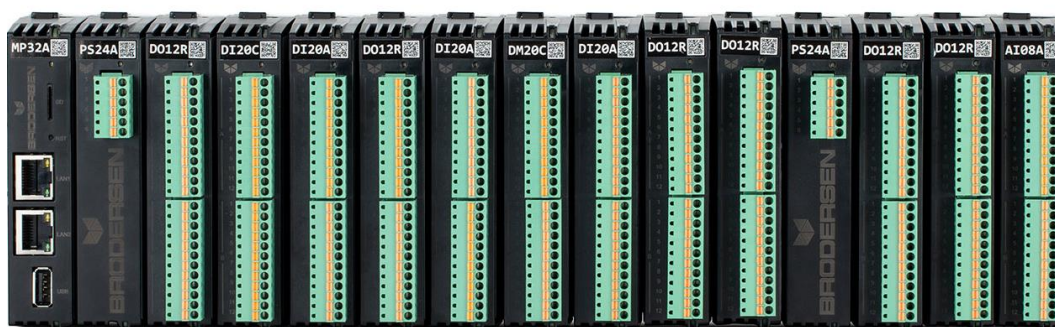


LB2 User manual

User manual for Brodersen LB2 I/O series

Manual

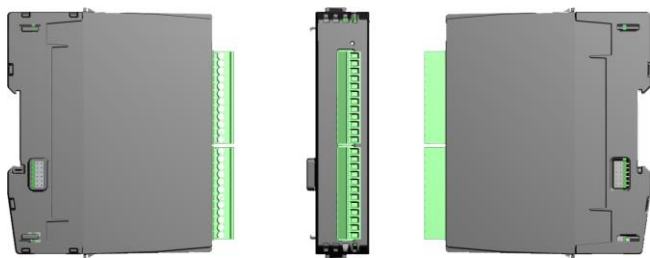
Doc: 40430 v1.04 / March 5th, 2020



BRODERSEN
simplifying systems



INTRODUCTION TO LB2 I/O SERIES



The Brodersen LB2 modules can be used with RTU32N & RTU32M series. The I/O modules are in two parts, bottom part containing the backplane bus, and top part containing the I/O board and logic. All LB2 modules are hot plug. LB2 modules are all equipped with 200 MHz processor to process I/O, handle filtering, SOE, debounce, module clock and general module logic. Diagnostic variables are available for all LB2 modules. See the module datasheets for full info. Firmware update is handled from RTU level in Brodersen worksuite.

Use only genuine Brodersen bus cables for connection to Brodersen RTUs and extension of I/O module blocks. The connection cables for LB2 is special made to handle the power requirements and shielding to run communication. The maximum overall length of complete system is 5m. Each I/O module & Power supply module is calculated as 2 cm. The cables are as the length indicates, e.g. UCC-610/1 count as 100 cm.

Maximum possible system configuration is 60 I/O modules on one LB2 Bus.

LB2 Cables

Description	Part Number
100cm LB2 Cable	UCC-610/1
200cm LB2 Cable	UCC-610/2
25cm LB2 Cable	UCC-610/25
50cm LB2 Cable	UCC-610/50

IO MODULE BACKPLANE PART

Description	Part Number
BUS I/O module Start	BB21A
BUS I/O module, Middle	BB21B
BUS I/O module, Expansion (End)	BB21C
BUS Power supply module, Start	BB41A
BUS Power supply module, Middle	BB41B
BUS module for power supply, Extension	BB41E
BUS CPU module, Start	BB61A
BUS CPU module, Middle	BB61B
BUS CPU module, Redundant	BB61R
BUS module for SYS-I/O, Start	BB81A
BUS module for SYS-I/O, Middle	BB81B

