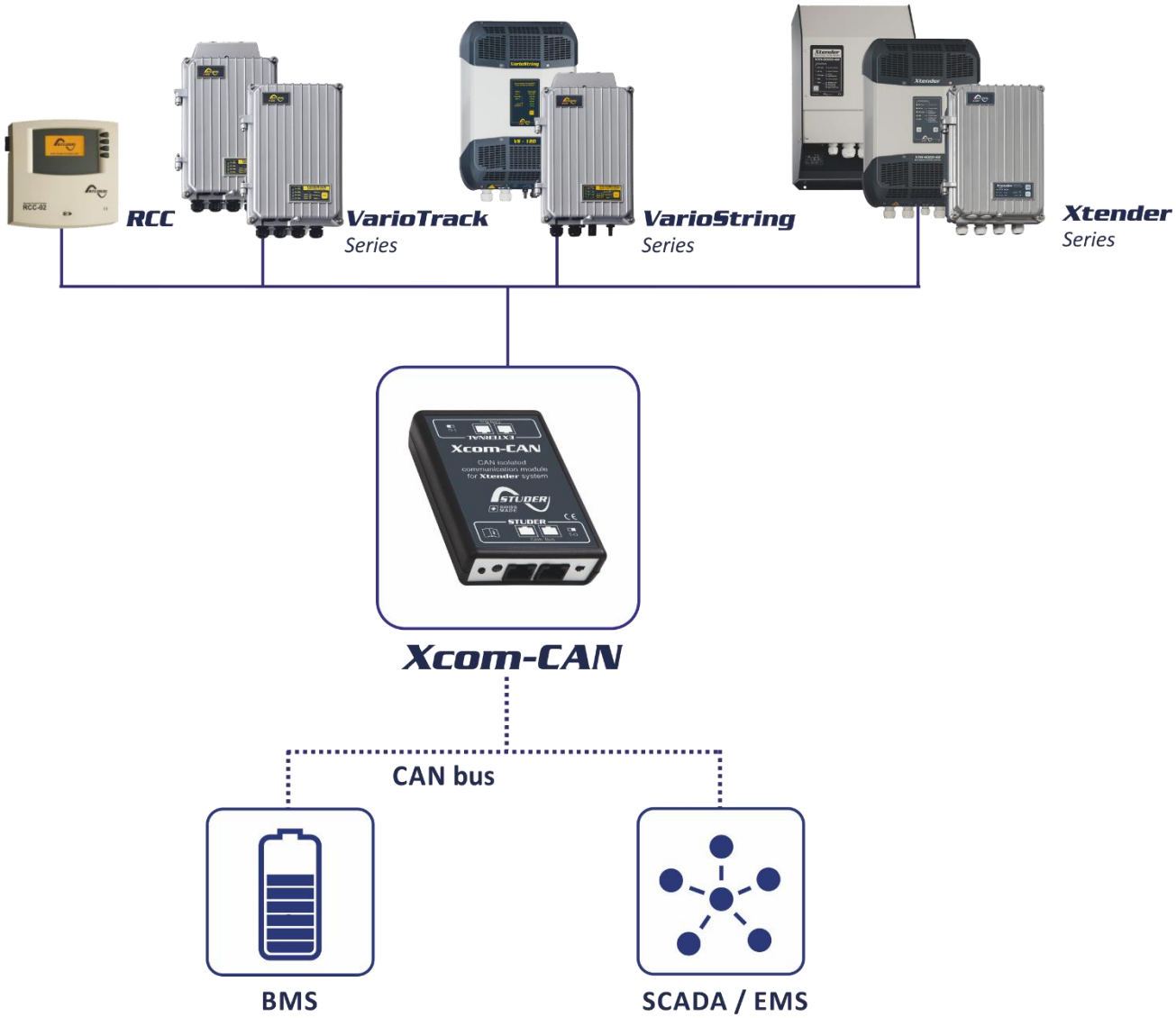
Xcom-CAN

Multi-protocol communication set for Xtender and Vario-systems

User Manual



Studer Innotec SA 2024 – V2.9.2
409R

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1 INTRODUCTION

1.1 XCOM-CAN MULTI-PROTOCOL COMMUNICATION FOR XTENDER AND VARIO-SYSTEMS

This manual contains a complete description of the functionalities of the multi-protocol communication module Xcom-CAN.
The Xcom-CAN Module is a bridge between the proprietary Studer communication bus on one side and various CAN protocol on the other side, in order to access/control Studer Innotec devices or apply specific behaviour on the Studer system, notably with Lithium or specific batteries.
This document applies to software versions V1.6.16 or higher of the Xcom-CAN. It is possible to update the product with the latest software version available on www.studer-innotec.com/en/downloads/ and the use of a Remote control (RCC-02, RCC-03, Xcom-232i, and Xcom-SMS).
The Xcom-CAN operates in Xtender systems (with products such as Xtender, VarioTrack, VarioString, BSP, RCC-02/-03, Xcom-232i, Xcom-LAN and Xcom-GSM).

1.2 LEGAL NOTICE

The use of Studer Innotec SA devices is the responsibility of the customer in all cases. Studer Innotec SA reserves the right to make any modification to the product without prior notice.

1.3 CONVENTIONS

1.3.1 Symbols

	This symbol indicates a risk of material damage.
	This symbol indicates a procedure or function that is important for a safe and correct use of the equipment. Failure to respect these instructions may lead to the cancellation of the guarantee or to a non-compliant installation.

1.4 WARRANTY AND LIABILITY

During production and assembly, each Xcom-CAN undergoes several controls and tests. These are carried out in full respect of fixed procedures. Each Xcom-CAN is given a serial number allowing a perfect follow-up of the controls, in conformity with the specific data of every device. For this reason, it is very important to never remove the descriptive sticker with the serial number. The production, assembly and tests of each Xcom-CAN are entirely carried out in our factory in Sion (CH). The warranty of this product depends on the strict following of the instructions in this manual. The warranty period for the Xcom-CAN is 5 years as from the date of delivery ex-works.

1.4.1 Exclusion of warranty

No warranty will be applied for damages caused by handling, operation or actions that are not described in this manual. Damages arisen from the following events are not covered by the warranty:

- Overvoltage on the device.
- Liquid in the device or oxidation due to condensation.
- Failures due to a fall or to a mechanical shock.
- Modifications made without the explicit authorization of Studer Innotec SA.
- Nuts or screws partially or insufficiently tightened during installation or maintenance.
- Damages due to atmospheric overvoltage (lightning).
- Damages due to transport or improper packaging.
- Disappearance of original marking items.

1.4.2 Disclaimer of liability

Installation, commissioning, use and maintenance of this device cannot be supervised by the company Studer Innotec SA. For this reason, we do not accept any liability for damages, costs or losses generated either by an installation that is not conforming to the prescriptions, by a defective operation or by poor maintenance. The use of this device is under the responsibility of the end-user. This device is neither designed nor guaranteed for the supply of life support applications or any other critical application with potential risks for human beings or for the environment. We shall assume no liability for patent infringement or other third-party rights involved in the use of this device.

1.4.3 Compatibility

Studer Innotec SA guarantees the compatibility of the software updates with the hardware for one year, starting from the date of purchase. The updates are no longer guaranteed beyond this date and a hardware upgrade may be required. Please contact your reseller for any additional information on compatibility.

1.5 SAFETY PRECAUTIONS

1.5.1 Generalities

Carefully read all safety instructions before proceeding with the installation and commissioning of the device. Failure to follow these instructions might constitute a lethal physical danger but can also damage the functionalities of the device. Therefore, this manual should always be kept close to the device.

⚠	For any installation, the local and national norms and regulations in force must be strictly followed.

1.5.2 Warnings

- Wherever the system is, the person in charge of installation and commissioning must know the safety measures and the prescriptions in force in the country. Therefore, the whole maintenance must be carried out by qualified personnel.
- All components connected to this device must be conforming to the laws and regulations in force. Persons without a written authorization from Studer Innotec SA are forbidden to do any changes, modifications or repairs whatsoever. Regarding authorized modifications and replacements, only genuine components shall be used.
- This device is meant for indoor use only and must under no circumstances be exposed to rain, snow or any other humid or dusty environment.

1.6 PRODUCT RECYCLING

The Xcom-CAN meets the European RoHS directive 2011/65/EU on hazardous substances and does not contain the following elements: lead, cadmium, mercury, hexavalent chromium, PBB or PBDE.
To dispose of this product, please use the service for collection of electrical waste and observe all obligations in force in the place of purchase.





