1 Installation of BUS devices

Connect only BUS devices of the JA-1xx JABLOTRON series to the system. Proceed with the following procedure:

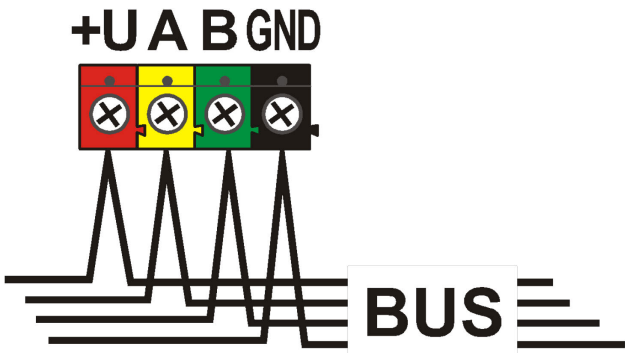
1. During the connection of any BUS modules the power supply of the control panel must be completely off or the BUS must be switched off in the F-Link software.
2. Follow the installation manuals of individual devices.
3. The BUS cable must be installed inside the area that is protected by the system. If the cable is outside the protected area, this part must be separated with a JA-110T BUS isolator.
4. For line branching use a JA-110Z BUS splitter (and the JA-110Z-B, JA-110Z-C, JA-110Z-D).
5. During the connection of BUS devices pay attention to the colour of wires (red, yellow, green, black).

Connection of third-party devices or a device of a different producer is possible via an appropriate module (the JA-111H, JA-116H, JA-114HN, JA-110M, JA-112M, JA-118M etc.). When such device is used, the producer (JABLOTRON) cannot guarantee proper functioning of the connected device and the system security grade.

1.1 The JABLOTRON BUS

The BUS of the JABLOTRON system consists of four wires (4-wire). The BUS is intended for the JABLOTRON system only and it cannot be shared with another system, not even to power different devices. For powering other systems by BUS (smart home automation) use the JA-121T interface or the JA-110T BUS isolator.

Terminal	Colour	Note
+U	red	positive power supply terminal; it can only be used to supply devices of the JABLOTRON series
A	yellow	data A
B	green	data B
GND	GND	common terminal (negative power supply terminal)



BUS terminal board

1.2 BUS cables

Resistance of the pair of power supply wires (there and back)		
CC-01	resistance of the pair per 1 m	0.0754 Ω
	resistance of the pair per 10 m	0.754 Ω
	resistance of the pair per 100 m	7.54 Ω
CC-02	resistance of the pair per 1 m	0.1932 Ω
	resistance of the pair per 10 m	1.932 Ω
	resistance of the pair per 100 m	19.32 Ω
CC-03	resistance of the pair per 1 m	0.0705 Ω
	resistance of the pair per 10 m	0.705 Ω
	resistance of the pair per 100 m	7.05 Ω
CC-11	resistance of the pair per 1 m	0.0754 Ω
	resistance of the pair per 10 m	0.754 Ω
	resistance of the pair per 100 m	7.54 Ω

Connect BUS devices using a JABLOTRON CC-01, CC-02, CC-03 or CC-11 cable.

The JABLOTRON CC-01 cable is designed for the main BUS line, or the connection of elements with a high consumption (siren) or remote elements. The cable has 4 wires (the colours corresponding to the BUS colour).

The power supply wires (black and red) have a bigger cross-section of the core (0.5 mm²) as compared to the communication wires (0.2 mm²). The cable is supplied in packs per 300 m.

The JABLOTRON CC-02 cable is designed for branches from the main BUS line or for the connection of elements with a low consumption (detectors) or for short distances. The cable has 4 wires (the colours correspond to the BUS colour). All the wires of the CC-02 cable have the same core cross-section (0.2 mm²). The cable is supplied in packs per 300 m.

