 input port 1 reports a closed alarm contact position:



Timing will allow to define when this job shall be executed. In this case, the job is executed once, at the precise moment when the defined alarm behaviour occurs. For more information, please refer to the chapter event handling at part 1 of this manual.

**Timing**

Immediately, once

After  seconds

After  seconds, repeat all  seconds

After  seconds on Battery

At  seconds remaining time

With save, the job will be written to the configuration file and executed as soon as the according event occurs. You do not need to restart the CS141 / BACS WEBMANAGER.

*Checking the job configuration:*

To test the job, unfold the event *BACS GX\_R\_AUX 1 Input 1 Alarm* by clicking

Your new job will be displayed:

Log

Einmal, sofort

{"text": "An Input 1 wurde der Kontakt geschlossen!"}

At this menu, you can edit, delete or test the job. More information can be found at event handling configuration in part 1 of this manual.

#### Communicate with third party devices via GX\_R\_AUX outputs

In this example, a third-party monitoring device shall be triggered by AUX output port 1.

1. Choose the event that shall trigger the output and press **+** to start the job configuration dialog
2. As job, choose AUX:

**Job**

AUX
▼

Depending on the number of installed GX\_R\_AUX modules, you can select an individual port from the list: In this example, GX\_R\_AUX 1, Port 3 is selected.

By doing so, use at GX\_R\_AUX output screw bar these screw connectors:

- 21 Relay contact 3 NO\*
- 22 Relay contact 3 NC\*\*
- 23 Relay contact Common

The wiring method determines what will happen in case of the command „Set High (On)“:

- NO <-> Common
- On trigger, the contact will be closed
- NC <-> Common
- On trigger, the contact will be opened

The standard configuration for these contacts is NO <-> Common. For this example, Port 3 will be closed as soon as the according event will occur.

**Parameter**

**Port Number** GX\_R\_AUX 1, Port 3 ▼

**Command** Set High (On) ▼

Timing will allow to define when this job shall be executed. In this case, the job is executed once, at the precise moment when the defined alarm behaviour occurs. For more information, please refer to the chapter for advanced event handling at part 1 of this manual.

**Timing**

Immediately, once

After  seconds


After  seconds, repeat all  seconds


After  seconds on Battery

At  seconds remaining time

With save, the job will be written to the configuration file and executed as soon as the according event occurs. You do not need to restart the CS141 / BACS WEBMANAGER.

Checking the job configuration:

At the according event, click  to unfold the job list configured to this event:  
The new job should be added accordingly:

			Log	Einmal, sofort	{"text":"BACS started"}
			AUX	Einmal, sofort	{"port":"102","on_off":"1","text":"BACS started"}

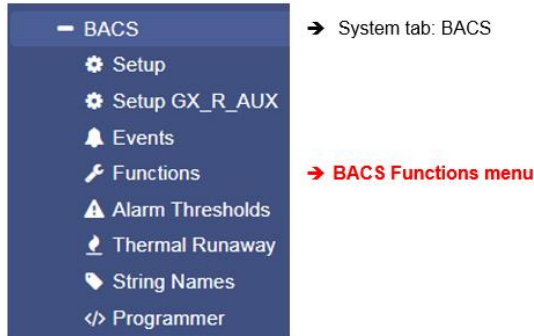
From here, you can edit, delete and test the job. Results can be seen at the GX\_R\_AUX monitor as well as event chains may be triggered.

**Note**

For the complete description of event handling including all symbols, please refer to page 58 of this manual, chapter:  
**System event handling**

**BACS Functions**

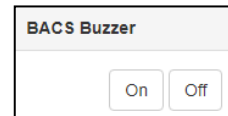
For this configuration step, navigate to the following menu:



Each BACS WEBMANAGER offers basic functions that can be switched on or off remotely via the web interface.

**BACS Buzzer**

This internal alarm provides a clear audible warning signal as soon as there is a problem with your BACS system or the connected sensors occurs or in the case of a so-called General Alarm. As a default, the buzzer will be triggered in case of the event „BACS General Alarm “.