2 EU DECLARATION OF CONFORMITY

The multi-protocol communication module Xcom-CAN described in this manual meets the requirements specified in the following EU directives and standards:

Low Voltage Directive (LVD) 2014/35/EU
- EN 62368-1:2014/AC:2015

Electromagnetic Compliance (EMC) Directive 2014/30/EU
- EN 61000-6-1:2007
- EN 61000-6-2:2005/AC:2005
- EN 61000-6-4:2007/A1:2011

2.1 CONTACT INFORMATION

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3 MATERIAL NEEDED FOR THE INSTALLATION

3.1 CONTENTS OF THE XCOM-CAN MULTI-PROTOCOL COMMUNICATION SET

The multi-protocol communication set Xcom-CAN contains the following material:

One Xcom-CAN module



Two 2 meters communication cables, to connect the Xcom-CAN to Studer and external devices



Mounting plate



2 DIN rail clips and screws



3.2 OTHER REQUIRED MATERIAL

In addition to the material delivered with the communication set the use of an Xcom-CAN necessitates a cross-headed screwdriver #1 (P1).
Since the Xcom-CAN is dedicated to communicate with a third-party system (Battery, SCADA, PLC etc.) you will need a specific cable crafted with the proper connector and pinning on each side. See chapter 0.

⚠	This device should not be used for any purpose not described in this manual. The device is using RJ45 connectors frequently used and standard for LAN (Local Area Network). The Xcom-CAN should never be used or plugged into communication networks other than the ones specified in this manual. This will seriously damage the product.

4 FUNCTIONALITIES OF THE XCOM-CAN

There are several functionalities (applications) listed below that can be achieved with the Xcom-CAN module. These functionalities (applications) can be selected by the proper setting of the DIP switches located inside the module. See chap. 5.1.

4.1 CONNECTION OF AN XTENDER-VARIO SYSTEM TO LITHIUM BATTERIES

An optimal management of Lithium batteries requires communication between the battery and the whole system, like inverters, chargers, display, SCADA and so on. Most Lithium batteries use a CAN bus (as physical layer) but must have specific protocols implemented to communicate. The Xcom-CAN has several protocols implemented for battery management.
These protocols are compatible with specific batteries, as listed in chap. 5.2.

4.2 ACCESS/CONTROL OF STUDER DEVICES FROM A THIRD-PARTY SYSTEM (PLC, SCADA)

The Xcom-CAN can be used to interface a Studer Xtender/Vario system with a third-party device via a CAN communication bus (SCADA system, PLC, etc.) with the Studer Public protocol. The technical specification of this protocol is available on Studer's web site, www.studer-innotec.com, and will allow the third-party device to read and write data, get alarm or messages and fully control the Xtender/Vario system.

5 INSTALLATION OF THE XCOM-CAN

This device was designed for indoor use only and must under no circumstances be exposed to rain, snow or any other humid or dusty environment.
As far as possible, reduce exposure to sudden temperature variation: important heat variation may create undesired and harmful condensation inside the equipment.
Before installing the module, the configuration of the function and the selection of pin out connection must be achieved.

5.1 SELECTION OF FUNCTIONALITY AND PINOUT ARRANGEMENT

To access the DIP switches and jumper array, the module must be opened. First disconnect your Xcom-CAN module from all devices (installation, battery, etc.) then open the Xcom-CAN with a Phillips screwdriver #1 (2 screws).
On the electronic board inside the device there are two elements to select the chosen configuration:

(1) Jumper array for RJ-45 (third party side) pinout arrangement.
(2) DIP switches to select the protocol/battery model (switch 1 to 5) and the bus speed (switch 6 to 8) whenever the protocol requires it.

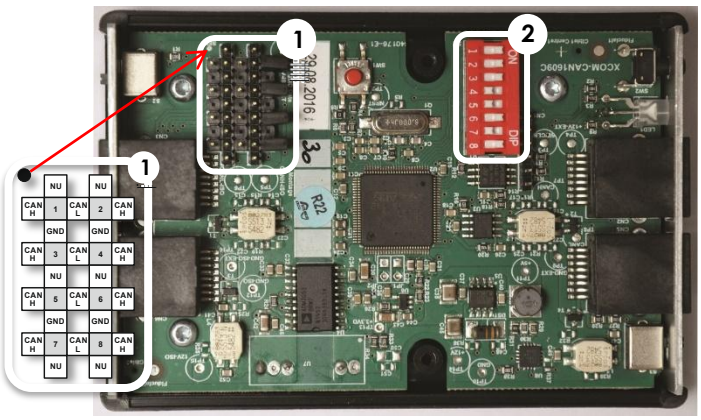


Figure 1: Electronic board inside the Xcom-CAN

5.2 DIP SWITCH CONFIGURATION FOR LITHIUM BATTERIES

Note: The list of compatibility is subject to change. Please contact Studer Innotec to get the updated list.

The information on the configuration of the DIP switches for lithium batteries can be found at https://studer-innotec.com/support/battery-compatibility/

Note: This table is for "Activity Control" mode. For "Activity Inspect" mode, switch 4 must be in "ON" position. For more information about activity modes, please refer to chapter 6.

** Please check details with the battery manufacturer for warranty conditions and availability*
***UP2500N**B**01V00101 released April 2020 has the CANBUS port and is supported.*

ℹ	All the listed batteries are compatible with the Xcom-CAN in terms of protocol. Studer Innotec is not responsible for performance and compliance to system size and requirements.
ℹ	When working with Lithium batteries, the Xcom-CAN will automatically change the Xtender system parameters related to the battery management (Xtender, VarioTrack & VarioString).

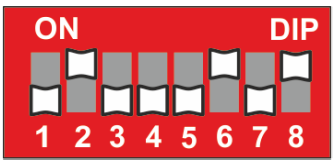
5.3 DIP SWITCH CONFIGURATION FOR THIRD PARTY PLC OR SCADA SYSTEMS

To interact with the Xtender/Vario systems through third party devices such as PLC or SCADA, you have to select the "Studer Public protocol". The "Studer Public Protocol" is available in two operating modes and with different CAN bus speed options. These can be set up in different combinations depending on the user's needs.

5.3.1 "Exclusive Protocol" operating mode

This configuration is recommended when there is only one device communicating with the "Studer Public Protocol" on the external CAN interface. The Xcom-CAN will send a response to every frame that appears on the external CAN interface. For frames which do not fit the "Studer Public Protocol" specifications, the Xcom-CAN will send an error frame message. This mode is practical for debugging as every frame sent by the PLC/SCADA will get a response. It will also detect any frame that could be corrupted when transmission occurs.

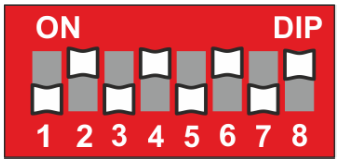
Configuration of DIP switches in "Exclusive Protocol" operating mode at 250 kbps. CAN speed can be adjusted depending on your needs, see chapter 0.



5.3.2 "Tolerant Protocol" operating mode

This configuration is recommended when there are several devices communicating with different protocols on the external CAN interface. The Xcom-CAN will only send a response to the frames that completey fit the "Studer Public Protocol" specifications. This mode enable the installer to extend the CAN bus on the external interface and to add others devices that can communicate with the PLC/SCADA on the same physical support as the Xcom-CAN.

Configuration of DIP switches in "Tolerant Protocol" operating mode at 250 kbps. CAN speed can be adjusted depending on your needs, see chapter 0.



⚠	Sharing the Xcom-CAN's external CAN interface with other devices and protocols is possible but needs special attention. A frame conflict can occur. It is the responsibility of the installer/developer to make sure that frame conflicts between two or more devices/protocols are avoided.

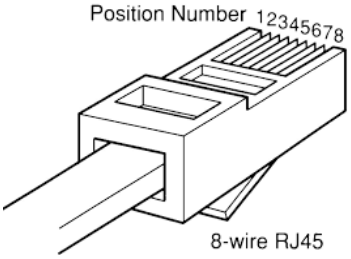
5.4 CAN BUS SPEED

The Studer public protocol and some batteries allow different CAN bus speed. This choice must be done in accordance with the third party device speed. Select the communication speed with the DIP switches in position 6 to 8 according to the table below. The default setting is 250kbps.

Position			CAN bus speed
6	7	8	
OFF	OFF	OFF	10 kbps
		ON	20 kbps
	ON	OFF	50 kbps
		ON	100 kbps
ON	OFF	OFF	125 kbps
		ON	250 kbps
	ON	OFF	500 kbps
		ON	1 Mbps

5.5 CABLE BETWEEN XCOM-CAN AND THIRD PARTY DEVICE OR BATTERY

Most communication devices provide a specific connector and pin assignment. A specific cable having on one side an RJ-45 connector and on the other side the third-party devices connector is required. This cable is either supplied by the manufacturer or must be crafted by the installer.
The Xcom-CAN package provides 2 cables with RJ-45 connectors on both ends. One of the two can be used to craft the proper cable.