LB2 Modules

Description	Part Number
20DI, bipolar 10-30 VDC	DI20A
20DI, bipolar 30-60 VDC	DI20B
18DI, 2CI 5kHz, bipolar 10-30 VDC	DI20C
12DI, unipolar 90-140 VDC	DI12H
10DI bipolar 10-30 VDC, 10DO 10-30VDC	DM20A
10DI, bipolar 30-60 VDC, 10DO 10-30VDC	DM20B
8DI, 2CI, 5kHz bipolar 10-30 VDC, 10DO 10-30VDC	DM20C
12RO, SPST	DO12R
8RO, SPDT	DO08R
20DO 10-30VDC	DO20A
8AI 16 bit user configurable	AI08A
2AO 16 bit user configurable	AO02A
8 DI, 2 DO, 3AI (Current), 1 AO	IO14A
8 DI, 2 DO, 3AI (Voltage), 1 AO	IO14B
Power supply 10-30 VDC Input, 12VDC 1.2A BUS output	PS24A
CPU Module	MP32A

DESIGNING A SYSTEM WITH LB2 I/O MODULES

In the following scenarios is only one type I/O module with 10 digital Input & 10 Digital output selected, with part-nr. DM20A. Only one type is chosen in the examples to make the illustrations more simple.



RTU32M System with backplane CPU & I/O modules.

For a backplane CPU system the first module is always CPU, second is always Power supply. Third module can be redundant power supply or I/O module.

Example I/O order would be.

1 x CPU module	MP32A
2 x Power supply module	PS24A
7 x I/O module	DM20A (10DI+10DO)
1 X Bus CPU module Start	BB61A
2 X Bus PS module Middle	BB41B
7 X Bus I/O module Middle	BB21B



RTU32N System with one I/O module.

For a single module system BB21A and a UCC cable is needed. BB21A has a RJ-45 connector to connect the CPU module and a possibility to connect to another module.

Example I/O order would be.

1 x I/O module	DM20A (10DI+10DO)
1 X Bus I/O module Start	BB21A
1 x 25cm LB2 Cable	UCC-610/2



Figure 1

System with multiple I/O modules example 1.

(Overall bus length max 5m)

When a multiple I/O configuration is engineered the power consumption must be considered. See the datasheet for the RTU or the power supply module to calculate how many I/O modules that can be connected before extra power supply modules BB-1PI.10 or BB-1PS.10 is needed. This configuration gives the possibility to add more I/O on next Din-rail. I/O modules can always be inserted in between start and end module. The UCC Cable in end module is not needed, it is to illustrate future possible expansion.

Example I/O order would be.

9 x I/O module	DM20A (10DI+10DO)
1 X Bus I/O module Start	BB21A
1 X Bus I/O module Expansion	BB21C
7 x Bus I/O module Middle	BB21B
1 x 25cm LB2 Cable	UCC-610/25

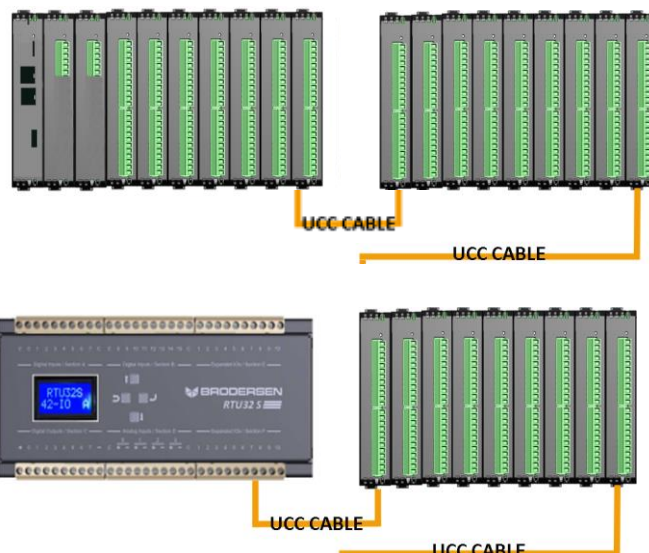


Figure 2



System with multiple I/O modules example 2.

(Overall bus length max 5m)

When a multiple I/O configuration is engineered the power consumption must be considered. See the datasheet for the RTU or the power supply module to calculate how many I/O modules that can be connected before extra power supply modules BB41E or BB41A is needed.

Example I/O order would be.