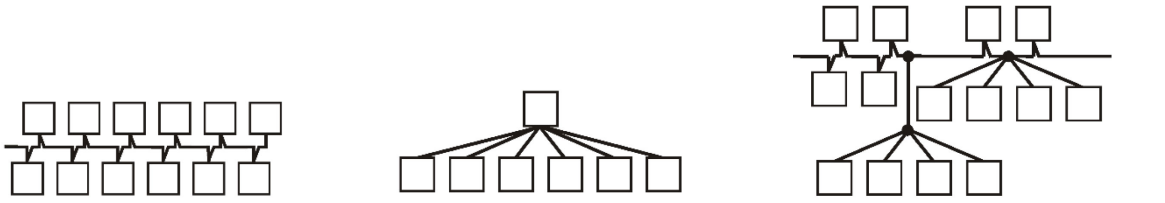
The JABLOTRON CC-03 cable is designed for the main BUS line, or the connection of elements with a high consumption (siren) or remote elements. The cable has 8 wires (8-wire) that are split as follows: The power supply conductors (red and black) have a bigger cross-section of 0.7 mm², the communication wires (green and yellow) for the system BUS and auxiliary wires (brown and grey, white and blue) have the cross-section of 0.3 mm². The auxiliary wires can be used as loops of magnetic detectors or tamper contacts. The cable is supplied in packs per 250 m.

The JABLOTRON CC-11 cable is designed for the main BUS line, or the connection of elements with a high consumption (siren) or remote elements. The cable has an external insulation of an orange colour, it has 4 wires (the colours correspond to the BUS colour). The power supply wires (black and red) have a bigger cross-section of the core (0.5 mm²) as compared to the communication wires (0.2 mm²). The cable is supplied in packs per 200 m. It has the B2CA increased fire protection certification.

1.3 BUS layout

When interconnecting individual parts of the system – detectors, keypads, sirens, output modules etc. you can route the BUS cable in the shortest possible direction regardless of the system parts that the used elements belong to. The BUS can branch as necessary. It can have a linear (Daisy-chain), Star or tree structure (Daisy-chain & Star). In real-life installation a combination of these three options is usually the most convenient choice.

Examples of possible wiring layouts of the BUS:



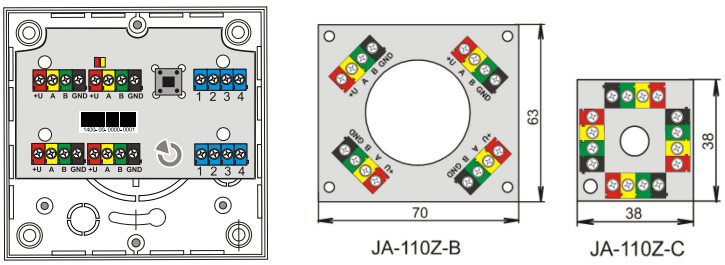
Daisy-chain (linear BUS structure) *Star BUS structure* *Daisy-chain & Star (tree BUS structure)*

The BUS cable **must not** be connected in such a way to create a **closed loop** of any wire (the ends of individual branches must never be interconnected and the common GND wire must not be interconnected either.

1.4 BUS branching and splitting

For branching and splitting of the BUS you can conveniently use a **JA-110Z BUS splitter**. It is produced in four variants: the JA-110Z, JA110Z-B, JA110Z-C and JA110Z-D. The JA-110Z is supplied in an installation box meant to be installed on a surface and equipped with front and rear tamper contacts to detect unwanted manipulation. It occupies one position in the system. All the terminals of the same colour are interconnected on the splitter PCB. Variant B is prepared with its dimensions for installation in the JA-190PL versatile assembly box. Variant C is prepared with its dimensions for installation in a standard KU-68 electric installation box.

Variants of interconnection terminal boards:



JA-110Z-B JA-110Z-C

1.5 BUS length and numbers of connected devices

The maximum length of one BUS without boosting (separation) is 500 m. The length is calculated as the sum of the length of all the cables between all the connected devices. The JA-107K control panels can have up to 3

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separate BUS branches, i.e. the total length of both the BUS lines can be 3x500 m. You are recommended to distribute its addressed BUS devices equally between both the BUS lines, i.e. maximum 60 devices per either BUS.

