GENEREX

BACS®

BACS ® - Battery Analysis & Care System

3rd Generation Battery Management System

- **Monitoring, balancing & alarm system for accumulators**
- **Avoid unnoticed or unexpected battery failures, extending the battery lifespan and preserving the reliability of the complete system**

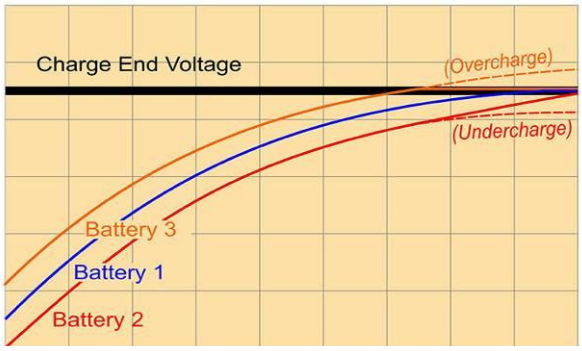
The patented BACS „**B**attery **A**nalysis & **C**are **S**ystem" now the 3rd generation is the most advanced product on the market today providing an Ethernet-network integrated battery monitoring and management system. Using web-management technology it checks the internal resistance, the temperature and the voltage of every single accumulator.

Through our patented balancing process (in Europe known as "*EQUALISATION", in the rest of the world known as "BALANCING")* it corrects the charging voltage of each accumulator individually to the chargers target value . The accumulators are kept in the optimal voltage operating range.

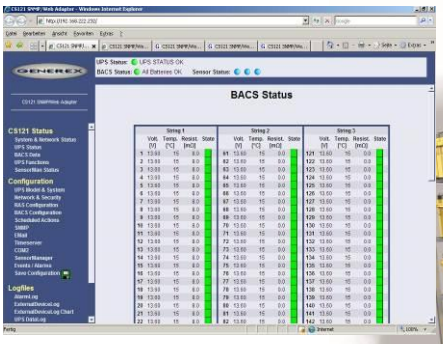
Note: The European wording "Equalizing" should not be misunderstood as the overcharging process known from wet-cells in other parts of the world. "Equalizing" is a balancing of voltages of every cell towards the chargers target voltage. This harmonization of voltages is called "BALANCING" or "EQUALIZING" and should be understood as identical)

The constant monitoring and controlling of the individual charging voltages for each accumulator guarantees the availability of the battery at all times – making the Achilles'heel of a UPS systems (or any other battery powered device) a thing of the past!

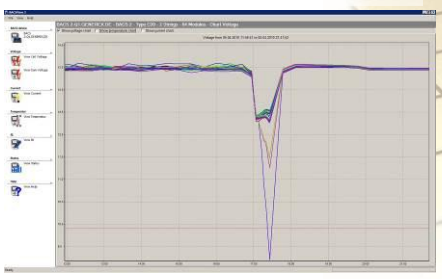
In addition, it can manage environmental measurements (temperature, humidity, acid fill level, hydrogen gas concentration, etc.) and appliances (UPS, inverters, transferswitches, generators, dry contacts, air conditioning systems, etc.).
BACS is the ideal system for all lead-acid based accumulators (open/wet cells, maintenance free, gel, AGM), etc. and NiCd, NIMH and most types of LI_ion accumulators.



Charging process of accumulators with BACS® patented equalisation – the charging of battery 3 is capped to prevent overcharging and gassing. Supply of charging energy to battery 2 is continued and boosted until the target charging voltage is obtained. Battery 1 performs ideally and is not regulated.



BACS® web server displays here the battery status of 140 accumulators. Actual impedance, temperature and voltage of every cell is displayed and stored. Status LEDs show a change of color if any accumulator drifts beyond thresholds.



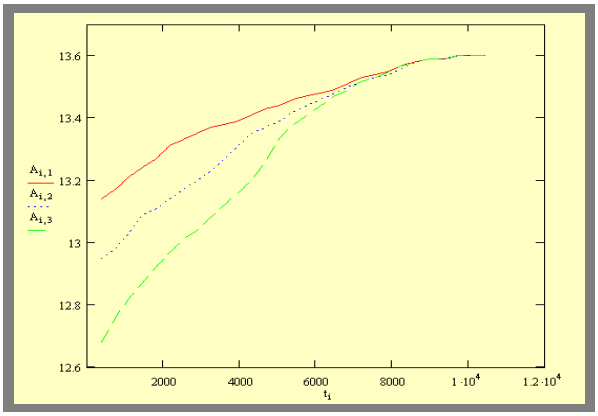
Discharge process displayed through BACS VIEWER software shows the voltage drop of several batteries during a discharge, unnoticed by the UPS. In a later stage these accumulators would make the complete system collapse. BACS corrects this problem and tries to fully recharge this specific battery!

TEL +49(40)22692910 - EMAIL generex@generex.de - WEB www.generex.de (This and all other product datasheets are available for download.)

BACS® features at a glance

- **Monitoring and regulating the charging process:** The system is designed for monitoring and optimizing lead-acid and other accumulator types in a group of batteries.

- **Individual voltage regulation:** BACS® is regulates the voltage supply for every accumulator from the charger/UPS. This results in a homogenous set of accumulators with at most capacity and lifespan. This regulation process is patented as “EQUALISATION”, (also known as “BALANCING”).



Oscilloscope graph of battery voltages at an equalising /balancing process: The voltages of the 3 batteries behave different because of the regulating influence of the BACS modules. The ideal harmonic charging curve will be archieved for every battery in the string.

- **Avoid overcharging:** Through the EQUALISATION/BALANCING process the unnoticed overcharging of individual batteries (gassing, dry-out, thermal runaway) is prevented.

- **Avoid undercharging:** Through the EQUALISATION/BALANCING process the unnoticed undercharging of individual batteries (sulphation, loss of capacity) is prevented.

- **Indicator of battery problems:** Typical battery problems like sulphation, corrosion, gassing, dry-out, thermal runaway etc. are visible through a massive change of impedance and – later - temperature.

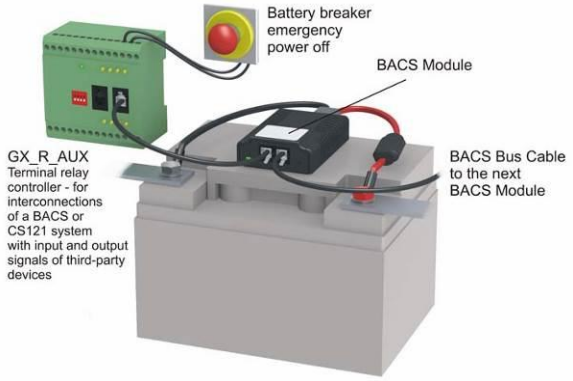
- **Avoid sulphation :** Sulphation is a typical problem for UPS batteries because they are consistently held at a float charge level for a long time or are using a charing principle which keeps the batteries uncharged over a longer period of time. Its not guaranteed that ALL accumulators have really been fully charged when the UPS charge switches from boost charging to float charging. The result maybe that some accumulators are overcharged, while others have never been fully charged. EQUALISATION/BALANCING avoids sulphation by keeping ALL accumulators to a balanced voltage level and keep them at the ideal SOC – which results in the ideal SOH.