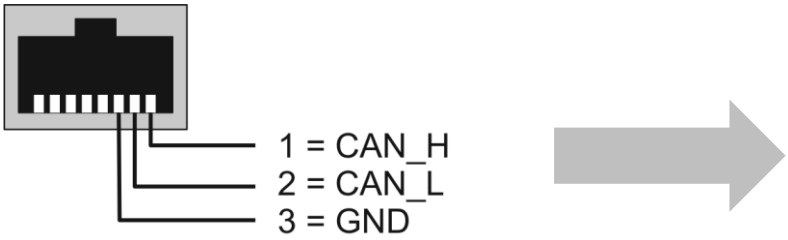


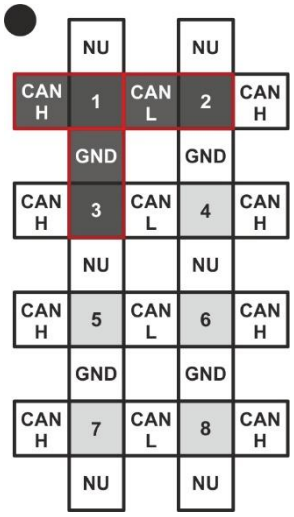
5.6 SELECTION OF THE PIN ASSIGNMENT OF THE CAN BUS CONNECTION

Any communication signal can be assigned to any pin of the RJ-45 connector by using the jumper array (1) in Figure 1.

The grey cells in the figure aside show the pin number of RJ-45 connector which can be connected to any signal of the communication line (GND, CAN-H, CAN-L) using the jumpers. By default, no connexion is done inside the module, so you have to open it and configure it manually.

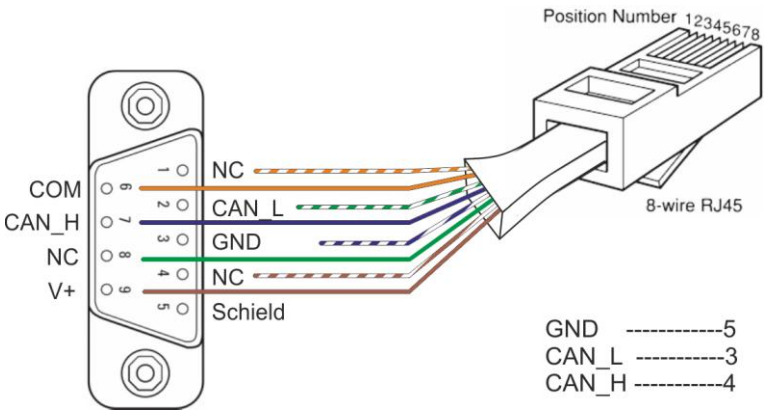
Here as an example, the pin assignment according to CIA-303-1:



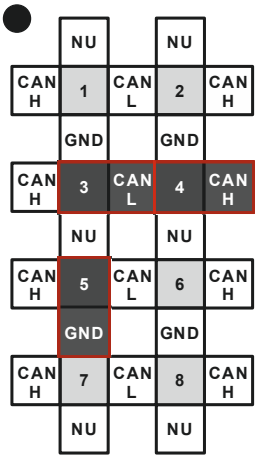


Jumper array

5.6.1 Example of cable and jumper selection



Third-party connector RJ-45



Jumper array

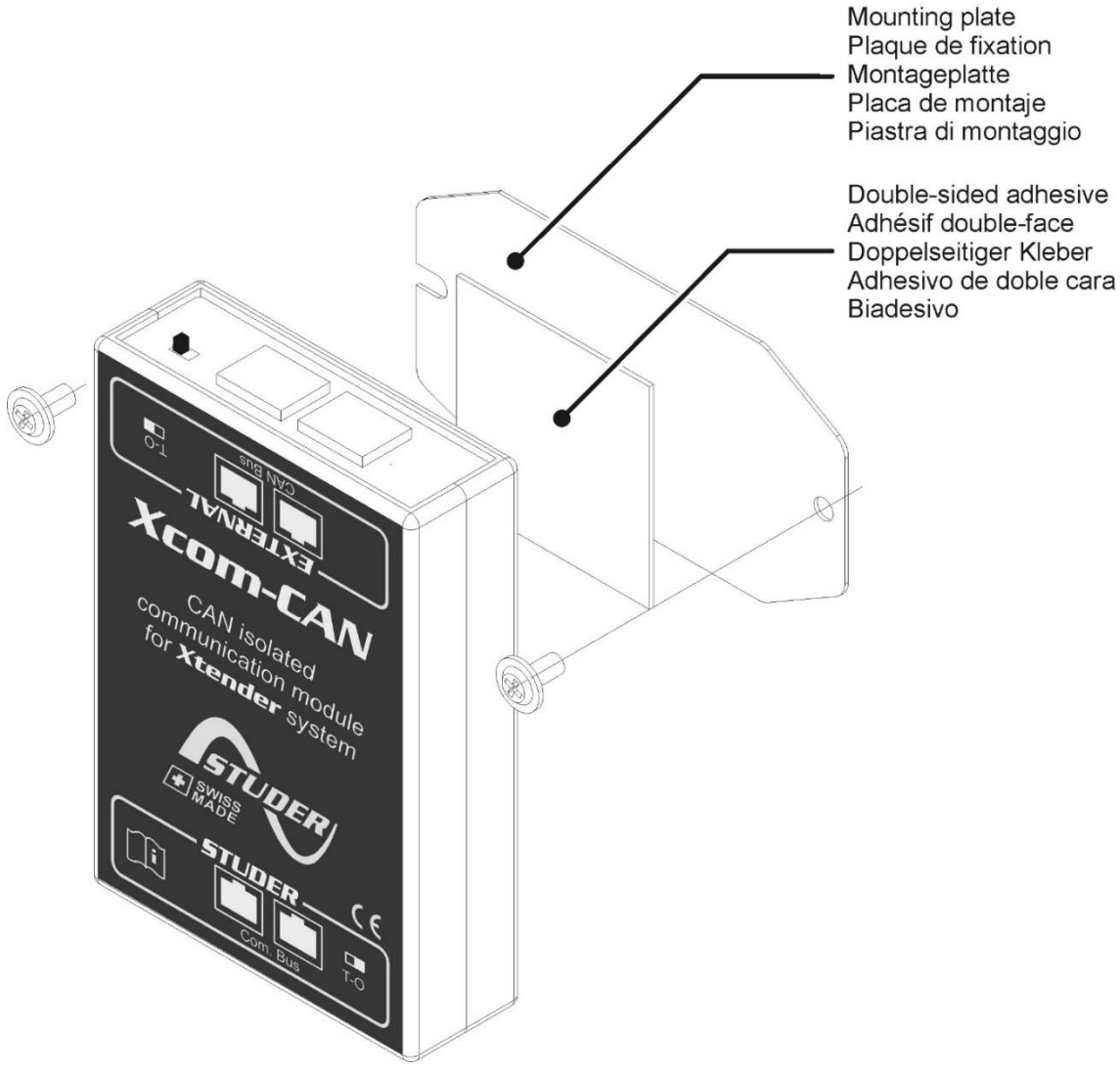
5.6.2 Jumper configuration according to listed batteries

The information on the configuration of the Jumper for can be found at
https://studer-innotec.com/support/battery-compatibility/

Please check details with the battery manufacturer for warranty conditions and availability.

5.7 MOUNTING

The Xcom-CAN can be mounted directly on any support by means of the supplied fixing plate, on a smooth surface with double-side adhesive or on DIN rail using the DIN rail clips (part of the Xcom-CAN communication set).



5.8 CONNECTION OF THE COMMUNICATION BUS (STUDER SIDE)

The Studer bus is daisy chained to the other XT/VT/VS Studer components and is powered by the communication plug as soon as the upfront device is powered. The Xcom-CAN module should not be installed between 2 devices powered by the battery. Connect the Xcom-CAN module with the supplied cable (2m). This cable should not be extended.

⚠	Do not connect the Xcom-CAN between devices connected to the battery. Do not connect the module to a device not connected to the battery (RCC or other Xcom).

⚠	The termination switch of the communication bus "Com. Bus" remains in position T (terminated) except when both connectors are used. In this case and only in this case, the switch must be placed in the O (open) position. If one of the two connectors is not used, the termination switch will be in position T. An incorrect setting of the link ends can lead to an erratic running of the system or impede its updating process.
ℹ	By default, the termination is set to terminated (position T) on each Studer product.