17 x I/O module	DM20A (10DI+10DO)
2 X Bus I/O module Start	BB21A
2 X Bus I/O module Expansion	BB21C
13 x Bus I/O module Middle	BB21B
1 x 25cm LB2 Cable	UCC-610/25
1 x 100cm LB2 Cable	UCC-610/1

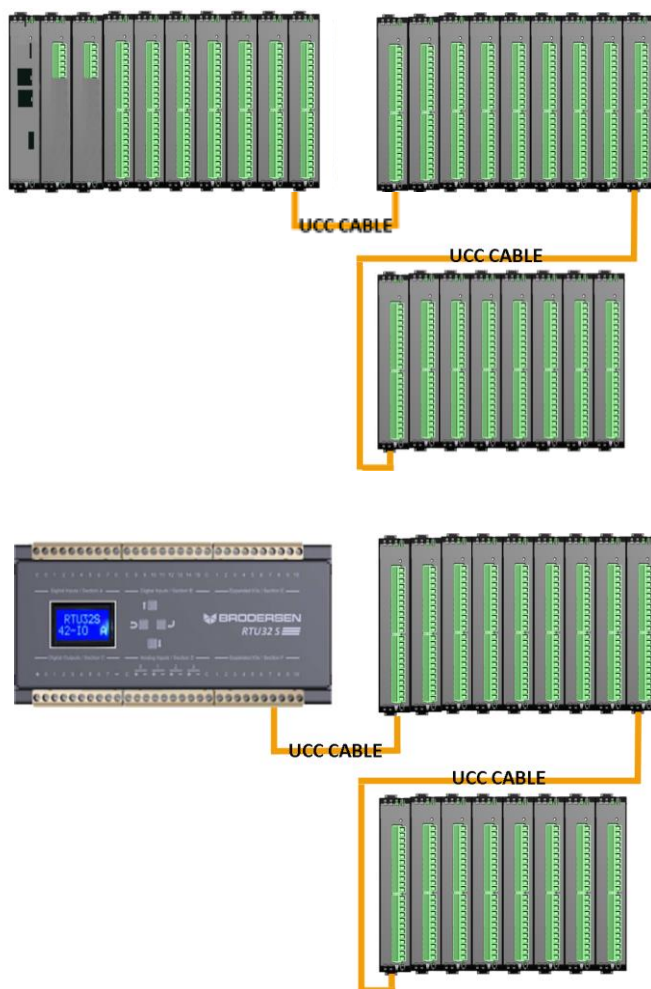
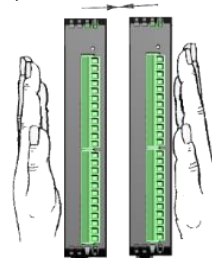


Figure 3

ASSEMBLE BUS I/O MODULES

Backplane modules are assembled by gently pressing them together with hands, no tools needed. See Figure 4



"CLICK"
Figure 4

DISASSEMBLE BACKPLANE MODULES

If two backplane modules needs to be disassembled, use a flathead screwdriver. Push it gently in between the backplane modules and rotate gently like shown on Figure 5.

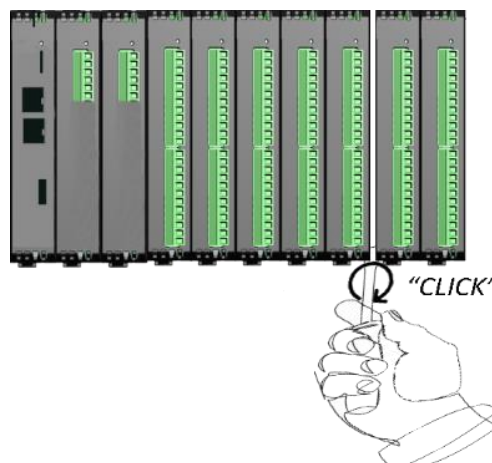


Figure 5

INSERT MODULE INTO BUS BACKPLANE MODULE

Gently slide module into backplane part. See Figure 6

*****Attention*****

Modules in Table 1 has a different backplane connector location. I/O modules and CPU module cannot be inserted by mistake into a power supply backplane module.