- **Show stratification:** BACS warns through increasing impedance and drifting voltages of a possible stratification of the electrolyte. Acid-gel-water mix requires from time to time a discharge process to reverse the stratification due to gravity. Through the discharge process the stratification can be removed and the BACS shows this effect through a lower impedance and improved equalizing/balancing performance.

- **Protection of neighbour batteries:** BACS avoids damages on neighbouring accumulators through the equalisation process in balancing all individual voltages of the accumulators. A new battery which has been added to a string of old batteries is protected against overcharge and a swap of all older batteries is no longer necessary.

- **Battery alert system :** Through monitoring of key parameters of the accumulators and measuring against set thresholds, the system is able to give you pre-warnings via audible, visible and network messages that attention is required.

- **Battery breaker switching at thermal runaways:** Through the embedded dry contact output the BACS system may trip the battery breaker in case of high battery temperature. An automatic stringwise battery disconnection is possible at the use of the GX_R_AUX relay which can trip the battery breaker at user defined parameters which define a thermal runaway.



The GX_R_AUX module provides 4 relay contacts plus 4 digital inputs. One of the standard functions is the control of up to 4 battery breakers to avoid a thermal runaway. The digital inputs read eg. the battery breaker status and display this in the BACS web interface. Any other alarm device may be connected to the outputs (eg. alarm buzzer, breaker etc.) or digital inputs of the GX_R_AUX..

- **Increase battery capacity:** BACS® guarantees, through EQUALISATION/BALANCING, a full charge level and the optimal capacity of a battery system.

- **Early warning to replace batteries:** Through impedance trending you can see in an early stage that some accumulators are damaged or simply weaker than others. The earlier accumulators are replaced the better for an increased lifetime of the complete battery system!

- **Extension of service life > 30%:** The service life of all accumulators in a string depends on the weakest cell or the weakest battery. Typically the service life of accumulators in a UPS are 50-60% of the manufacturer design life. By equalizing/balancing all batteries are kept constantly in their ideal voltage window so that all negative influences of wrong charging voltages and currents within the string are eliminated. Through this constant „care“ process through equalizing/balancing, it is very likely to increase the service life >30% compared to a system without. At ideal operating conditions it is possible to keep batteries in a string operating until the design life, and beyond ! From scientific researches it has been proofed that equalizing increases the service life for at least 10%. From our own testresults since year 2004 we can proof today that more than 50% service

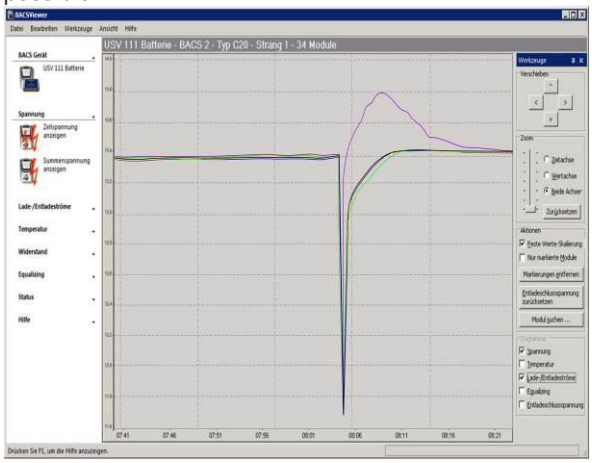
life has been reached. We hope to be able show that with equalizing even more than the design life is possible. (2 BACS systems running in our labls since 2004 with 5-10 years design life batteries, already 2 years longer in operation than the design life and still performing.

- **Power & environmental alert system :** The BACS system monitors environmental parameters (temperature, humidity, hydrogen gas concentration, acid fill level, DC current, dry contacts etc.) and UPS system data. This information including alarm alerts is available via a mix of multiple communication systems.

- **Maintenance:** A BACS system improves the service quality by providing remote monitoring through Internet, VPN or other network for downloading real time data and battery history for analysis. Individual battery tests are now possible without the effort to disconnect batteries from the group. Maintenance and battery testing are possible to take place at time, under real operating conditions, without downtime of the system!

- **UPS SNMP & MODBUS MANAGER:** A BACS system includes a full qualified UPS/SNMP and MODBUS manager - compatible to any UPS vendor in the market! A unique function in the market of BMS system.

- **MODBUS/PROFIBUS/LONBUS/SNMP :** A BACS system allows MODBUS clients to read the data of the BACS system through IP and RS232 (optional through RS485) and through SNMP. Through optional converters a conversion to PROFBIS and LONBUS is possible.