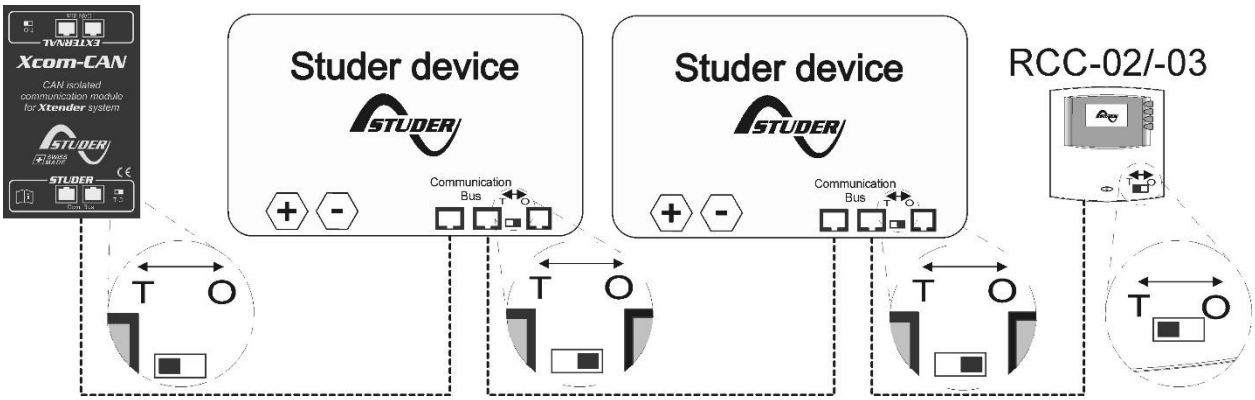


Figure 2: Connection schematic for Xcom-CAN

5.9 CONNECTION OF THIRD-PARTY DEVICES

In most cases, a specific cable must be crafted by the installer according to chapter 5.6 . This cable will have on the Battery BMS side the appropriate connector supplied or recommended by the third-party device manufacturer (Battery, SCADA, PLC etc.) and on the Xcom-CAN side an RJ-45 connector.

5.10 ELEMENTS ON THE STUDER SIDE OF THE MODULE



Figure 3: Front and isometric view of the Xcom-CAN

Key	Description
(a)	Push button (Not used / reserved for future use)
(b)	Bicoloured signalisation LED (green/red) The signalisation LED indicates different functions using colour and frequency of blinking. It is explained in chapter 5.10.1.
(c)	Studer device communication connectors These connectors allow the Xcom-CAN to be connected with an Xtender system. This is the Studer communication side of the device. Do not connect your battery on it, neither any devices suited for standard Ethernet connection.
(d)	Switch for communication line ending This switch activates or deactivates the communication bus termination. The termination is by default activated (terminated). In Figure 3, the termination is activated. Place the switch to the correct side: if there is only one cable connected on port c (com bus) put the switch in T (terminated) position. If there are two cables connected on port c (Xcom-CAN connected to two other devices) place the switch in position O (open).

5.10.1 Signalisation LEDs

Bicolour LED	Meaning
Blinks **2x** repeatedly in **GREEN**	The Xcom-CAN is running without any error.
Blinks **1x** repeatedly in **ORANGE**	The Xcom-CAN is currently starting up.
Blinks **2x** repeatedly in **RED**	The Xcom-CAN is in error. See chap. 7.

5.10.2 Elements on the external CAN bus side of the module

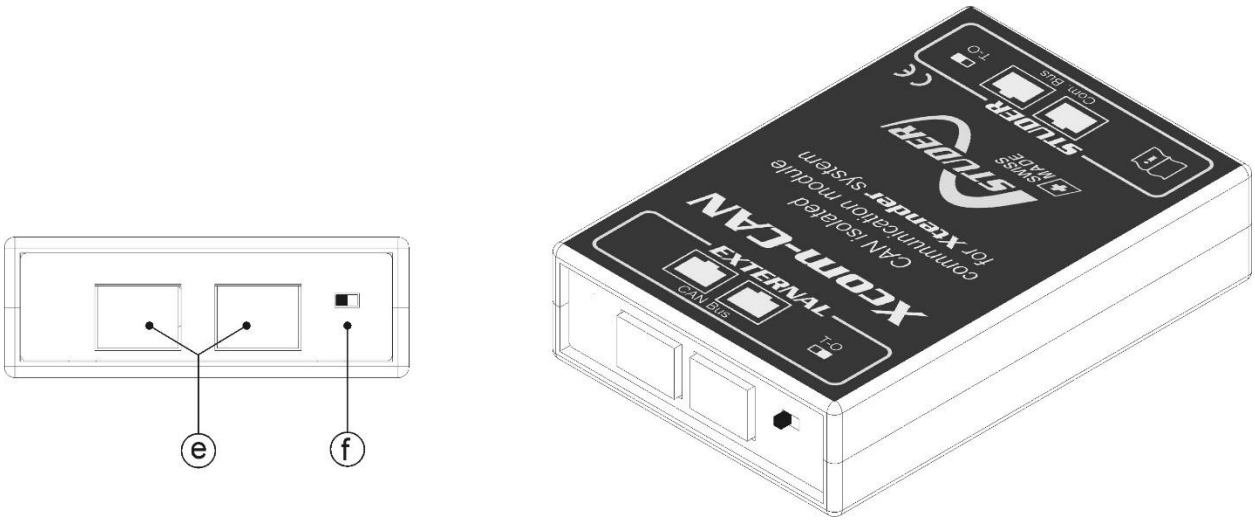


Figure 4: Back and isometric view of the Xcom-CAN

Key	Description
(e)	CAN connectors for an external network These connectors allow the Xcom-CAN to be connected to a third party system like battery BMS or a SCADA/PLC system. To communicate with the third party system, a specific cable with a specific connector must be crafted according to chapter 5.6. The cable pinning must be carefully checked before connecting any device at this point. Do not connect any devices suited for standard Ethernet connection.
(f)	Switch for CAN termination This switch activates or deactivates the communication bus termination. The termination is by default activated. In Figure 4, the termination is activated (T). Place the switch to the correct side: if there is only one cable connected on port e put the switch in T (terminated) position. If there are two cables connected on port e (Xcom-CAN connected to two other devices) place the switch in position O (open).

6 USING XCOM-CAN WITH LITHIUM BATTERIES

⚠	The use of lithium batteries requires special care. It is the responsibility of the installer to handle the battery correctly and to conform to the safety requirements of the battery manufacturer. Studer Innotec will not be responsible for any damage done to the battery and/or to the installation in case of wrong/bad handling of the lithium battery.

⚠	The use of an Xcom-CAN with lithium batteries is incompatible with the use of a BSP. Therefore, it is not possible to have an Xcom-CAN working in BMS mode together with a BSP on the same Studer CAN bus.

⚠	The Xcom-CAN module supports lithium batteries with BMS communicating on the CAN bus. See chapter 5.2 for a complete list of compatible brands. The Xcom-CAN should not be used with lithium batteries that are not on this list.

The Xcom-CAN module enables the use of lithium batteries with your Xtender/Vario installation. Lithium batteries are more complicated to handle compared to simple lead acid batteries. Lithium batteries usually embed a BMS (Battery Monitoring System) which is responsible of cell monitoring and battery safety. The BMS knows the status of each cell, and it computes maximum charging/discharging currents and maximum/minimum target voltages. These values, that change dynamically, are known as set points/limits and must be respected when the installation is working. When using the Xcom-CAN module with compatible lithium batteries, the installer, depending on the application, can choose between two operating modes:

- "Activity Control" operating mode
- "Activity Inspect" operating mode

6.1 "ACTIVITY CONTROL" OPERATING MODE

In this operating mode (which is the most commonly used), the Xcom-CAN module enables automatic use of compatible batteries within an Xtender/Vario system. Thanks to the communication protocol between the battery's BMS and the Xcom-CAN, the system is plug and play. The user no longer have to care about the battery's configuration. For this reason, the battery configuration menus for the Xtender, VarioTrack and VarioString are removed from the RCC when using Xcom-CAN with a compatible battery in "Activity Control" operating mode.

At start-up, the Xcom-CAN automatically configures the system based on information received from the battery's BMS. Once the installation is running, the Xcom-CAN takes into account the set points/limits sent by the battery's BMS and manages the connected Xtenders, VarioTracks and VarioStrings accordingly.

For safety reasons, the battery's BMS can send warnings/alarms via the communication protocol. The Xcom-CAN module reacts to these as soon as possible and tries to solve the problem by automatically stopping the charge and/or discharge of the battery, depending on the nature of the warning/alarm. A typical example would be an overvoltage warning/alarm. The Xcom-CAN will react by stopping the charge of the battery.

The reaction of Xcom-CAN on warnings/alarms is normally fast enough to avoid the battery's BMS to disconnect the battery from the installation by opening its relays. However, this situation might occur in exceptional situations (e.g. battery internal damage). In any case, the safety of the battery is guaranteed by the battery's BMS, not by the Xcom-CAN module.

In "Activity Control" operating mode, a third-party controller (e.g. SCADA, PLC) might be used (typically as a supervision functionality) but is not mandatory. Several applications are fully plug and play and do not need an additional controller (refer to chapter 0 for a list of plug and play applications).

