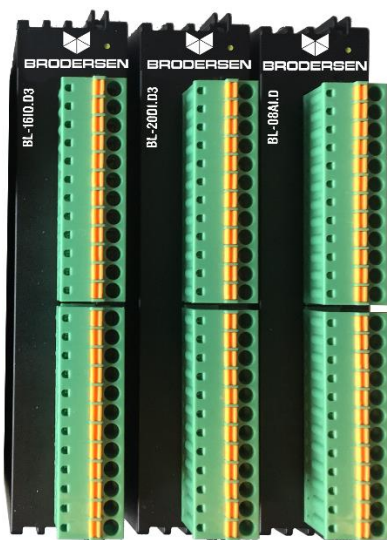


LB2 User Manual

User Manual for Brodersen LB2 Series Modules

Manual

Doc: 40430 v1.02 / June 20th, 2018



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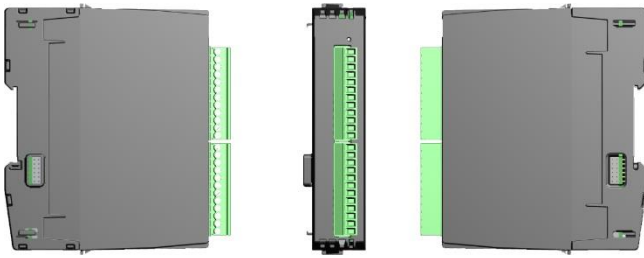


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INTRODUCTION TO LB2 I/O SERIES



The Brodersen LB2 I/O modules can be used with RTU32N & RTU32M Series products. The modules are in two parts - the bottom part contains the backplane bus and top part contains the I/O board and logic. All LB2 modules can be hot swapped.

The LB2 modules are equipped with a 200 MHz processor to process I/O, perform 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 updates are handled from Brodersen Worksuite.

Use only genuine Brodersen bus cables for connection to Brodersen RTUs and for extension of I/O module blocks. The LB2 connection cables are a special build, to handle the power requirements and shielding to run bus communications. The maximum overall length of a complete system is 5m. Each I/O module & Power supply module is calculated as 2cm. The cables are available in various lengths from 25cm to 200cm.

Each LB2 Bus supports up to 250 I/O modules.

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

Table 1

IO MODULE BACKPLANE PARTS

Description	Part Number
Bus I/O module Start	BB-1LS.10
BUS I/O module, Middle	BB-1LI.10
BUS I/O module, Expansion (End)	BB-1LE.10
BUS Power supply module, Start	BB-1PS.10
BUS Power supply module, Middle	BB-1PI.10
BUS CPU module, Start	BB-1CS.10
BUS CPU module, Middle	BB-1CI.10

Table 2

LB2 Modules

Description	Part Number
20DI, bipolar 30-60 VDC	BL-20DI.D3
20DI, bipolar 10-30 VDC	BL-20DI.D6
18DI, 2CI 5kHz, bipolar 10-30 VDC	BL-20CI.D6
10DI bipolar 30-60 VDC, 10DO 10-30VDC	BL-10DIO.P3
10DI, bipolar 10-30 VDC, 10DO 10-30VDC	BL-10DIO.P6
8DI, 2CI, 5kHz bipolar 10-30 VDC, 10DO 10-30VDC	BL-10CIO.P6
12RO	BL-12DO.R1
20DO 10-30VDC	BL-20DO.D6
8AI 16 bit user configurable	BL-08AI.D
2AO 16 bit user configurable	BL-02AO.D
Power supply 10-30 VDC Input, 12VDC 1.2A BUS output	BP-51.105
CPU Module	BC-32M.A

Table 3



DESIGNING A SYSTEM WITH LB2 I/O MODULES

In the following example, a single I/O module with a mix of 10 Digital Inputs and 10 Digital Outputs is selected.

RTU32N system with one I/O module.

For a single module system, a Bus Start module BB-1LS.10 and a UCC cable is also needed. The BB-1LS.10 has a RJ-45 connector to allow a connection to the RTU32N or to other blocks of I/O modules.

Part numbers used in this example:

- 1 x I/O module BL-10DIO.D6 (10DI+10DO)
- 1 X Bus I/O module Start BB-1LS.10
- 1 x 25cm LB2 Cable UCC-610/2



Figure 1

RTU32N system with multiple I/O modules - example 1.