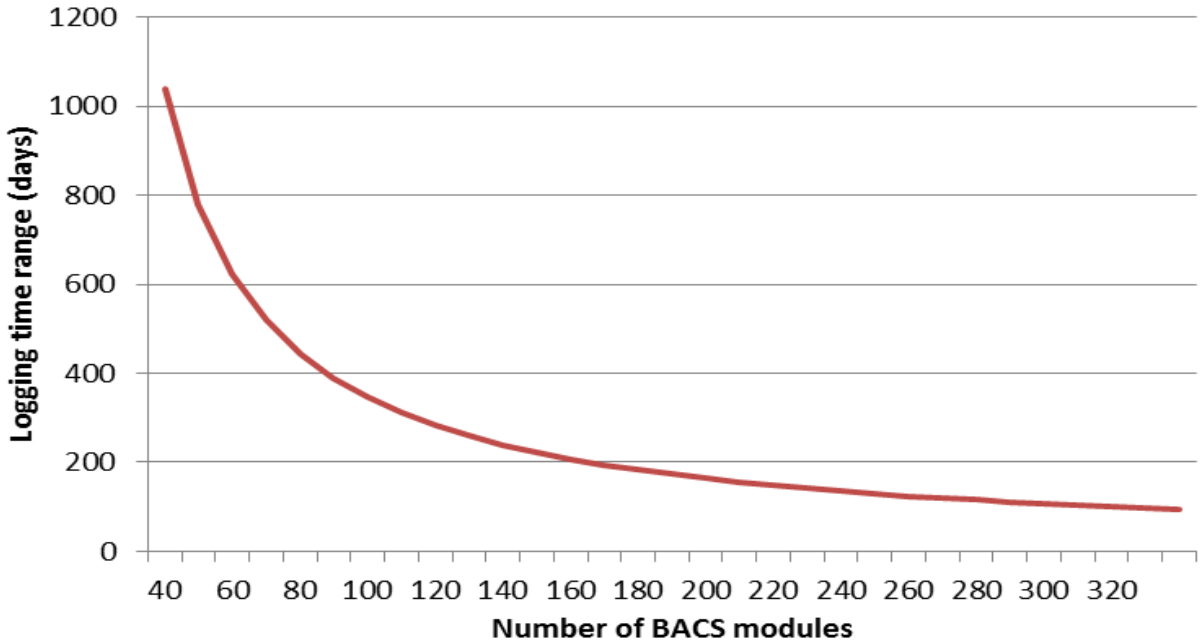


The free BACS VIEWER software shows the EQUALISATION/BALANCING of a battery within a string or 32 batteries (shown as bold violet line) during a discharge/recharging process .

BACS EQUALISATION/BALANCING avoids that this violet accumulator gets overcharged, while other accumulators still require further charging.

- **Free BACS VIEWER analysis software :** Provides graphical BACS data analysis and reports!

Flash ROM capacity for battery history depending on no. of BACS modules in the system



No. Of BACS Modules	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330
Log range in flash ROM (in days)	3112	1556	1037	778	622	519	445	389	346	311	283	259	239	222	207	195	183	173	164	156	148	141	135	130	124	120	115	111	107	104	100	97	94

This tables shows the capacity of the BACS WEBMANAGER flashrom for the BACS data during float charging operation. (Autosave of battery data every 20 minutes). At a discharge or any other alarm, the autosave intervall is drastically reduced which increases the data to save on the flash rom to provide very precise data for the analysis through the BACS VIEWER. The number of BACS modules and the number of discharges determines the available capacity. The table above shows the storage of battery history in days on the flashrom, assuming that there is no discharge and the system operates normally. This amount of data is available for the transfer to other storages in the network. Older files get overwritten and only the latest battery data is kept on the flashrom. We recommend to use the BACS VIEWER software for regular downloads of battery history and storage on a remote computers harddisk.

BACS Description

The reliability of an accumulator based power supply can only be guaranteed when the availability of each accumulator is at 100% capacity all of the time!

The BACS® battery modules have instruments for taking exact measurements of the internal resistance, temperature and voltage which are valuable for making a precise analysis of each battery. The data is transferred through a bus system to the BACS WEBMANAGER which is at the same time the manager for UPS, inverters, environmental sensors, Transferswitches, Generators, dry contacts and other devices.

The BACS WEBMANAGER acts as the central control unit by gathering, evaluating and storing all information on its internal flash memory. A webserver displays the actual status of the accumulators, a 2nd webpage shows the actual UPS data and a 3rd webpage shows environmental data and alarm contacts status. The web browser interface of the system is designed for easy configuration, displaying all system values and events, a flexible EVENT MANAGER is the programming interface for automatic reactions in case of alarms.

The BACS WEBMANAGER reads the individual accumulator voltages in relation to the ~~current~~ chargers target voltage level of the overall system. This value is sent to every BACS® module which starts counter steering if any of the accumulators voltages deviate from this target voltage. This process is called “EQUALISATION” or “BALANCING” and ensures that the voltages of all accumulators are equalized/balanced within a window of 0.01 volt precision.

The BACS® system limits the charge to already overcharged accumulators to avoid gassing and drying. Undercharge is prevented to avoid sulphation. Each individual accumulator receives an optimal charging voltage through this EQUALISATION/BALANCING process and therefore kept at an optimal SOH (State of Health) for all times.

Limiting the charging voltages of the accumulator increases the durability and reliability of the whole system considerably.

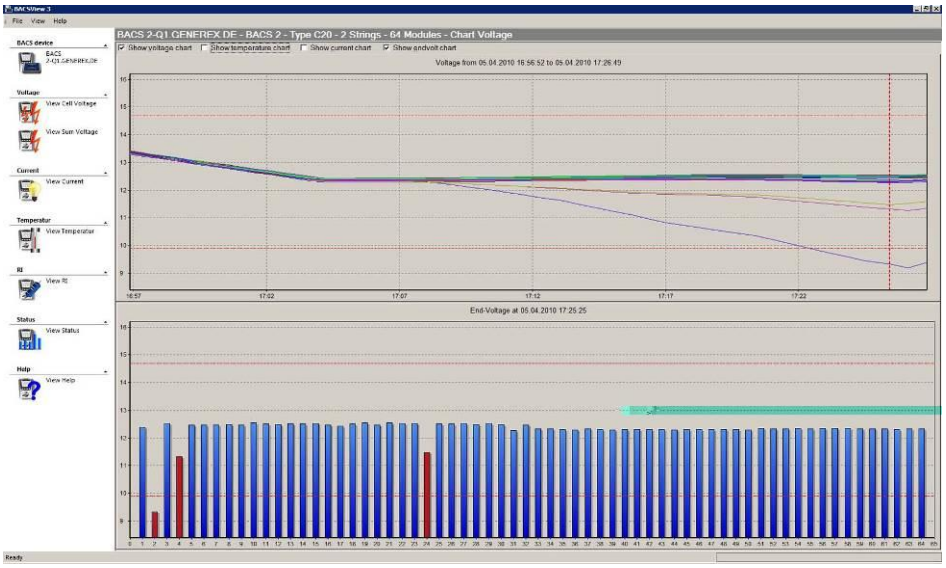
Rising internal resistance of an accumulator due to corrosion or sulphation will trigger an alarm. Alarm values can be configured to match the type of battery. This „early warning system“ makes it possible to warn users (by email, email-to-SMS, network message, SNMP, RCCMD, MODBUS, PROFIBUS, LONBUS etc.) far in advance about battery weaknesses before it is too late. For instance, should sulfation increase internal resistance, the user can reverse this process with a series of discharging and charging cycles. The effect of such „battery training” on the internal resistance can be observed immediately – no risk anylonger to damage batteries at a battery test without knowing.

In addition to internal resistance, the values for voltage, temperature, equalizing/balancing, current (optional) and the number of charging/discharging cycles are constantly monitored and compared with preset thresholds. When any of the threshold values are exceeded, corresponding alarms will be communicated using the network connection, email, SMS, SNMP, RCCMD, MODBUS and (optional) PROFIBUS, LONBUS or GSM.

At the BACS MANAGER an alarm buzzer acoustically warns the users. An alarm LED on the module and on the BACS MANAGER shows the alarm optically.