6.2 "ACTIVITY INSPECT" OPERATING MODE

In this operating mode, the Xcom-CAN module acts as an interface between the battery's BMS and a third-party system (e.g. SCADA, PLC). The Xcom-CAN module decodes the communication protocol and makes the information available. The third-party controller will access this information by reading the different Xcom-CAN User Information (see chapter 6.6.3 for a complete list). This can be done by using an additional Xcom-232i module with the SCOM protocol or by using a second Xcom-CAN module configured in "Studer public protocol" mode (see chapter 4.2).
The third-party controller will need to control all Studer Innotec devices on the installation and ensure that set points/limits sent by the battery's BMS are respected. The third-party controller will be responsible for the safety of the complete installation. The Xcom-CAN will not perform any action on the installation.

6.3 SELECTING OPERATING MODE

Selecting operating mode is done by DIP switch 4 regardless of the battery model. The table in paragraph 5.2 shows the DIP switch configuration for the compatible battery in "Activity Control" mode. For "Activity Inspect" mode, it is the same, except that the switch 4 must be to "ON". To summarise:

- ***"Activity Control" operating mode : DIP switch 4 must be in position "OFF"***
- ***"Activity Inspect" operating mode : DIP switch 4 must be in position "ON"***

6.4 BATTERY POWER UP

Follow the battery manufacturer start-up procedure. Some batteries have a preload system unable to pre-charge all the devices connected to the battery. In this case, disconnect all devices connected to the battery. Repeat the start-up procedure and after a few seconds, reconnect the devices. You can achieve this by using additional breakers on the battery cables.

6.5 SYSTEM POWER UP

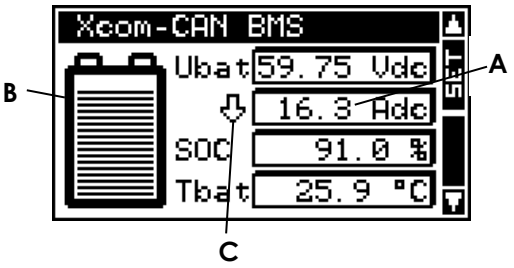
Once the Xcom-CAN is connected and powered by the Studer system it will perform different sequences indicated by the bi-coloured LED (b) according to chapter 5.10.1.

6.6 BATTERY MONITORING ON THE RCC

If an RCC is present in the system, several information is available in a specific screen dedicated to the battery.

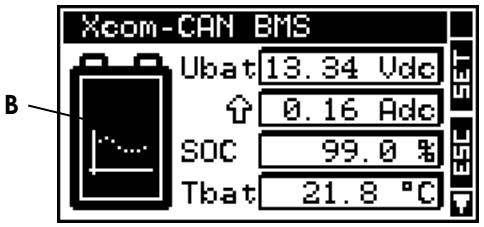
6.6.1 Displayed values

In area (A), the Xcom-CAN displays four values. The information to be displayed can be selected with the key "SET" and arrow up/down to select the field, and then "SET" again + arrow up/down to select the info among the one listed in chap. 6.6.3. When the current is displayed, the direction of the current is given in (C): an arrow upwards means the charge, an arrow downwards means the discharge. The battery symbol (B) gives a quick overview of the battery's state of charge (SOC).

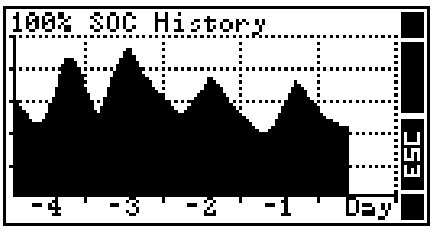


6.6.2 SOC history

When the battery symbol field (B) is selected you can access the last 5 days SOC history, with the "SET" key.



On the horizontal axis are indicated today and the last 4 days. Each horizontal pixel represents one hour. The vertical axis gives the state of charge of the battery. The graduations indicate 20, 40, 60, 80 and 100 % and one pixel represents 2 %.



6.6.3 Battery information

The table below shows the available information to display. All information can be read by a third-party controller using the SCOM protocol or the Xcom-CAN Studer Public protocol.

Info. no.	Name	Unit	Description
7000	Ubat	Vdc	Battery voltage
7001	Ibat	Adc	Battery current
7002	SOC	%	State of Charge
7003	Pbat	W	Power
7007	0d<	Ah	Ah charged today
7008	0d>	Ah	Ah discharged today
7009	-1<	Ah	Ah charged yesterday
7010	-1>	Ah	Ah discharged yesterday
7029	Tbat	°C	Battery temperature
7030	Ubat	Vdc	Battery voltage (minute avg)
7031	Ibat	Adc	Battery current (minute avg)
7032	SOC	%	State of Charge (minute avg)
7033	Tbat	°C	Battery temperature (minute avg)
7047	mSoc	%	Manufacturer State of Charge
7053	bTyp		Battery Type
7054	BMSv		BMS Version
7055	bCap	Ah	Battery Capacity
7056	bmid		Reserved Manufacturer ID
7057	SOH	%	State of Health
7058	hSOC	%	High resolution State of Charge
7061	UChL	Vdc	Charge voltage limit
7062	UDiL	Vdc	Discharge voltage limit
7063	IChL	Adc	Charge current limit
7064	IDiL	Adc	Discharge current limit
7065	IChR	Adc	Recommended charge current
7066	IDiR	Adc	Recommended discharge current
7067	Name		Manufacter name
7068	state		State of Charge status
7069	SocBu	%	Real State of Charge for Backup
7070	SocGf	%	Real State of Charge for Grid-Feeding

7071	SocEoc	%	Real State of Charge for End of Charge
7072	MgSoc	%	Minigrid state of charge

Note: If the battery is not providing a specific information or value the displayed value is "NA".

6.7 SETTING OF THE PARAMETERS

The table below shows the available parameters. All these parameters can be written by a third party controller using the SCOM protocol or the Xcom-CAN Studer Public protocol.

Level	Nr	Xcom-CAN parameter description	Factory value	User value
Basic	6004	Restore default settings	-	
Inst.	6005	Restore factory settings	-	
Expert	6062	SOC level for backup	30 %	
Expert	6063	SOC level for grid feeding	98 %	
Expert	6064	Use battery current limits instead of recommended values	No	
Expert	6066	Manufacturer SOC for 0% displayed	0 %	
Expert	6067	Manufacturer SOC for 100% displayed	100 %	
Expert	6068	Allow user to define the maximum charge current of the battery	No	
Expert	6069	Maximum charge current defined by user	10 A	
Expert	6070	SOC level under which battery discharge is stopped	15 %	
Expert	6071	Use battery priority as energy source when SOC >= SOC for backup (not recommended in parallel)	No	
Expert	6072	Solar Inverter connected on AC-Out	No	
Expert	6073	Delta from user frequency to start derating of solar inverter	1 Hz	
Expert	6074	Delta from user frequency to reach 100% derating of solar inverter	2.7 Hz	
Expert	6075	SOC level for end of charge	100 %	
Expert	6076	Allow user to define the maximum discharge current of the battery	No	
Expert	6077	Maximum discharge current defined by user	10 A	
Expert	6078	Charge current limit ratio	80%	
Expert	6079	Allow periodical full charge	No	
Expert	6080	Waiting time between periodical full charge	7 days	
Expert	6081	Time fully charged before resetting periodical full charge	5 min.	
Expert	6086	Ac-coupling priority	No	
Expert	6087	SoC value to start derating at end of charge	90%	
Expert	6088	Charge current rate at end of charge	20%	
Expert	6089	Allow adaptative Soc for Backup	No	
Expert	6090	Time before resetting adaptative Soc for Backup	5 min.	

Expert	6091	Soc in percent to reset adaptative Soc for Backup	99%	
Expert	6092	Soc in percent to increase adaptative Soc for Backup	98%	
Expert	6093	Discharge current limit ratio	95%	
Inst.	6094	Enable Minigrid	No	
Inst.	6095	Enable Minigrid as central	No	
Inst.	6097	Minigrid empty frequency offset	-3 Hz	
Inst.	6098	Minigrid full frequency offset	+3 Hz	
Inst.	6099	Minigrid enable force genset	No	
Inst.	6100	Minigrid time to force genset	18:00	
Inst.	6101	Minigrid State of Charge to start forcing genset	20 %	
Inst.	6102	Minigrid State of Charge to end forcing genset	50 %	
Expert	6104	Soc in percent to reset periodical full charge	100 %	

6.7.1 Restore default settings {6004}

Use this parameter to restore the initial settings of the Xcom-CAN.



If your installer has made some settings at "installer" level while commissioning your installation, this function restores his settings and not the factory ones.

6.7.2 Restore factory settings {6005}

With this function, you will restore the factory settings. For each parameter, not only the factory value is restored but also the limits and the user level. This function is only accessible with the level "installer".