BUS Power supply module, Start.	BB41A
BUS Power supply module, Internal.	BB41B

Table 1

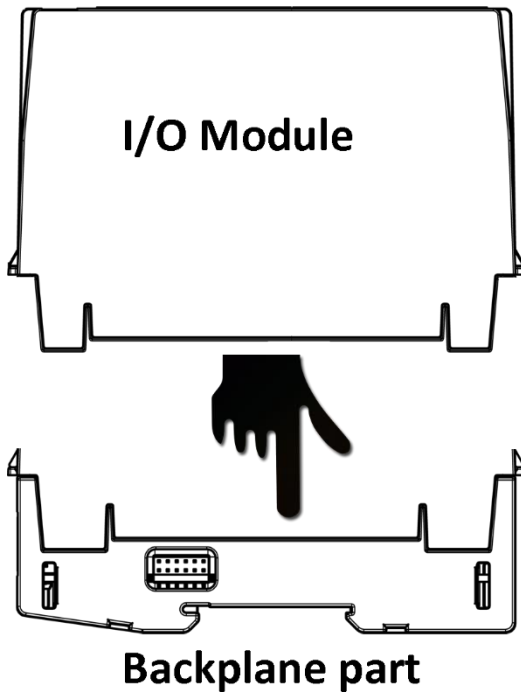


Figure 6

REMOVE MODULE FROM BACKPLANE MODULE

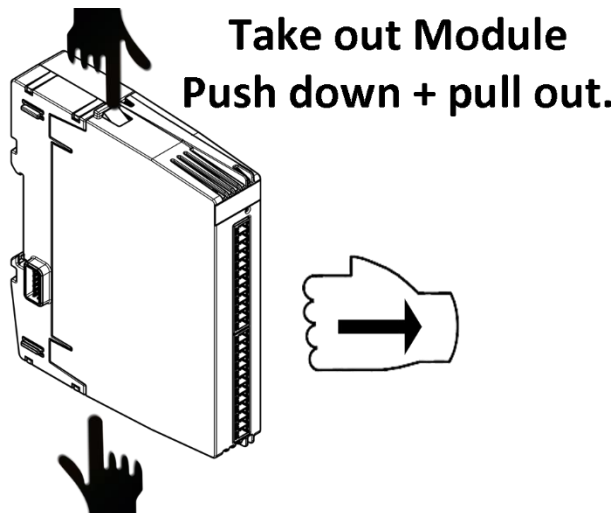


Figure 7

Backplane & I/O module side view

Backplane bus connector located in the circle marked with D.

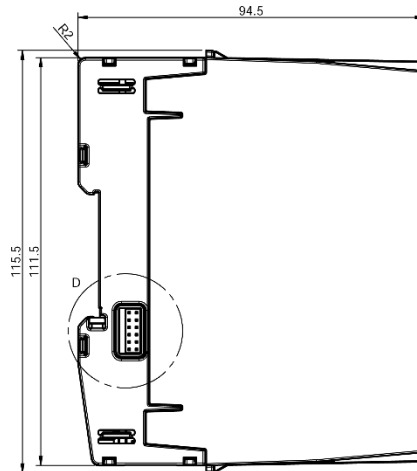


Figure 8

Backplane & I/O module top view

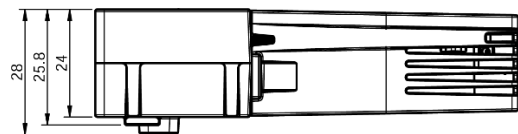


Figure 9

Backplane start & Expand with I/O module

Backplane Start:

Backplane start has a RJ45 connector for connecting I/O modules to RTU if the solution not is with CPU mounted in the backplane.

Backplane Expand or End module

The Expand module is also the End module. The Expand module has RJ45 connector for Backplane bus expansion. It can be for expansion to next cabinet or for future possibility for expanding the solution. Maximum overall system length is 5 meter.

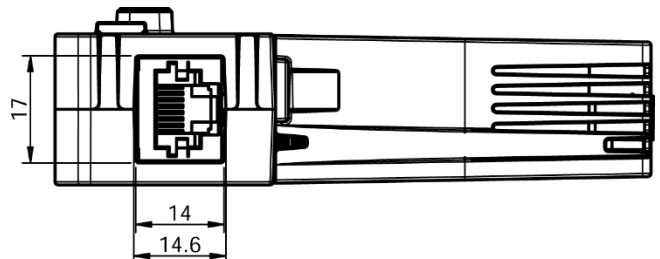


Figure 10

Part nr. for backplane module (not IO module)