The BACS WEBMANAGERs are equipped with a large flash MEMORY or SD memory cards that can log all system data for a duration of at least 6 months and up to 3 years dependent of the size of the system. All data can be downloaded and archived over the network in order to free-up storage capacity for further data logging and for analysis using the BACS VIEWER software or other graphical tools.

The alarms for other devices connected to the BACS WEBMANAGER (e.g. UPS) are logged in various other files on the device and at remote interfaces. The BACS WEBMANAGER is equipped with a real-time clock for precise data/time stamps in the log files, additionally the system time is automatically synchronized with a network time server (SNTP).



BACS Viewer shows the individual battery voltage of all accumulators at the end of a discharge. The red dotted line shows the voltages when power has returned. In the lower bar graph is shown which accumulators have collapsed earlier than others and have been discharged. to a very low level. These accumulators are a risk to the complete system.

Accumulators in UPS applications

In a typical UPS battery installation there could be many accumulators (singles cells, multiple cells like 6Volt, 12Volt, 16Volt accumulators) that are connected in series to archive a high voltage in the string. Modern UPS with IGBT rectifiers are working very efficiently, but require a high string voltage, compared to the string voltages of older type transformer UPS systems. This increase in string voltage has in turn increased the number of accumulators required within a string. It is not unusual to have 800 Volts or more within a string of accumulators – with the equivalent larger number of batteries/cells. Modern UPS tend to have to use many more accumulators per string, but smaller capacities to avoid more space in the server rooms.

Short battery life in UPS usage: The more accumulators that are in a string, the more cables, connectors, distances are involved which leads to higher and lower potential within the battery string. The more resistive materials accumulator placement, length of cabling etc. the more differ the impedances within the accumulators of this string and the more the charging levels/voltages are different. This effect gets over the time so dramatic that a window of 2 volts and more is not unsuual within a string. The differences will in the beginning in the 10th's of a volt but over time an accumulator that is at the stated float of 13.60 Volt will drop incrementally as other accumulators rise as the current will flow elsewhere. Taking in to play that all accumulators are not created equal, it is just logic that in a string their individual accumulators/cells will never get the correct amount of charge they need to prevent sulfation and dry out as well as premature aging and failure.

For years, this was simply commonly accepted in the UPS industry and nobody ever thought it could be a problem to have voltage difference in a battery string of 1 Volt or more. Since there was no technical solution the UPS maker did not focus on this problem and simply recommended to replace accumulators far earlier than the designed lifetime to reduce the risk for battery failures. Nowadays it is commonly accepted that in a UPS application the lifetime of a 12Volt battery is just 50%-60% of the design life.

Customers who have suffered from failing UPS batteries did not feel comfortable just to change batteries more often since it would not guarantee a safe operation with the new batteries that could collapse without warning. A high string voltage UPS cannot tolerate a missing accumulator and the complete system collapses at a single point of failure.

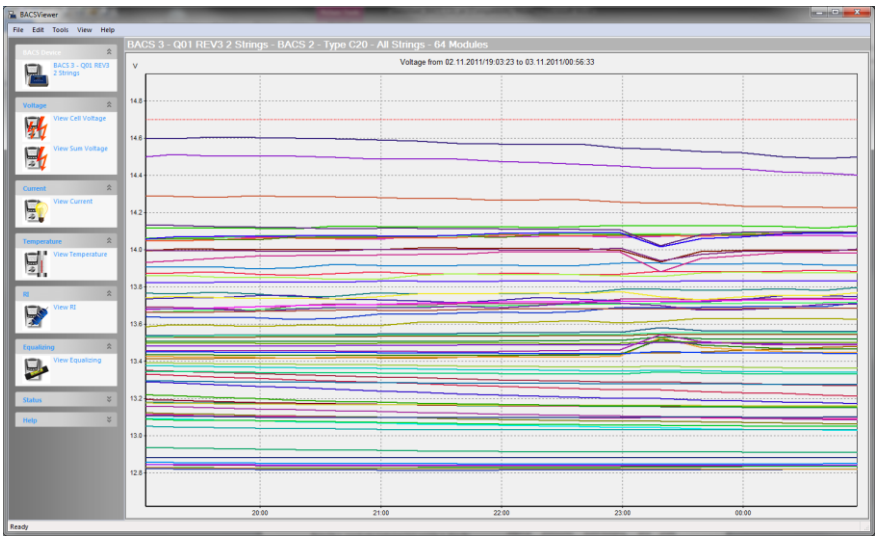
UPS makers have counteracted this issue by offering the customers redundant UPS systems with at least 2 strings of accumulators. This reduces the risk drastically, but has several disadvantages (Costs, space for installation, higher service efforts) – and still it is no guarantee – the user can not see what is going on in the battery strings and only theoretically can reduce the risk by adding as many strings as possible.

To reduce the risk of unnoticed battery failures and loss of backup, customers installed automatic transfer switches to their redundant UPS and generators as the main backup in case of a power failure.

Also this extremely costly solution is still not safe since - all generators need a few seconds to start, so there always will be a number of accumulators between the UPS and generator. Also the generators starter battery is another risk factor – **and the battery remains the Achilles Heel of every UPS or other battery backup system.**

Knowing this, customers began to install battery monitoring systems “BMS” for batteries. Such systems should not only show why batteries are failing (Voltage differences, rising impedance etc.) but also start automatic counteractions. **BACS is the only system on the market which does not only “monitoring” but is regulating the system through its EQUALISATION/BALANCING!**

The following screen shows the battery voltages of a batteries connected in a string that would be found in every UPS system today, which is <u>not</u> managed by BACS. The individual voltages after 5 years differ in a a window of more than 1.8 Volt.



BACS VIEWER screenshot:

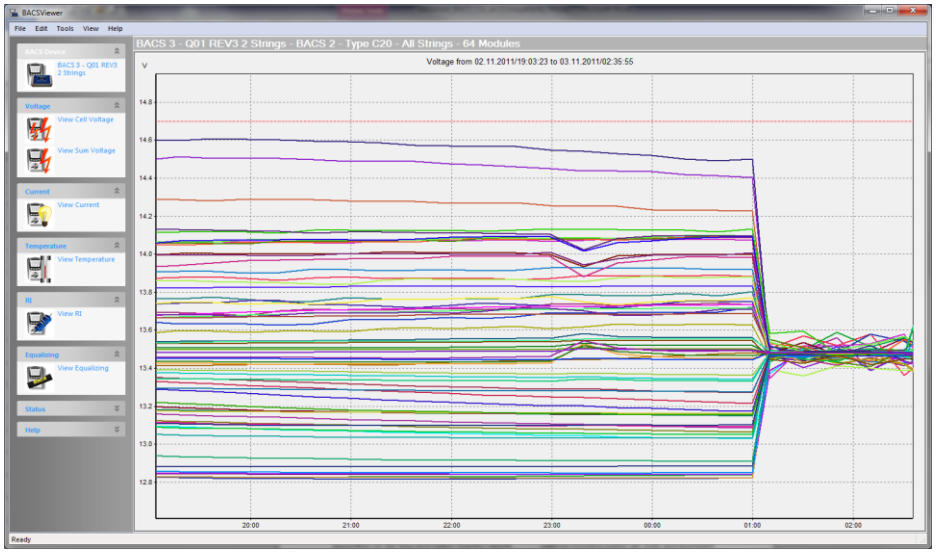
An UPS with 64 * 12Volt batteries after 5 years in operation shows that voltages have drifted within a large window of 1.8Volt between the lowest and the highest battery.