6.7.3 SOC level under which battery discharge is stopped {6070}

You can find this parameter in the “Advanced settings menu” of the Xcom-CAN.
This parameter defines a SOC level under which battery discharge is stopped to prevent any battery dammage caused by deep discharge. The Xcom-CAN will automatically disable all Xtender functionalities that discharge the battery when the actual value of the SOC is lower than this paramenter.
For example, if you set this parameter to 4%, the battery discharge will stop once the SOC value reach 3 %. It will only be possible to discharge the battery again once the SOC level reach 5% (except from the system's self-consumption). If you set this parameter to 0%, it will not be taken into consideration. In this case the discharge of the battery will be stopped by the communication between the BMS and the Xcom-CAN or by an undervoltage detected on one Studer Innotec’s devices.

6.7.4 SOC for backup {6062}

You can find this parameter in the “Advanced settings menu” of the Xcom-CAN.

This parameter defines a SOC value that will be maintained by the Xtender/Vario system. This SOC level is your energy reserve in case of blackout (grid failure or grid disconnection).
Energy to maintain this level of SOC is taken in priority from the VarioTrack and/or VarioString. If there is not enough energy available from DC-coupled devices, energy is taken from the grid through the AC-In of the Xtender. Once this set level of SOC is reached, no more energy from AC-In will be used.

6.7.5 SOC for grid feeding {6063}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN.
This parameter defines a SOC value from which the system starts to feed the grid, in case grid feeding is enabled. If energy is available from DC-coupled devices when the SOC reaches this parameter value, the system will feed the exra amount of energy from the VarioTrack/VarioSting to the grid.

6.7.6 SOC for end of charge {6075}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN.
This parameter defines a SOC value that will limit the maximum charge level. All chargers (inverters and solar chargers) stop and the battery never exceed this SOC. By setting this parameter under 100% can be benefical for the battery lifetime.
Warning! Some SOC calculation algorithm may have troubles if the SOC does not go up to 100% for recalibration. Ask the battery manufacturer. In case of doubt set 100% to this parameter {6075}.

6.7.7 Charge current limit ratio {6078}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN. The max charge current is given by the BMS of the battery. In practice, the different BMS manufacturer have different point of view about this current. For some, it is a max charge current never to be exceeded else the battery gets faulty. For some other, it is a recommended max charge current and are tolerant if not exactly respected during transitions. So generally, the setpoint cannot be exactly on the limit.

To avoid problems, a margin of 20% was set previously (<R682) with a fixed value. This value can be chosen now with this parameter that is at 80% by default.

Note for BYD: You can set this parameter to 95% for BYD batteries to retrieve the previous behaviour. There has always been a special case for BYD batteries to allow to go at 95% of the max current. This has been asked and validated by the manufacturer.

6.7.8 Discharge current limit ratio {6093}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN. The max discharge current is given by the BMS of the battery. This parameter has the same behaviour as {6078} but for the discharging current. The default value is set to 95%.

6.7.9 Periodical full charge {6079}, {6080}, {6081}, {6104}

You can find these parameters in the "Advanced settings menu ➔ Charge/discharge settings" of the Xcom-CAN.
The parameter {6079} selects the periodical full charge feature. This has been added to periodically reach a state of charge of {6104} Soc in percent to reset periodical full charge (100% by default) which is mostly used by the batteries to recalibrate their algorithm.
Two parameters are used to set the interval of the full charge:

- {6080} Waiting time between periodical full charge. The interval time between two attempts of full charge. When the time elapsed, both SoC for grid-feeding {6063} and SoC for end of charge {6075} are forced to 100%.
- {6081} Time fully charged before resetting periodical full charge. When the full charge is forced and reached, this parameter allows to set the duration over which the SoC must stay to 100%. This duration must be long enough to allow the battery performing a self-calibration. After this time, the SoC for grid-feeding {6063} and SoC for end of charge {6075} are reset to their default values.

6.7.10 Understanding SOC parameters {6062} and {6063}

Parameters {6062} and {6063} enable you to configure the behaviour of your installation depending on SOC.

⚠	The two parameters are dependent on each other. It is not possible to set SOC for backup {6062} at a higher value than SOC for grid feeding {6063}. In the same way, SOC for grid feeding {6063} cannot be set at a lower value than SOC for backup {6062}.

The following two figures shows a typical application using Xtender with VarioTrack and/or VarioString and how the system works depending on SOC.

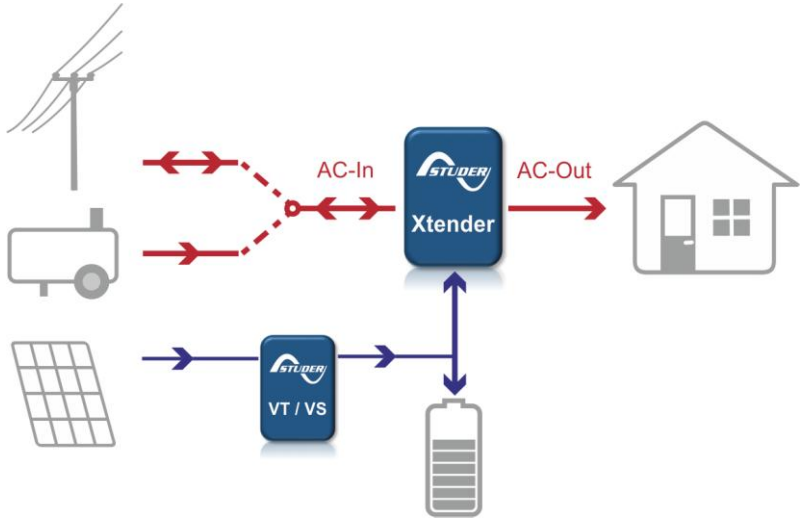


Figure 5: Typical installation toppology, VT/VS are optional

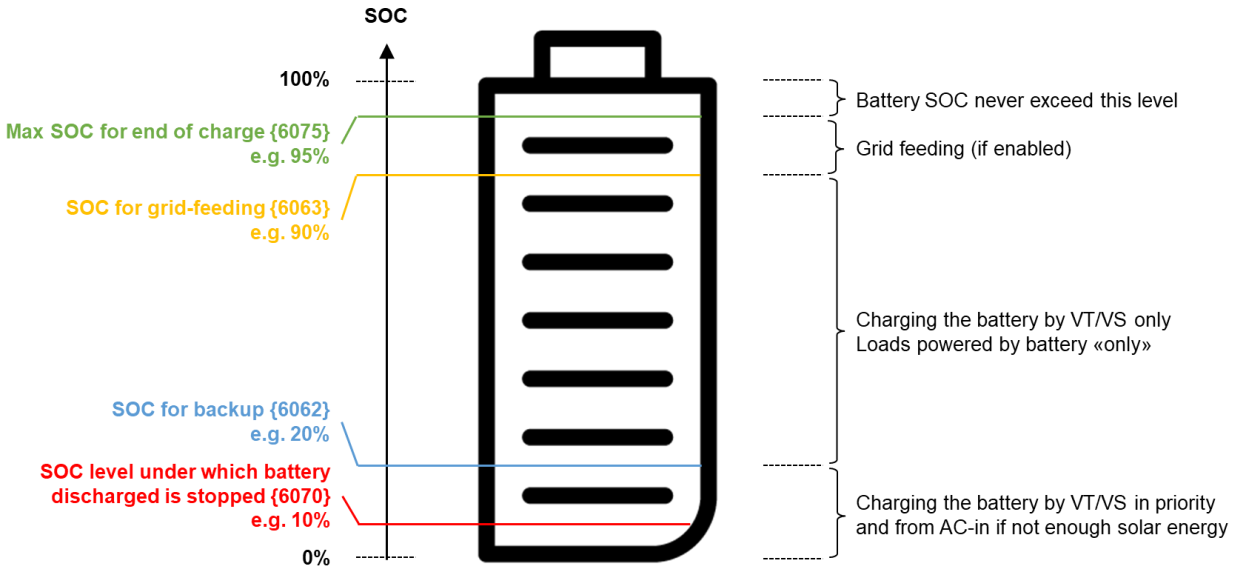


Figure 6: The functioning of a system depending on SOC

Summary:

SOC level conditions	Behaviour
{6075} "Max SOC for end of charge" to 100%	All chargers (inverters and solar chargers) stop at this maximal level and the battery never exceed this level
{6063} "SOC for grid-feeding" to {6075} "Max SOC for end of charge"	Energy from the VarioTrack and/or VarioString is used to feed the grid, if grid-feeding is enabled.
{6062} "SOC for backup" to {6063} "SOC for grid-feeding"	Energy to charge the battery is taken from VarioTrack and/or VarioString. If parameter {6071} is set to "yes", the battery priority is automatically turned on (parameter {1296} of Xtender is activated by Xcom-CAN internally) and the loads are mainly powered with battery energy. If parameter {6071} is set to "no", no energy is taken from the battery except when the Xtender is working in "Smart-Boost" {1126}.
{6070} "SOC level under which battery discharge is stopped" to {6062} "SOC for backup"	Energy to charge the battery is in priority taken from VarioTrack and/or VarioString. If there is not enough solar power, additional energy is used from the Xtender's AC-In.
0% to {6070} "SOC level under which battery discharge is stopped"	All functionnalities that make the inverter discharge the battery are automativally turned off. It is only possible to charge the battery.