Bus I/O module Start	BB21A
BUS I/O module, Expansion (End)	BB21C



Backplane middle with I/O module

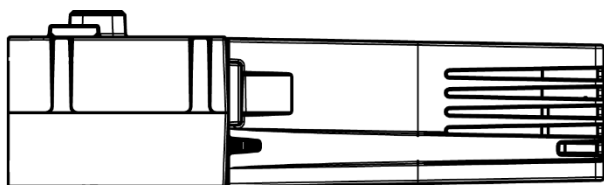


Figure 11

Part nr. for backplane module middle (not IO module)

BUS I/O module, Internal (middle)	BB21B
--	--------------

Backplane Power Supply

The backplane power supply cannot be inserted into any other backplane modules than BB41A, BB41B & BB41E. The connector on the backplane is located in a different position for avoid inserting I/O cards into the Power supply backplane module. The power supply can be redundant like all the rest of the modules, and has a 200 Mhz processor to handle all the logic on the module.

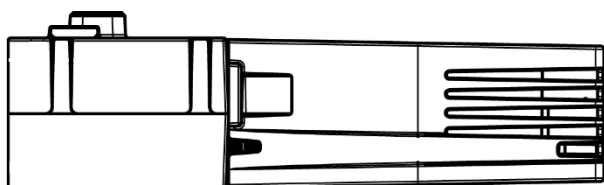


Figure 12

Part nr. for backplane module middle (not IO module)

BUS I/O module, Internal (middle)	BB21B
--	--------------



MODULE CONFIGURATOR

All modules are configured in the Brodersen worksuite. It is recommended to see our video about how to configure and insert LB2 modules in I/O system. It can be found on our webpage or by pressing this link: [VIDEO](#)

Module configurator Toolbar

Figure 13 shows the configurator toolbar with icon explanations.

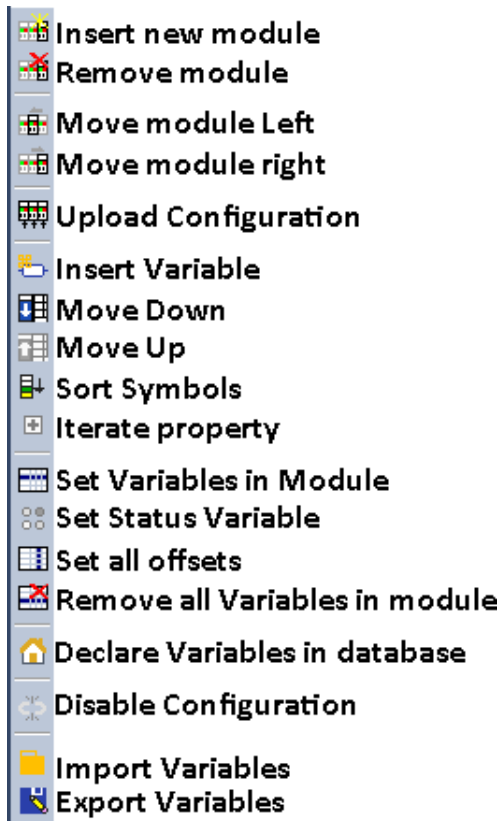


Figure 13

Inserting a module in Brodersen Worksuite

To open the I/O configurator press the ICON in the top menubar "open I/Os"

The I/O configurator is now open.

Modules can be inserted in several ways.

- Left click in the I/O module window and select "Upload Configuration" This will upload modules connected to the online RTU.
- Left click in the I/O module window and select ADD Module
- Drag and drop from module list in the right side of I/O module window
- A existing module can be copied by "Ctrl+c" & "Ctrl + V" → Windows copy paste

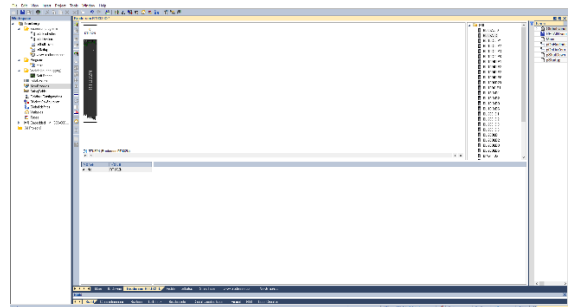


Figure 14

Move a module in Brodersen Worksuite


- Modules can be moved left or right by pointing the mouse cursor on the module, press and hold left mouse button and drag module to desired position.
- Modules can be moved left or right by pointing the mouse cursor on the module, press right mouse button and select "Move Right" or "Move Left"