For use of more than 60 peripherals on a single bus, it is necessary to use the JA-120Z bus booster unit is required.

The number of connected BUS devices is limited by the capacity of the backup battery of the control panel. To meet the standard for security level 2, in case of a 230 V mains failure the system must reliably work for at least 12 hours being powered by the backup source. Thus, the total consumption of all the BUS devices must not exceed the maximum continuous consumption of current from the control panel, see chapter 5.8 Example of calculation of BUS consumption to back-up the system. To calculate the total continuous consumption of connected elements summarize their **backup consumption** (Chapter 5.8).

Another limiting parameter for the max. length of a BUS can be the voltage loss along the line (shown clearly by the System Diagnostics in F-Link software).

1.6 Calculation of line losses

Voltage losses along the line depend on the line resistance, which results from the used conductor (cable) and consumed current. Current consumption values of devices can be found in individual manuals. These values can be used to calculate the line voltage loss and to find out whether there will be sufficient voltage available for the last installed device. The calculation is based on Ohm's law **U = I * R.**

CC-01 cable (power supply pair)		**CC-02 cable**		**CC-03 cable (power supply pair)**		**CC-11 cable (power supply pair)**	
Total current	Max. length	Total current	Max. length	Total current	Max. length	Total current	Max. length
50 mA	400 m	25 mA	200 m	70 mA	400 m	50 mA	400 m
100 mA	300 m	50 mA	150 m	140 mA	300 m	100 mA	300 m
200 mA	150 m	100 mA	100 m	280 mA	150 m	200 mA	150 m
300 mA	100 m	200 mA	50 m	420 mA	100 m	300 mA	100 m
500 mA	50 m	300 mA	30 m	800 mA	50 m	500 mA	50 m
The data in the table assume the worst possible case i.e. that the total consumption is at the end of the cable.							

In the normal operation state, the voltage of the +U and GND terminals is nearly 14 V. For the calculation consider a situation when the control panel is only powered by the battery and the voltage approximates 12 V. A higher voltage than the minimum allowed voltage of 10 V must be available for all the devices. For proper functioning of the connected devices the **maximum allowed voltage loss is 2.0 V.**

Unexpected voltage loss can be caused by terminal connections with a poor contact (transitional resistances).

Voltage losses of individual devices can be approximately verified using the F-Link software in the Diagnostics card for addressed devices. Non-addressed devices (e.g. output modules) do not provide this possibility; they must be checked with a measuring device.

In a real-life installation we always recommend you verify the calculation and connection by terminal measurement. In the case of high-consumption devices (siren, keypad, relay output) carry out this measurement during increased consumption periods (active siren, backlit keypad, engaged relay).

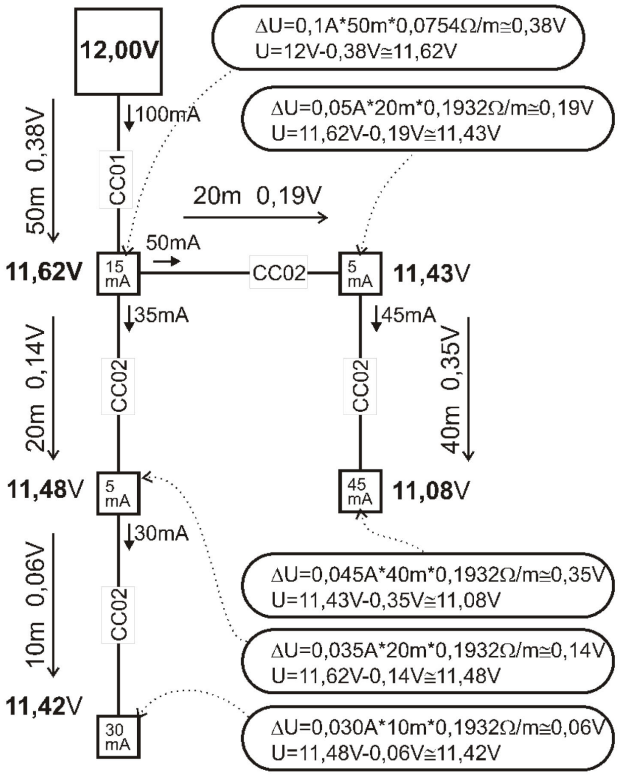
The limitations specified in the table are generally valid.