**BACS Relay**

Parallel to the alarm buzzer, BACS provide an internal relay:  
With this relay external monitoring systems can be informed that something went wrong. The internal BACS alarm relay is linked to a general alarm and cannot be configured: The relay is a pre-defined normally closed contact, which automatically picks up about 15-20 seconds after system start-up and is only reopened in case of a system fault:

1. A BACS General Alarm is in progress
2. The BACS WEBMANAGER or BACS Bus Converter is depowered.



Master alarm will start, if ...

- Voltage alarm high/low,
- Temperature alarm high/low
- Impedance alarm high/low
- Communication lost to one or more modules or a system alarm is in progress
- Thermal Runaway alarm
- Equalizing / Balancing Error alarm
- String voltage alarm

**Note:**

If you manually open the relay, it remains open until one of the following conditions is met:

- The device restarts (by rebooting via software button or in case of a cold boot).
- An active BACS-alarm falls back to normal state (voltage measurements reach alarm levels and drops below).
- It will be closed via BACS relays functions menu.

**BACS alarm thresholds**

In principle, there are two points during usage, that may heavily damage the batteries of a UPS system:

*Battery Overvoltage*

The overvoltage occurs if a UPS initiates a boost charging cycle to restore emergency power time as fast as possible after a discharge. As an example, the charging process will be done with a boost charge or operates with predefined charging voltage. In both cases, the reference charging point is the slowest loading battery to rule the entire charging process. As result, normal or fast charging batteries are consequently overcharged, leading into average temperature issues and as a long-term

consequence, overcharging the cells in the battery are damaged through the dehydration process coming with abnormal temperature usage. Overcharging will damage the battery, but this is not enough: As a consequence of an overcharge, a battery will heat - this may lead into a dangerous battery overheating and fire issue. Conversely, a battery damaged by overvoltage can subsequently not meet the requirements set, which leads to different behavioural characteristics:

- Extended loading time
- Permanently performance decrease
- Temperature increasing with each charge/discharge cycle
- Sporadically dropping below the discharge end voltage
- Lapsing service time
- Overheating and acute fire hazard.