6.7.11 Battery priority as energy source when SOC ≥ SOC for backup {6071}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN.
This parameter activates the battery priority when SOC is greater than or equal to "SOC for backup" {6062}. This parameter is set to "yes" by default.
The battery priority allows the Xtender to use energy from the battery in priority even if a source (grid or genset) is connected to its AC-In port.

6.7.12 Use battery current limits instead of recommended values {6064}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN.
Some battery models (e.g. IPS liCube modular LiFePO4-System) send both "reccomended values" and "limit values" on the communication interface for the charging and discharging currents. This parameter enables you to choose the values you prefer. "Recommended values" ensure long life time of the battery system by charging the battery at a lower C-rate. It is selected by setting this parameter {6064} to "No". "Limit values" enable you to use your battery system at the maximum possible performance (higher C-rate). It is selected by setting this parameter {6064} to "Yes".

6.7.13 Allow user to define the maximum charge current of the battery {6068} & Maximum charge current defined by user {6069}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN.
The installer/user can define its own battery charge current limit using two parameters. Parameter {6068} enables the use of the functionnality. Parameter {6069} allows the user to define the value of the maximum charging current. Note that this value is a limit and a setpoint. It is possible that the Xcom-CAN can not reach this value if there is not enough energy or if the battery's BMS sends a current charging limit lower than parameter {6069}. The Xcom-CAN uses the lowest value of parameter {6069} and the value sent by the BMS to control the charging current in order to respect the battery limits and to maintain the battery safety.

6.7.14 Allow user to define the maximum discharge current of the battery {6076} & Maximum discharge current defined by user {6077}

You can find this parameter in the "Advanced settings menu" of the Xcom-CAN.
The installer/user can define its own battery discharge current limit using two parameters. Parameter {6076} enables the use of the functionality. Parameter {6077} allows the user to define the value of the maximum discharging current. Note that this value is a limit and a setpoint. It is possible that the Xcom-CAN cannot reach this value if the battery's BMS sends a current discharging limit lower than parameter {6077}. The Xcom-CAN uses the lowest value of parameter {6077} and the value sent by the BMS to control the discharging current in order to respect the battery limits and to maintain the battery safety.

6.7.15 Solar Inverter connected on AC-Out {6072} & Delta from user frequency {6073} and {6074} & Ac-coupling priority {6086}

To enable control of a solar inverter connected on AC-Out with frequency shifting by the Xtender in off-grid mode, parameter {6072} must be set to "Yes". This gives access to two sub-parameters:

- the first {6073} defines the frequency delta from the user frequency (e.g. 50Hz) at which the power derating of the solar inverter begins,
- the second {6074} defines the frequency delta from the user frequency at which the power derating of the solar inverter reach 100%.

The frequency shifting is performed according to the maximum charging current allowed by the Lithium battery.

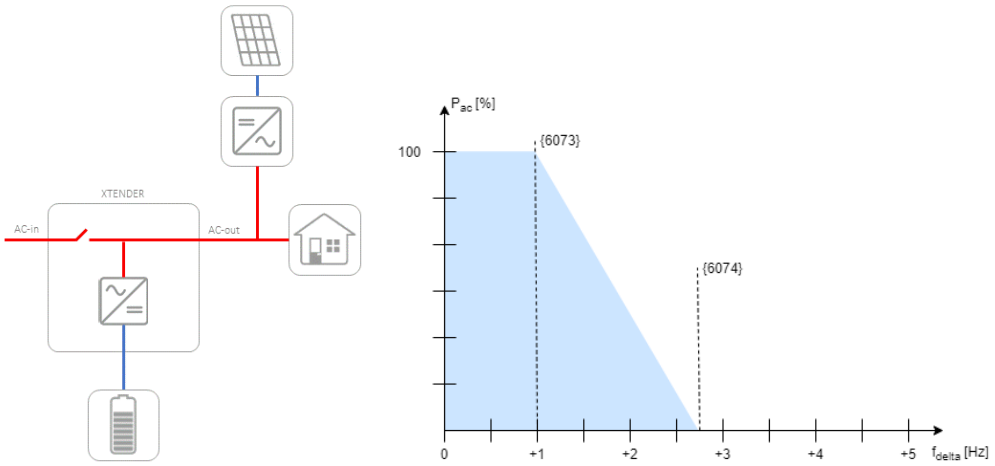


Figure 7: Offgrid topology with solar inverter on AC-Out & derating graph according to default values of parameters {6073} and {6074}

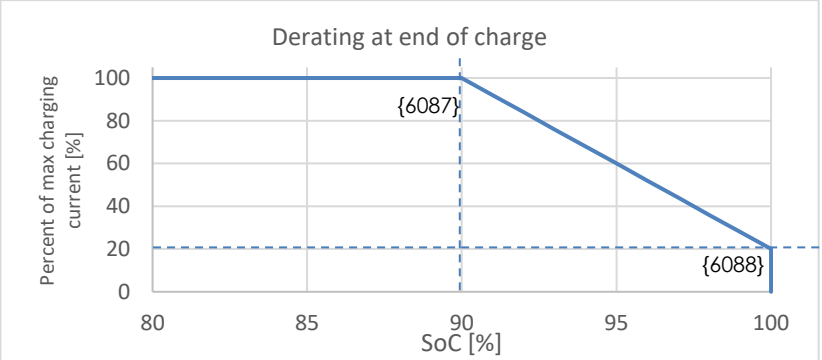
{6073} has a default value of 1.0 Hz, which makes the frequency to start derating equals to 51 Hz.
{6074} has a default value of 2.7 Hz, which makes the frequency to reach 100% derating equals to 52.7 Hz.
These 2 parameters apply the same way when the frequency of the system is set to 60 Hz, which will produce 61 Hz and 62.7 Hz.

A third parameter {6086} allows to prioritize the ac-coupling solar inverter instead of the solar charger (off-grid mode only). When the ac-coupling solar inverter produces enough energy to reach the battery required charging current, the solar chargers stop producing and only the ac-coupling solar inverter is regulated using the frequency.

6.7.16 Control the derating at end of charge using {6087} and {6088}

Depending on the battery, the behavior at end of charge is different. Some of them didn't perform a derating at end of charge in order to reduce the softly the current.

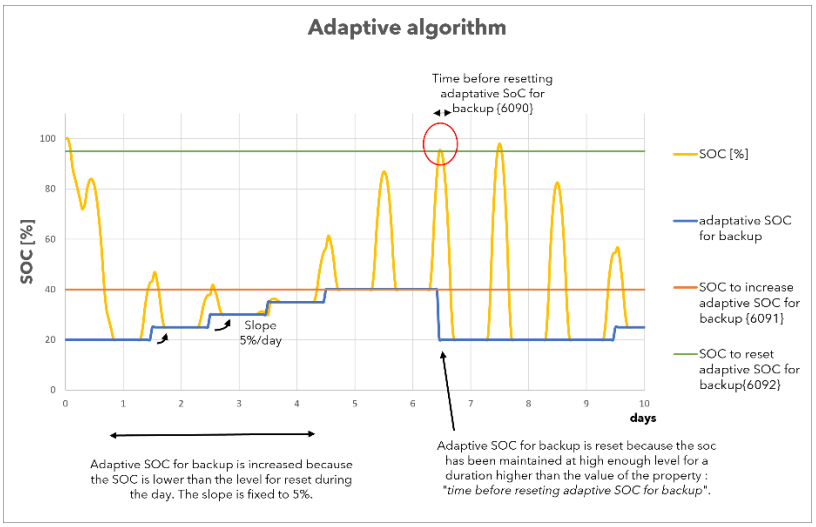
The parameter {6087} soc level to start end of charge derating and {6088} charge current rate at end of charge allows the user to control the derating. {6087} determines at which state of charge the derating starts and {6088} determines the percent of the max charging current at 100%.



Note that the battery remains the master to determine the max. charging current and the system will follow the min. value between the calculated derating and the charging current send from the battery.

6.7.17 Adaptative SoC for backup {6089}, {6090}, {6091}, {6092}

To enable the adaptative SoC for backup, the parameter {6089} must be set to "Yes". The adaptative SoC for backup allows to force recharging the battery every seven days. Most of the batteries reset their SoC algorithm at 100%. By combining this functionality with the periodical full charge, it's possible to force recharging the battery even without solar power.



Based on the "SoC for backup" {6062}, the adaptative SoC for backup will be increased every day from 5% until the "SoC to increase adaptative SoC for backup" {6091}. This SoC can only be reached using solar energy (no recharge from grid). When the "SoC to reset adaptative SoC for backup" {6092} is reached during more than "Time before resetting adaptative SoC for backup" {6090}, the adaptative SoC for backup is reset to the "SoC for backup" {6062}.