Remove a module in Brodersen Worksuite

- Modules can Removed/Deleted by pointing the mouse cursor on the module, press right mouse button and select "Remove Module"
- Modules can Removed/Deleted by pointing the mouse cursor on the module and press Delete on keyboard



Add variables to a module in Brodersen Worksuite

In left pane of the I/O modules press the Icon  "Set Variables In Module" a Set variables window appears. Remember to check Declare Variables in Database if Variables are to be used later as Global Variables. Use the Drop Down list to select a syntax, or make you own.

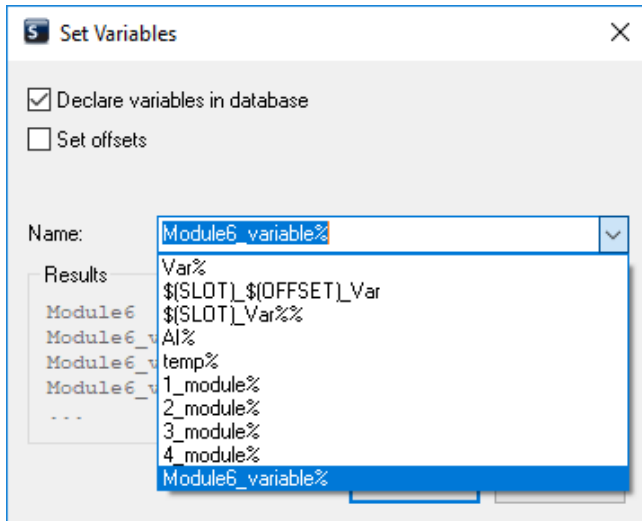


Figure 15

If as an example the syntax `$(SLOT)_$(OFFSET)_VAR` is selected the variables will be like in Figure 16 for a 8 Analogue input module.

Name	Value	Symbol	Type	Channel
Art-No	BL-08AI-D	Slot 2_0_Var	Input WORD	0
Description	8 Analogue Inputs (16 bit)	Slot 2_1_Var	Input WORD	1
		Slot 2_2_Var	Input WORD	2
		Slot 2_3_Var	Input WORD	3
		Slot 2_4_Var	Input WORD	4
		Slot 2_5_Var	Input WORD	5
		Slot 2_6_Var	Input WORD	6
		Slot 2_7_Var	Input WORD	7

Figure 16

The way the syntaxes are built, give the flexibility to engineer your own. If the syntax is modified it could be:

Module_Nr_\$(SLOT)_Analogue_in_\$(OFFSET)

And the result would be see Figure 17

Name	Value	Symbol	Type	Channel
Art-No	BL-08AI-D	Module_Nr_2_Analogue_in_0	Input WORD	0
Description	8 Analogue Inputs (16 bit)	Module_Nr_2_Analogue_in_1	Input WORD	1
		Module_Nr_2_Analogue_in_2	Input WORD	2
		Module_Nr_2_Analogue_in_3	Input WORD	3
		Module_Nr_2_Analogue_in_4	Input WORD	4
		Module_Nr_2_Analogue_in_5	Input WORD	5
		Module_Nr_2_Analogue_in_6	Input WORD	6
		Module_Nr_2_Analogue_in_7	Input WORD	7

Figure 17

Rename auto generated variables

In some cases there are some variables names that can't be generated through a syntax. In this case point the mouse on the variable see Figure 17 where the line is blue. Double click on it. And Figure 18 appears

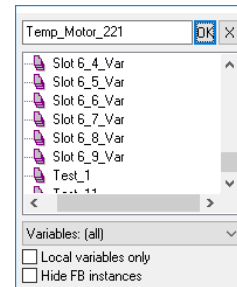


Figure 18

Now the variable name can be changed to temperature of motor 221 e.g. Temp_Motor_221, press OK and Figure 19 appears. Remember in Figure 19 to select "Rename the Variable"