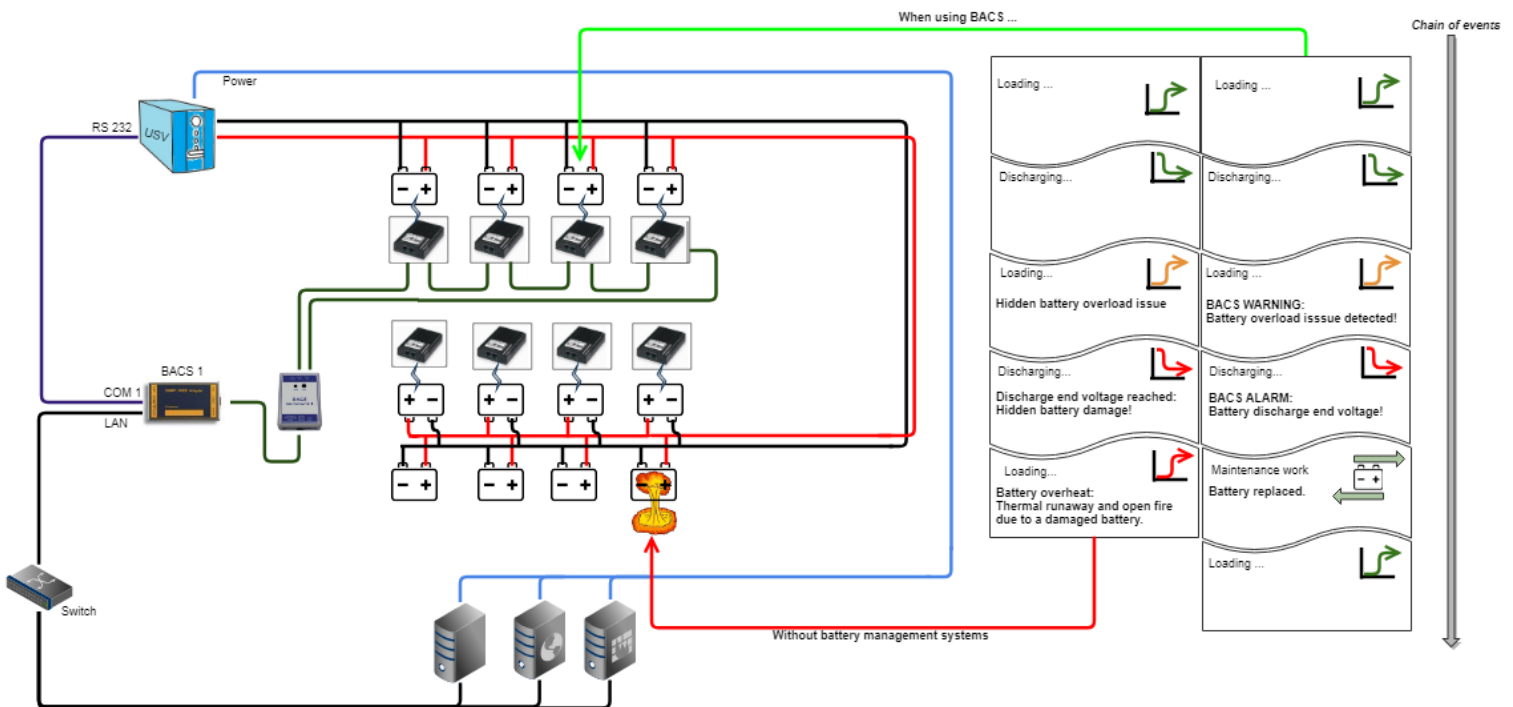
Which defects occur exactly depends on the type of battery as well as the basic conditions. Overloading should, if possible, be avoided for these reasons.

**Deep discharge**

During deep discharge, a cell of a battery is discharged during use until a complete depletion. In case of a deep discharge, the voltage drops below the final discharge voltage, a condition in which a wide variety of defects may occur. Depending on the type of battery even a single deep discharge can damage the battery internally so that it can lead into a total failure or even a polarity reversal of the battery contacts. Reloading damaged battery can be very dangerous because the reaction to the charging current unpredictable:

Although the battery is faulty, it initially appears to be responding normally to the charging process initiated by the UPS - a creeping malfunction can appear up to 16 hours after charging is complete. Everything may happen, starting at an acute overheating when starting or during charging process as well as a seemingly sporadic phenomenon during charging that leads creeping into a fire issue many hours later.

**Note**  
Typically, a UPS will stop operating in time to avoid this deep discharge, but overvoltage or undervoltage that weaken the cells, cannot be detected the UPS.



**Technical data and specification BACS GX R AUX:**

description :	GX_R_AUX BACS Businterface
Voltage range power supply :	12- 30 VDC
supply:	via 4pol. BACS bus communication cable
current consumption typical:	about. 170mA with 12V
control:	DIP-switch for ID assignation
indicator:	LED for status, inputs and outputs
connections:	2 RJ10-ports ,28 screw terminals (4 dry relay contacts (two-way contacts), 4 digital inputs, BACS Bus)
Busprotocol:	proprietary Generex busprotocol, 9600 Baud
Max. relay contact load:	30VAC – 2A, 30VDC – 1A
Operating temperature :	Temperature 0 - 60°C, max. Humidity 90%
Humidity:	0 - 95% not condensated
Dimensions :	75 x 75 x 47.5 mm = 2,95 x 2,95 x 1,87 in. (B x H x T)
Weight:	170g
Protection class :	IP 20
Housing:	PC (Polycarbonate)
Certifications:	DIN EN 50178, RoHS