For the calculation of the total load of cables calculate the **consumption for cable selection** (you will find it in the manuals of devices).

1.7 Example of a voltage loss calculation

1. Find the values of current consumption of individual devices (in the technical parameters of the products - Current consumption for cable selection).
2. Get information about cable lengths. You need to know the cable length as exactly as possible from node to node.
3. Draw a plan with cable lengths and consumption of individual branches.
4. Calculate the electric current flowing through individual branches.
5. Use the assumed line length and the estimated values of current of individual branches in accordance with the tab above to compare suitability of cable selection.

Deduct individual losses from the supply voltage to determine the voltage at the line end. Always consider the voltage of 12 V from the control panel during mains supply failure operation.



1.8 Example of calculation of BUS consumption to back-up the system

The table presents an example of a small system. The total idle consumption in the backup mode is 78 mA. Thus, you can use the JA-103K control panel with a GSM communicator and a switched off LAN communicator, which enables maximum permanent loading of 80 mA.

Device	Description	No. of pieces	Consumption in backup mode
JA-11xR	module for radio communication	1	25 mA
JA-114E	control panel 15 mA + 3x 1 mA segments	1	18 mA
JA-110M	module for magnetic sensors 5 mA	1	5 mA
JA-110P	PIR motion detector 5 mA	2	10 mA
JA-110ST	fire detector 5 mA	2	10 mA
JA-110A	internal siren 5 mA	1	5 mA
JA-111A	external backed-up siren 5 mA	1	5 mA
		TOTAL	**78 mA**

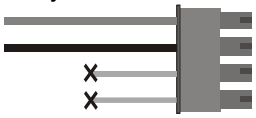
The JA-103 type is more suitable for wireless systems where devices are powered by batteries. When planning the configuration of a wireless control panel, do not forget to include the radio module(s) in the consumption.

For larger BUS systems use the JA-107K control panel.

1.9 Power supply requirements

The control panel requires to be powered permanently by protected AC power in a range 110 – 230 V, see Technical Specifications The control panel is a device with double isolation so its connection is usually performed by a cable with double insulation and a cross-section of 0.75 to 1.5 mm². The control panel has a protective small glass fuse. It is a part of the mains power terminals. The JA-103K and JA-103K-7Ah cannot be powered from alternative sources such as high-capacity batteries charged by solar panel, etc.

The JA-107K control panel makes it possible to utilize an external power supply which is in conformity with EN 50131-6. The power supply must be within the range of 10 to 15 V (DC) and intended for use in remote system installations and/or objects without a constant 230 V (AC) power supply. In order to connect the external power supply, we recommend the use of a VOD-JA-107K cable. It is comprised of a conductor, a fuse box containing a fuse (F 6,3 A) and a connector.



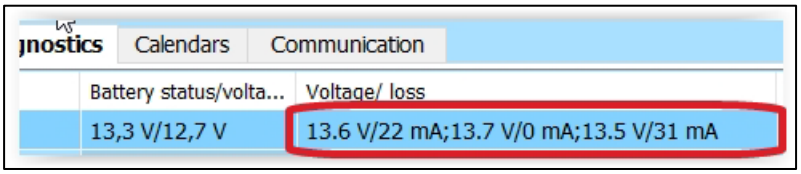
1.10 Backup requirements

A security system which has to comply with security grade 2 has to backed up by backup battery for 12 hr during a mains power disconnection and it also has to be fully charged 48 hr after mains power recovery and be ready to back the system up again. To meet this requirement, it is necessary not to exceed the maximum current consumption from the BUS.