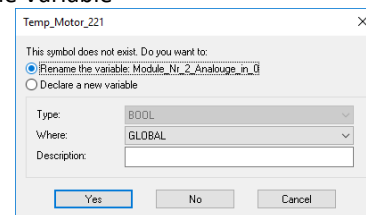


Figure 19



Configure Modules

This document is a general document for all modules, and there will be new features on modules. Use the datasheet of the modules to see what specific features there is available on the module. In this example a combination module and an analogue input module will be shown. In the module configurator see Figure 20 DoubleClick on a module

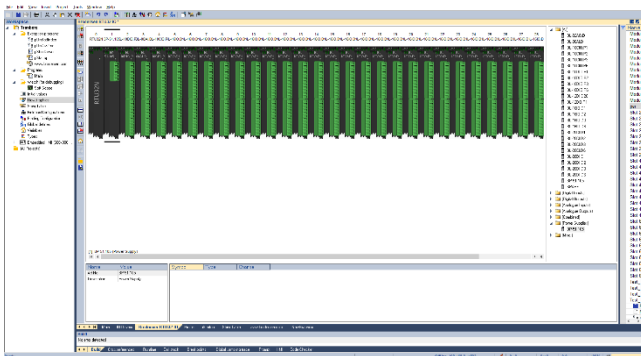


Figure 20

After DoubleClick on the module the configuration page appears. See Figure 21.

Configure Combination DI/DO module example

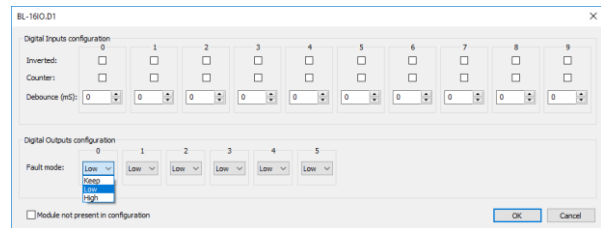


Figure 21

In this illustration a Combination module with 10 DI and 6 DO has been selected.

- Configure Input:
 - **Inverted:** Select if input is Low level inverted. Can also be inverted in the PLC logic.
 - **Counter:** Select if input is a counter. If an input is a 5 KHz counter, but not defined as a counter. Then the bus will be spammed with 5000 pulses/sec. equal to a pulse every 200 μ s.
 - **Debounce:** Debounce in milliseconds, determines how long time the I/O must be high or low before it is detected as state change.
 - **Fault Mode** Fault mode is where module has no contact with a CPU. It is necessary to select for all channels.
 - Keep (I/O module will keep last state)
 - Low (Output will be forced Low)
 - High (output will be forced High)

Configure AI module example

In the module configurator see Figure 20 DoubleClick on a module

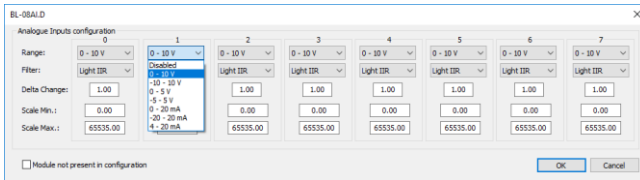


Figure 22

After DoubleClick on the module the configuration page appears. See Figure 22

- **Configure Analogue Input:**
 - **Range:** Select input type for each channel in dropdown menu.
 - **Filter:** select filter type for each channel in dropdown menu. See Figure 23
 - **Delta change:** See AI module datasheet
 - **Scale Min:** See AI module datasheet
 - **Scale Max:** See AI module datasheet

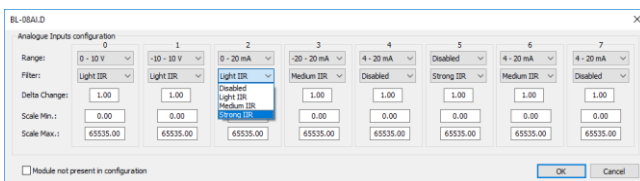


Figure 23

Export/Import Module variables.

Export:

Select the I/O module and press Export Variables, see Figure 13. Now the CSV export file can be edited in EXCEL. Scale min, Scale Max, Variable name etc.