Voltages <u>without</u> the equalisation process after 5 years in operation.
Following pictures shows the same Batteries, now <u>with</u> EQUALISATION.

Due to individual differences in the accumulators the voltages are not identical. The longer such differences have been in place and the accumulators have not received a separate, balancing charge, the more the accumlators start drifting until they finally show a difference of 1 Volt or more – like in the screenshot of such 5 year batteries above.

With the introduction of the BACS patented EQUALISATION/BALANCING technology in 2004 the system is now able to eliminate all the voltage/charging differences in a string of accumulators. through its “Equalisation” process. The Equalisation process brings all accumulators to 1/100th of Volt for each accumulator on the string, despite its interconnections or location in that string and keeping the accumulator at full charge and within the stated manufacturing float voltages.

The following screen shows the voltages of the same 5 year old accumulators a few hourse after BASC technology has started its equalisation process.



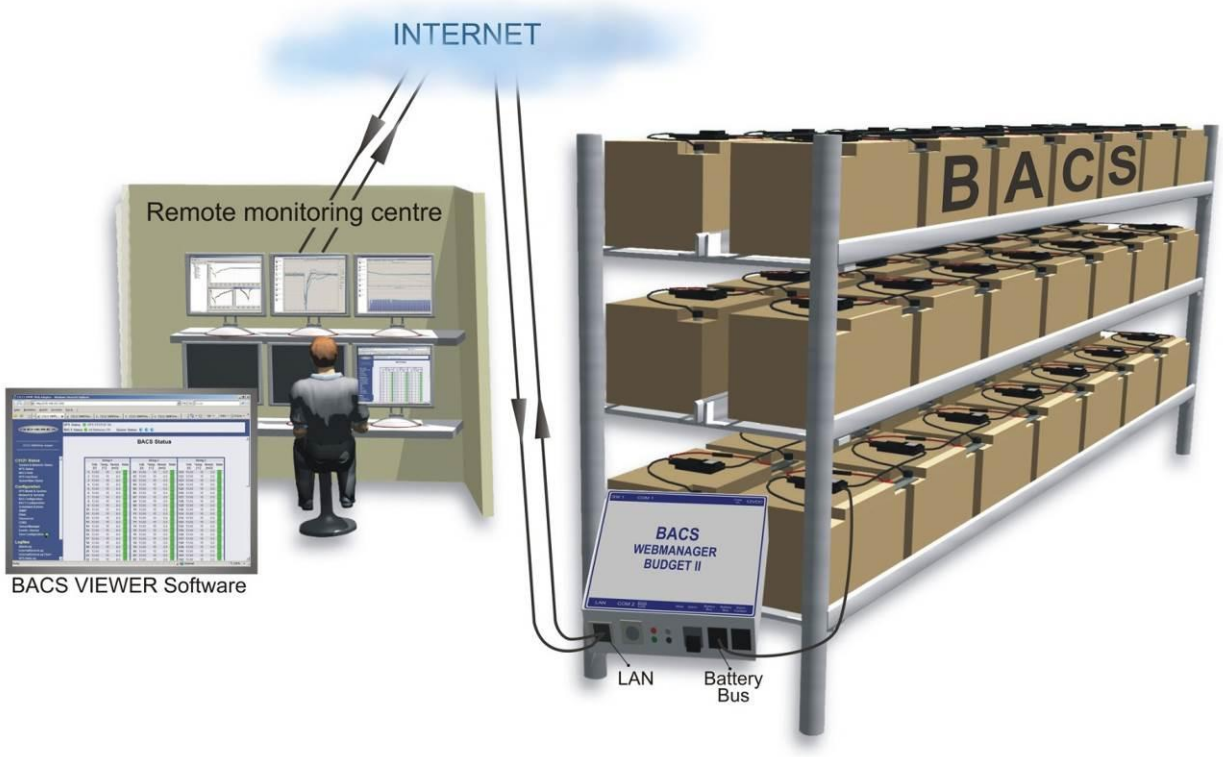
BACS VIEWER screenshot:

The same 5 year old battery string above, now with BACS EQUALISATION. Within a few hours the equalisation brings all accumulators to within 100th volt of each other and keeping the accumulators at the manufacturers stated float charge.

BACS equalisation process is correcting the negative influence that cause premature accumulator failures due to voltage and impedance differences within a string.

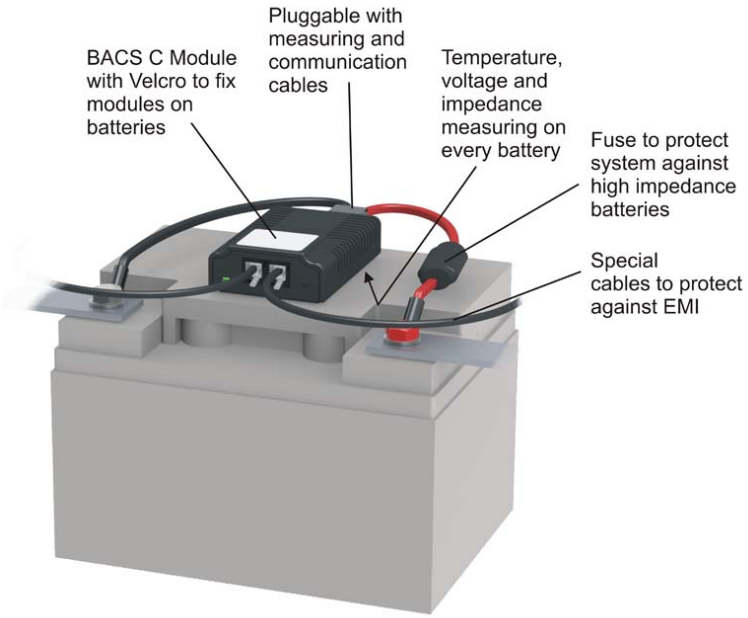
A general description about the equalisation principle and explanation why this extends battery life drastically and extends cycle life by about a factor of 3 is scientifically explained in the INTELEC Paper 32.1 “Life Extension through charge Equalisation of Lead-Acid Batteries” by Philip T. Krein Member of IEEE

Based on scientific expertise and GENEREX own investigations from 2002 to 2004 the BACS patent has been established.