Example of maximum permanent current taken from system BUS according to the backup battery capacity:

	JA-103K 2.6 Ah battery		JA-103K-7Ah 7 Ah battery		JA-107K 18 Ah battery	
Maximum continuous current consumption from the BUS	BUS 1 – 1000 mA I-BUS – 200 mA		BUS 1 – 1000 mA I-BUS – 200 mA		2000 mA permanent 3000 mA for 60 min. (max. 2000 mA for one BUS)	
Maximum continuous current consumption for 12-hours backup supply	Without GSM communicator	LAN – OFF: 115 mA LAN – ON: 88 mA	Without GSM communicator	LAN – OFF: 328 mA LAN – ON: 304 mA	Without GSM communicator	LAN – OFF: 1135 mA LAN – ON: 1107 mA
	With GSM communicator	LAN – OFF: 88 mA LAN – ON: 53 mA	With GSM communicator	LAN – OFF: 296 mA LAN – ON: 272 mA	With GSM communicator	LAN – OFF: 1100 mA LAN – ON: 1072 mA
Maximum continuous current consumption for 24-hours backup supply	Without GSM communicator	LAN – OFF: 21 mA	Without GSM communicator	LAN – OFF: 136 mA LAN – ON: 12 mA	Without GSM communicator	LAN – OFF: 535 mA LAN – ON: 499 mA
	With GSM communicator	LAN – OFF: 17 mA	With GSM communicator	LAN – OFF: 104 mA LAN – ON: 80 mA	With GSM communicator	LAN – OFF: 530 mA LAN – ON: 494 mA

The current taken from each BUS output terminal is shown in the F-Link software in the Diagnostics tab on line 0 where the control panel is. For the JA-107K control panel it is necessary to sum the values of all BUS outputs. This current is compared with the current stated in the table above. This way you can check if the backup battery capacity is adequate to norm requirements for system backup time. If the measured current is higher than the one stated in the table, it is necessary to solve the system power supply with e.g. adding the JA-120Z booster unit.



1.11 BUS isolation

Parts of the BUS routed in unprotected areas must be protected from possible short-circuit or another attempt to disable the system by isolation using a JA110T BUS isolator. This module can be incorporated in a JA-190PL multipurpose installation box. The isolator also improves the signal quality of the BUS. It is connected to and powered by the BUS, it does not occupy any position in system and makes it possible to extend the maximum BUS length up to next 500 m. Avoid using 2 or more BUS isolators on one BUS leg – devices cannot communicate through 2 or more of them.

An application example may be routing of the BUS to relay modules controlling for example blinds or a siren to which the BUS is routed in such a way that it could be potentially attacked or disabled from outside. You will find more information in the JA-110T manual.

BUS from the control panel

Possible BUS damaging behind the module caused for instance by short circuit, doesn't influence the BUS in front of the module!

1.12 Use of existing cabling in refurbishment projects.

- For the installation of new lines, you should preferentially use the CC-01, CC-02, CC-03 and CC-11 cables.
- In case of connection to cables of the SYKFY 3x2x0.5 type the data wires of the BUS (A, B) must be connected to one selected twisted pair. For the power supply (+U12, GND) you can connect the respective wires together in the remaining two pairs (doubling within a pair).
- In case of connection to cables of the UTP the data wires of the BUS (A, B) must be connected to one selected twisted pair. For the power supply (+U, GND) it is suitable to connect together (double) the respective wires of the remaining wire pairs.

If a shielded cable is used, do not connect the shield to the BUS terminals! We recommend bonding all the shields (tinning) in the control panel to an auxiliary terminal and not to connect this bonding anywhere else. Also leave the other end of shielding at the device side unconnected.