6.7.18 Minigrid {6094}, {6095}

The mode minigrid allows to enable a distributed minigrid using lithium batteries. In case of interest, please contact Studer Innotec SA for more information.

6.8 TYPICAL APPLICATIONS IN "ACTIVITY CONTROL" OPERATING MODE

The most typical applications in "Activity Control" operating mode are presented here. These applications are typical and variations can be made, depending on the special needs of the installation.

⚠	If you use the "Activity Control" operating mode with more than one Xtender in parallel per phase, the parameter {6071} "Use battery priority as energy source when SOC >= SOC for backup" should be set to "No" for stability reason. In this case, self-consumption strategy can be configured by using the Grid as generator function. More details you will find in our FAQ "How should I configure the system for maximizing the self-consumption'"

6.8.1 Backup/mobile application with or without VarioTrack/VarioString

In a backup/mobile application, the user would like to have the battery fully charged in order to have maximum energy in case of blackout (backup solution) or grid disconnexion (mobile application). For such an installation, set the parameters as explained below :

1. Xcom-CAN settings :
   - SOC for grid feeding {6063} => 100%
   - SOC for backup {6062} => 100%
2. Xtender settings :
   - Grid feeding allowed {1127} => no
   - Charger allowed {1125} => yes
   - Inverter allowed {1124} => yes
   - Smart-boost allowed {1126} => yes
   - Maximum current of AC source (input limit) {1107} => set to the value corresponding to the fuse of your installation.

6.8.2 DC-coupled self consumption application with VarioTrack/VarioString

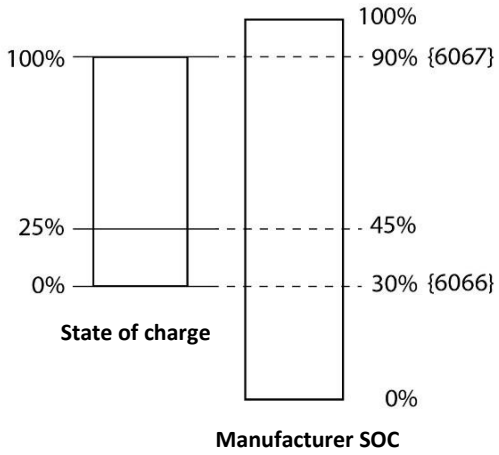
In a DC-coupled self-consumption application, the user would like to set a minimum SOC level for backup in case of blackout. Above this SOC level, the battery has to be charged by DC-coupled devices (VarioTrack and/or VarioString). When the SOC is really high , grid feeding can start if allowerd. An example of settings is explained below :

1. Xcom-CAN settings :
   - SOC for grid feeding {6063} => 90%
   - SOC for backup {6062} => 10%
2. Xtender settings :
   - Grid feeding allowed {1127} => yes
   - Charger allowed {1125} => yes
   - Inverter allowed {1124} => yes
   - Smart-boost allowed {1126} => yes
   - Maximum current of AC source (input limit) {1107} => set to the value corresponding to the fuse of your installation.

6.8.3 Manufacturer SOC for 0 % displayed {6066} and Manufacturer SOC for 100 % displayed {6067}

It is possible to scale the manufacturer SOC in order to define a user SOC. This is possible by setting the "Manufacturer SOC for 0% displayed" {6066} and the "Manufacturer SOC for 100% displayed" {6067}. It will enable the installer to define a reduced range of battery capacity whenever it is needed.

As an example, imagine an installation where you want the generator to start when SOC reaches 0%. However, in order to have extra capacity in case the generator does not start you set the "Manufacturer SOC for 0% displayed" {6066} to 30%. This way you will have 30% of battery capacity as "extra reserve" in case the generator has a problem.



6.8.4 Xtender/Vario system settings

The Xcom-CAN will automatically initialize the DC voltage/current parameter of your system. All other parameters, non-related to battery management and/or specific to the installation, must be set as described in the user manual of the various XT-VT-VS appliances in the system. For example: the input limit of the Xtender {1107}, the AC output voltage {1286} or the behaviour of the auxiliary relays.

7 TROUBLESHOOTING

There are different problems that may cause the Xcom-CAN to malfunction. This list presents known irregularities and the procedures to follow to address them.

Symptom	Description
All LEDs are off	Your Xcom-CAN is not powered correctly. Check that the module is correctly connected to your Xtender system with the appropriate cable. See chapter 5.8.
Red LED blinking	An emergency stop occurred or the communication with the battery or third party device is lost. The RCC screen will help you find the source of the problem. In case of an emergency stop: 1. Restart the battery system if it has stopped (switched off) or changed to limited power source (preload mode). See also chap. 6.4. 2. Check whether the battery is correctly connected with the Xcom-CAN module. 3. Check that the CAN communication speed of the Xcom-CAN module is corresponding to the one of the battery. The communication speed is indicated on the RCC under the menu "System info". Use the arrows to find and select the Xcom-CAN. 4. Check that the jumpers are correctly positioned. See chap. 5.6. 5. When the LED is blinking normally again (Blink 2x green), turn on the Studer devices that were turned off by the emergency stop, one by one.

8 SOFTWARE UPDATES

In case of requirement of software upgrade of the system through the RCC unit, the Xcom-CAN is automatically upgraded. The software updates are available in the download area of the website www.studer-innotec.com/en/downloads/.

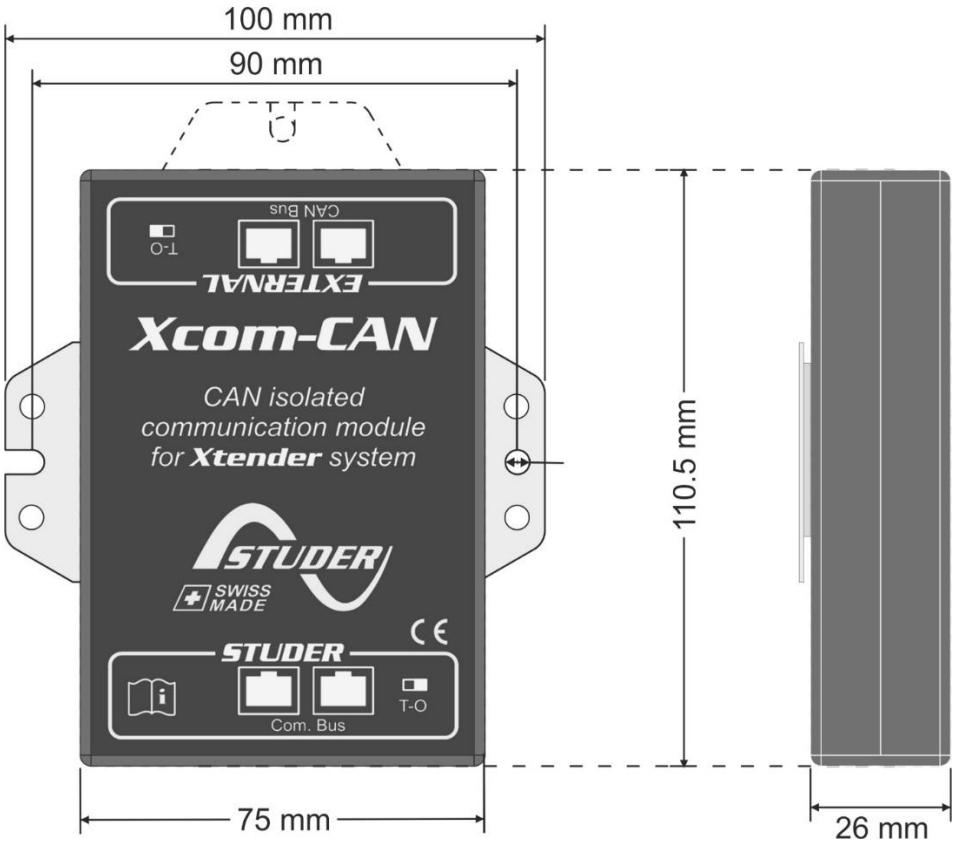
8.1 UPDATING PROCESS

⚠	Turn off all inverter units before making the update. If not manually done, the updating process will automatically stop all Xtender connected to the communication bus.

To carry out an update, insert the micro SD card (containing the latest software version) in the RCC's micro SD card reader. Before starting the updating process, the system automatically checks the compatibility between the devices and the software present on the micro SD card. The micro SD card must **not** be removed until the end of the updating process. If for some reason the updating process is interrupted, reinsert the SD card to let the process finish.

ℹ	The latest software versions are available on our website www.studer-innotec.com/en/downloads/ under the heading "Softwares and Updates".
ℹ	The updating process can take between 3 and 15 minutes. During this period, it is possible that the signalisation LED does not respect exactly the cyclical ratio described.
ℹ	The updating of a remote control RCC-02/-03, Xcom-232i/-SMS/-LAN/-GSM must be done directly on the connected device.

9 DIMENSIONS





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