BACS System Components

BACS C modul & cable



A diagram of a BACS module installation:

A calibrated measuring cable with 2 high-voltage fuses connected to the positive and the negativen Battery poles uses a 4-string wire for measuring the individual battery data.

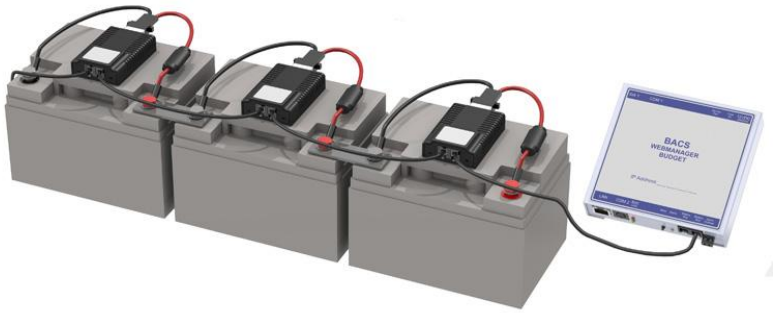
The BACS module measures through an integrated sensor the surface temperature of the accumulator, the voltage and the impedance.

The BACS module is available in 5 different types: 16Volt, 12Volt, 6Volt, 2Volt and for NiCd, NiMH and Lithium Ion batteries with a widerange of 1.2 V- 3Volt.

At EQUALISATION/BALANCING mode, the thermal energy is transferred through the cooling fins to the environment, until the process has finished.

The status is shown at an LED on the frontpanel.

Simple installation or retrofitting through Velcro tapes and bus cables.



BACS WEBMANAGER

2 external and 1 UPS slot version

Management of up to 330 BACS C modules in up to 10 parallel strings.

Includes a full qualified UPS-SNMP & MODBUS manager at COM 1 for the monitoring of a UPS/inverters/rectifiers or other devices with a serial interface.

COM 2 for optional environmental sensors (e.g. temperature, humidity, current, acide fill level, etc.).

1 programmable alarm relay output, 1 alarm-LED, 1 alarm buzzer, mute button.

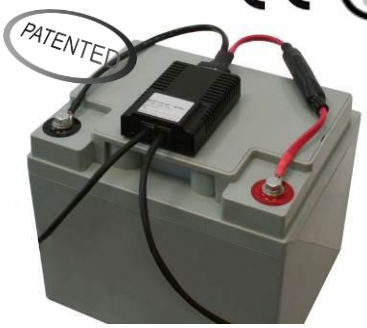
Integrated web server for status display configuration of all alarm treshholds (battery impedance, voltage, temperature, UPS alarms, environmental alarms, etc. network messaging system (email, SMS, SNMP, RCCMD, MODBUS and (optional) PROFIBUS, LONBUS, BACnet.

Data logger for all measuring data, (optional) current sensors for charge- and discahrge current measuring.

Compatible to UNMS monitoring software and LED matrix remote display.

Integrated DIN rail mounting on all external manager types.

BACS modules - Technical data and dimensions



BACS C20 module with external temperature sensor for 12V accumulators between 7–600 Ah, with individual block voltage regulation, LED status and error display, and bus cable connections.

BACS® modules REV 3

Construction	Measuring modules with equalisation BACS patent no.: DE 102004013351.4
Power consumption from battery	Consumption at normal operation: 15-20mA Consumption at „Sleep Mode“: < 1mA
Measuring precision Reference HIOKI	Internal resistance : < 10 % at C40, < 5% at C20/30 Voltage : < 0,5 % Temperature: < 5 %
Interfaces	2x RJ10 for BACS battery bus Internal RS232 bus interface 1x button for the addressing Temperature sensor -35 bis + 85 °C Optical display LED (alarms red/green, mode red/green)
Housing Dimensions, weight	ABS housing (UL certified, flame retardant, cooling fins) 55 x 80 x 24 mm = 2,17 x 3,15 x 0,94 in. (B x H x T), 45g
Operating condition Int. protection rating	Temperature 0 - 60°C, max. humidity 90%, not condensing IP 42 coated against dust and condensate)
High voltages security tested	Protection against high ohmic batteries fault voltages up to 150 Volt /per module (fuse opens). At higher voltages the fuse opens, but BACS module is damaged. All REV 3.1 modules are designed for fault voltages up to 600 Volt
MTBF (calculated)	87.600 hours (10 years)

Module BACS® C20

Order No. BACSC20
REV 3 module for 12Volt 7-600Ah lead batteries (UL certified)

Voltage range	7V – 17V
RI range	0.5-60mOhm
Equalisation power	0.15 A

Module BACS® C23

Order No. BACSC23
REV 3 module for 16Volt 7-600Ah lead batteries

Voltage range	7V – 21V
RI range	0.5-60mOhm
Equalisation power	0.12 A

Module BACS® C30

Order No. BACSC30
REV 3 module for 6Volt 7-900Ah lead batteries

Measuring value	4.8V – 8.0V
RI range	0.5-60mOhm
Equalisation power	0.3 A

Module BACS® C40

Order No. BACSC40
REV 3 module for 2Volt 7-5000Ah lead batteries (UL certified)
Voltage and temperature measurement

Measuring value	1.25V – 3.2V
RI range	0.02-6mOhm
Equalisation power	0.9 A (at 2.27V)

Module BACS® C42 REV 3 for NiCd/NiMH & Li-Ion

Order No. BACSC42
REV 3 module for 2,4 Volt NiCd/NiMH & 2Volt lead batteries
Voltage and temperature measurement, no RI measuring

Measuring value	1.2V – 3.6V
Equalisation power	0.9 A (at 3.4V)

BACS WEBMANAGER – Technical data

BACS® WEBMANAGER BUDGET (external version)

Order No. BACSKIT_B

Processor and memory	32-Bit RISC-processor, 32 MB storage / 64 MB RAM up to 256 BACS modules
Power consumption	At 12V default power supply = 200mA (the connected BACS modules at the BACS BUS CONVERTER will be supplied via own power supply and need +5mA per BACS module
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, COM3=BACS battery bus) 1x RJ12 for battery bus converter 1x RJ45, 10/100Mbit Ethernet
Display	2x LED (Manager status, UPS/device alarm)
Housing	PVC, RAL 7035 (light gray) ETL listed, FCC class A
Dimensions	69 x 30 x 126mm = 2,72 x 1,18 x 4,96 in. (L x W x H)
Weight	110g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
MTBF (calculated)	70.000 hours (8 years)