	A	B	C	D	E	F	G	H
1	NAME	TYPE	OFFSET	SCALEMIN	SCALEMAX	HWMIN	HWMAX	#
2	4_module1	IX	0 0.0		65535.0	0	65535	-1
3	4_module2	IX	1 0.0		65535.0	0	65535	-1
4	4_module3	IX	2 0.0		65535.0	0	65535	-1
5	4_module4	IX	3 0.0		65535.0	0	65535	-1
6	4_module5	IX	4 0.0		65535.0	0	65535	-1
7	4_module6	IX	5 0.0		65535.0	0	65535	-1
8	4_module7	IX	6 0.0		65535.0	0	65535	-1
9	4_module8	IX	7 0.0		65535.0	0	65535	-1
10	4_module9	IX	8 0.0		65535.0	0	65535	-1
11	4_module10	IX	9 0.0		65535.0	0	65535	-1
12	4_module11	QX	0 0.0		65535.0	0	65535	-1
13	4_module12	QX	1 0.0		65535.0	0	65535	-1
14	4_module13	QX	2 0.0		65535.0	0	65535	-1
15	4_module14	QX	3 0.0		65535.0	0	65535	-1
16	4_module15	QX	4 0.0		65535.0	0	65535	-1
17	4_module16	QX	5 0.0		65535.0	0	65535	-1

Import:

Press the Import Variables see Figure 13. Select the CSV file and import.

Firmware update I/O modules

Firmwareupdate of LB2 modules is done through Brodersen Firmware updater. Firmware version is displayed in Brodersen worksuite. Check www.brodersen.com for new firmwarereleases or contact support at support@brodersen.com

**Module status LED flashing codes.**

A two color (red/yellow) LED is provided on the module. This indicates the module status with different blinking patterns. The yellow is indicating module mode (run, stop). The red indicate module error or warnings. Each pattern / color will operate in 2 sec duty cycles. When the red LED is inactive (off), only the 2 sec yellow duty cycle will operate (yellow is always active). When the red LED is active, a switch between 2 sec yellow, and 2 sec red patterns will occur.

The patterns in Table 2 are possible:

Table 2 Module LED pattern

LED	Pattern
Off	LED is constantly off
on	LED is constantly on
Blinking:	LED is flashing, 200 ms on, 200 ms off
Flickering:	LED is flashing, 50 ms on, 50 ms off
Single Flash:	LED pattern is, 200 ms on, 1800 ms off
Double Flash:	LED pattern is, 200 ms on, 200 ms off, 200 ms on, 1400 ms off
Triple Flash:	LED pattern is, 200 ms on 200 ms off, 200 ms on 200 ms off, 200 ms on 1000 ms off
Quadruple Flash:	LED pattern is, 200 ms on 200 ms off, 200 ms on 200 ms off, 200 ms on 200 ms off, 200 ms on 600 ms off

*Table 2***Table 3 Yellow I/O module LED Codes:**

Yellow LED	Pattern Description
Off	No module power
on	Module is Operational mode.
Blinking:	Module is in Operational Timeout, caused by missing RTU heartbeat "timeout from CPU to I/O module". Outputs will be managed according to failsafe configuration (Last state, forced On, forced Off)
Flickering:	NA
Single Flash:	No valid node ID. Normal after power up.
Double Flash:	Module is assigned a valid node ID, and is Stopped .
Triple Flash:	NA
Quadruple Flash:	Module is in firmware update mode.

*Table 3***Table 4: RED I/O module LED Codes:**

Red LED	Pattern Description
Off	No warnings or errors.
on	Module LB2 communication error. A number of LB2 communication errors has occurred, which has caused the LB2 error counters to reach the error level. The module will automatically stop any transmission on the bus, to prevent LB2 bus corruption for other modules (nodes). The module will still listen for NMT commands, and a communication reset command will reconfigure module configuration / communication, if the error was temporary.
Blinking:	NA
Flickering:	Corrupted module information / calibration data in eeprom. Fatal error
Single Flash:	Module communication error warning. A number of LB2 communication errors has occurred, which has caused the LB2 error counters to reach the warning level. A number of successful communications will automatically reset this warning.
Double Flash:	NA
Triple Flash:	NA
Quadruple Flash:	NA

Table 4