BACS® WEBMANAGER BUDGET SC (slot version)

Order No. BACSKIT_BSC

Processor and memory	32-Bit RISC-processor, 32 MB storage / 64 MB RAM up to 256 BACS modules
Power consumption	At 12V default power supply = 200mA (the connected BACS modules at the BACS BUS CONVERTER will be supplied via own power supply and need +5mA per BACS module
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, COM3=BACS battery bus) 1x RJ12 for battery bus converter 1x RJ45, 10/100Mbit Ethernet
Display	2x LED (Manager status, UPS/device alarm)
Housing	Slot card “SC format” for UPS devices witch compatible slots ETL listed, FCC class A
Dimensions	60 x 20 x 130mm = 2,36 x 0,79 x 5,12 in. (L x W x H) – Slot card „SC format“
Weight	90g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
MTBF (calculated)	70.000 hours (8 years)

BACS® WEBMANAGER BUDGET III 12Volt (UL certified)

Order No. BACSKIT_B_III

Processor and memory	32-Bit RISC-processor, 32 MB storage for battery history in days (see Example table in the datasheet above)
Number of Sensors & Power consumption	Stabilized external power supply 12V 2000mA supplies 1830mA for up to 330 BACS C modules (à 5mA) and other BACS bus sensors (See datasheet of other BACS sensors for power consumption)
Interfaces	3x RS-232 interfaces, (COM1= UPS/power device, COM2 =Multipurpose, service port for Windows BACS READER and PROGRAMMER software) 2x battery bus converter outputs internal 1x RJ45, 10/100Mbit Ethernet
Display/Signal	3x LED (Manager status, UPS/device alarm, BACS alarm) 1x Buzzer with mute button
Housing	Aluminium, RAL 7035 (light gray) ETL listed, FCC class A
Dimensions	130 x125 x 30mm = 5,12 x 4,92 x 1,18 in. (W x L x H)
Weight	180g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensing
MTBF (calculated)	70.000 hours (8 years)

BACS® WEBMANAGER BUDGET III 18V-72V

Order No. BACSKBIII72

Description	Identical to BACSKIT_BIII, but designed for power supply directly from the 24Volt or 48Volt batterie group. The external pluggable power supply is replaced against a TRACOPOWER TCL 024-112DC DIN rail power supply (DIN rail not included). Technical data of the TRACOPOWER TCL 024-112DC: Input : 18V – 72V DC Output : 12V 2000mA DC stabilized. 1830mA are available for up to 330 BACS modules (à 5mA) and other BACS bus sensors (see datasheet of other BACS sensors for powerconsumption). NOTE: Input safeguarding fuse (recommended circuit breaker 6-16A / characteristic C) is not included.

BACS WEBMANAGER - Technical data

BACS® WEBMANAGER BUDGET III 120V - 370V

Description

Order No. BACSKBIII370
Identical to BACSKIT_BIII, but designed for power supply directly from the 24Volt or 120Volt to 370 Volt batterie group. The external pluggable power supply is replaced against a MEANWELL SNT MW-MDR20-12 DIN rail power supply (DIN rail not included).
Technical data of the MEANWELL SNT MW-MDR20-12:
Input : 120V – 370V DC (or 85V-264V AC)
Output : 12V 2000mA DC stabilized.
1500mA are available for up to 330 BACS modules (à 5mA) and other BACS bus sensors (see datasheet of other BACS sensors for powerconsumption).
NOTE: Input safeguarding (input fuse) is not included.

BACS accessories - Technical data and dimensions

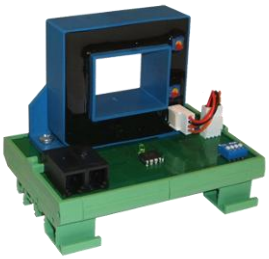
BACS® BUS CONVERTER 3 & 5

Construction	Conversion and galvanic separation of the BACS battery bus to the BACS WEBMANAGER BUDGET plus real time clock (RTC) timer for the BACS WEBMANAGER, if no timeserver is at hand into the network environment
Power supply	Stabilized external 12V/2000mA for up to 330 BACS module (à 5mA) + other BACS bus devices (see datasheet for power consumption of other BACS bus devices)
Interfaces	2x RJ10 for BACS battery bus 1xRJ12 for COM3 BACS WEBMANGER BUDGET 1xMiniDin8/RS232 interface for serial connection to workstation. For CONVERTER 3 an adapter is required (see below) 1x2,1mm DC connector socket for power supply via external wall wart power supply 1x potential-free contact (2 pole screw terminal for max. 1,0 mm², 125 VAC, 60 VDC and 1A)
Display	Optical display (LED) additionally, alarm buzzer with acknowledge button Optional: Adapter from mini-8 to RS232 for the BACS CONVERTER 3, with junction cable mini-8 1.5m
Housing	Polystyrene housing in grey
Dimension, weight Operating condition	91,5 x 67 x 25 (W x H x D), 120g, Temperature 0 - 60°C, max. humidity 90%, not condensing

BACS® SPLITTING BOX

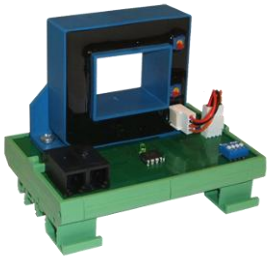
Construction	Passive splitter for BACS communication cables. For the optimization of the cable lenghts and for the creation of an optical pleasant wiring. In addition to the extension of the 2 BACS bus inputs at the BACS CONVERTER. We recommend to use the BACS SPLITTING BOX, if you want to connect more than 50 BACS modules into the BACS bus.
Power supply	Not required, passive element for the star wiring of BACS bus cables
Interfaces	5x RJ10 for BACS bus cable 1x RJ10 for the connection to BACS CONVERTER or rather BACS bus at BACS WEBMANAGER
Housing	Polystyrene housing in grey
Dimension, weight Operating condition	91,5 x 67 x 25 (B x H x T), 90g, Temperature 0 - 60°C, max. humidity 90%, not condensated

BACS accessories - Technical data



BACS DC current sensor 200/400

Construction	Ord. No: BACS_CS200 or rather BACS_CS400 DC current sensor for measuring battery string discharge and charging process +/-200A or rather 400A DC Current transducer diameter hole : 40mm * 30mm
Power supply	No external power supply, device is powered by the BACS bus
Power consumption	70mA
Interfaces	2x RJ10 for BACS bus cable, pluggable system
Housing	DIN rail
Dimension, weight	110x90x76mm 4,33 x 3,54 x 2,99 in. (LxWxH), 380g
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensated



BACS DC current sensor 500/1000/1500

Description	Ord. No: BACS_CS500, BACS_CS1000, BACS CS_1500 DC current sensor for measuring battery string discharge and charging process +/-500A, 1000A, 1500A DC Other technical details identical to BACS_CS300/400

BACS bus interface GX_R_AUX

Construction	Order No. GX_R_AUX BACS bus module with free programmable 4 digital inputs and 4 relay outputs. A typical application is the control of a battery breaker in case of “thermal runaway” alarm in the battery system. In case of a high battery temperature and increasing voltages during float charge, the GX_R_AUX may open the battery breaker to stop a further increase of the temperatures in the batteries. Individual programming of the relays through web interface.
Power supply	No external power supply, device is powered by the BACS bus
Power consumption	ca. 170mA
Interfaces	4 potential-free relays, 4 digital inputs
Relay output	250VAC – 2A, 30VDC – 1A
Dimension, weight	75 x 75 x 45mm = 2,95 x 2,95 x 1,77 in. (LxWxH), 170g
Housing	Polyamid, pluggable system DIN rail
Operating condition	Temperature 0 - 60°C, max. humidity 90%, not condensated

BACS external temperature sensor

Construction	Order No. BACS_TS External temperature sensor for BACS REV 2 and REV 3 for retrofitting. This sensor comes with a 23cm/9.06in. cable and allows to place the temperature sensor at the optimal place on the battery. If this sensor is attached, the internal temperature sensor of the BACS module REV 3 will be automatically switched of. Sensor only, has to be attached to the BACS C module by a qualified BACS service engineer. UL certified material, voltage proofed up to 1000V.
Measuring range/precision	-10°C - +90°C, +/- 1 °Celsius

BACS measuring cables

Order No. BC5-x, BC4-x
Measuring cables for BACS sensors type Cx REV 3. 1000Volt DC sorted fuse protected cables for high precision measuring and secure operations in high voltage environments. Various terminal connections and length available. See latest BACS pricelist for details. UL certified material.

BACS bus cables

Order No. B2BCRJx
High quality halogen free twisted pair RJ10 BACS communication bus cable. Various length available. See latest BACS pricelist for details.

BACS CONTROL CABINETS - Technical data and dimensions

Control cabinet for BACS systems - Plug-play, with AC input plug (Euro) - ready to install. With optical and audible display on the outside door, protection class IP 56. Only a AC power supply and Ethernet cable has to be provided by the customer. Easy connection of inputs and outputs through a strip terminal. There is a wide range power supply installed for every BACS WEBMANAGER with an input from 110V-240V AC, max. power consumption is 20Watt depending on the number of BACS components in the bus. Output of the power supply is 12Volt 1600mA, which results in 1140mA available for up to 330 BACS modules or other components in the BACS bus (For BACS bus components power consumptions, see datasheets of the BACS devices).

BACS® CONTROL CABINET Type 1

Order No. BACS_CC1
1 * BACS WEBMANAGER BUDGET III,
1 * 12V Power supply (100 – 240V, 50/60Hz),
1 * CAT 6 Ethernet socket,
1 * Alarm contact (potential-free) , max. 230VC, 30VDC, 8A
in front door integrated:
1 * POWER LED, 1 * BACS ALARM LED
6 * spare bus communication cable
Dimension: 400 x 500 x 210 mm = 15,75 x 19,69 x 8,27 in. (WxHxD)

BACS® CONTROL CABINET Type 2

Order No. BACS_CC2
2 * BACS WEBMANAGER BUDGET III,
2 * 12V Power supply (100 – 240V, 50/60Hz),
2 * CAT 6 Ethernet socket,
2 * Alarm contact (potential-free) , max. 230VC, 30VDC, 8A
in front door integrated:
2 * POWER LED, 2 * BACS ALARM LED
8 * spare bus communication cable
Dimension: 400 x 500 x 210 mm = 15,75 x 19,69 x 8,27 in. (WxHxD)

BACS® CONTROL CABINET Type 3

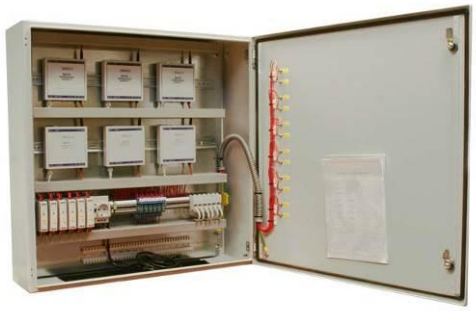
Order No. BACS_CC3
3 * BACS WEBMANAGER BUDGET III,
3 * 12V Power supply (100 – 240V, 50/60Hz),
3 * CAT 6 Ethernet socket,
3 * Alarm contact (potential-free) , max. 230VC, 30VDC, 8A
in front door integrated:
3 * POWER LED, 3 * BACS ALARM LED
10 * spare bus communication cable
Dimension: 500 x 500 x 210 mm = 19,69 x 19,69 x 8,27 inch (WxHxD)

BACS® CONTROL CABINET Type 4

Order No. BACS_CC4
4 * BACS WEBMANAGER BUDGET III,
4 * 12V Power supply (100 – 240V, 50/60Hz),
4 * CAT 6 Ethernet socket,
4 * Alarm contact (potential-free) , max. 230VC, 30VDC, 8A
in front door integrated:
4 * POWER LED, 4 * BACS ALARM LED
12 * spare bus communication cable
Dimension: 500 x 500 x 210 mm = 23,62 x 29,92 x 8,27 in. (WxHxD)

BACS® CONTROL CABINET Type 5

Order No. BACS_CC5
5 * BACS WEBMANAGER BUDGET III,
5 * 12V Power supply (100 – 240V, 50/60Hz),
5 * CAT 6 Ethernet socket,
5 * Alarm contact (potential-free) , max. 230VC, 30VDC, 8A
in front door integrated:
5 * POWER LED, 5 * BACS ALARM LED .
14 * spare bus communication cable
Dimension: 600 x 800 x 250 mm = 23,62 x 29,92 x 8,27 in. (WxHxD)



BACS® CONTROL CABINET Type 6

Order No. BACS_CC6
6 * BACS WEBMANAGER BUDGET III,
6 * 12V Power supply (100 – 240V, 50/60Hz),
6 * CAT 6 Ethernet socket,
6 * Alarm contact (potential-free) , max. 230VC, 30VDC, 8A
in front door integrated:
6 * POWER LED, 6 * BACS ALARM LED .
16 * spare bus communication cable
Dimension: 600 x 800 x 250 mm = 23,62 x 29,92 x 8,27 in. (WxHxD)