When a multiple I/O configuration is engineered, the power consumption must also be considered. See the datasheet for the RTU or the power supply module to calculate how many I/O modules can be connected before extra power supply modules BB-1PI.10 or BB-1PS.10 are needed.

Additional I/O modules can be inserted in between the start and end module to further expand the I/O.

Part numbers used in this example:

- 9 x I/O module various I/O modules
- 1 X Bus I/O module Start BB-1LS.10
- 7 x Bus I/O module Middle BB1LI.10
- 1 X Bus I/O module Expansion BB-1LE.10
- 1 x 25cm LB2 Cable UCC-610/25

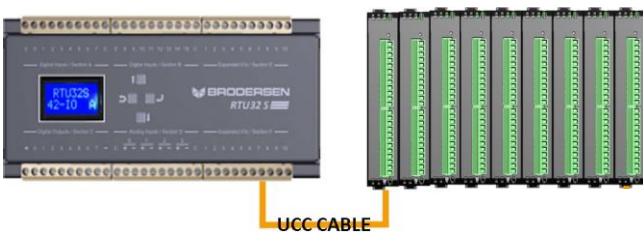


Figure 2

RTU32N System with multiple I/O modules - example 2.

When a multiple I/O configuration is engineered, the power consumption must also be considered. See the datasheet for the RTU or the power supply module to calculate how many I/O modules can be connected before extra power supply modules BB-1PI.10 or BB-1PS.10 is needed.

Part numbers used in this example:

- 17 x I/O module various I/O modules
- 2 X Bus I/O module Start BB-1LS.10
- 13 x Bus I/O module Middle BB1LI.10
- 2 X Bus I/O module Expansion BB-1LE.10
- 1 x 25cm LB2 Cable UCC-610/25
- 1 x 100cm LB2 Cable UCC-610/1

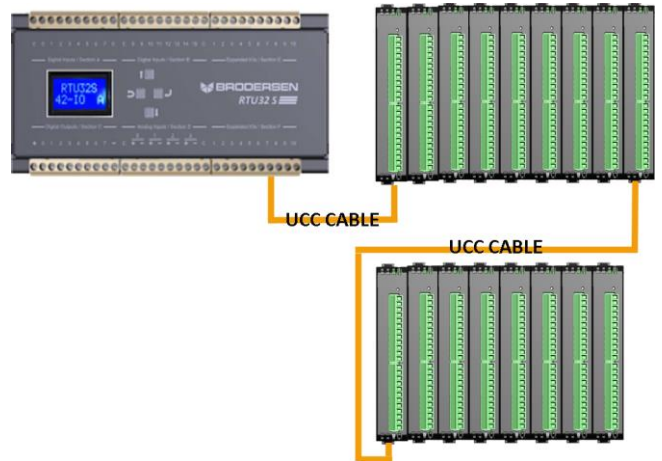


Figure 3

RTU32M System with CPU & I/O modules.

For a backplane CPU system, the CPU and power supply module/s are always to the left of the I/O modules (power supplies can be used as a redundant pair if required).

Part numbers used in this example:

- 1 x CPU module BC-32M.A
- 2 x Power supply module BP-51.105
- 7 x I/O module BL-10DIO.D6 (10DI+10DO)
- 1 X Bus CPU module Start BB-1CS.10
- 2 X Bus PS module Middle BB-1PS.10
- 7 X Bus I/O module Middle BB-1LS.10

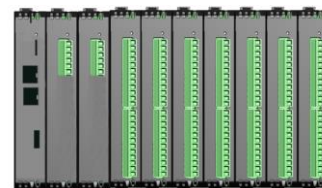


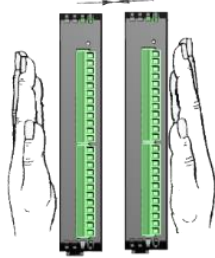
Figure 4

Extra I/O modules can be added as per examples above.



ASSEMBLE BUS I/O MODULES

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



"CLICK"
Figure 5

SEPARATE BACKPLANE MODULES

If two backplane modules need to be separated, use a flathead screwdriver. Push it in between the backplane modules and rotate it gently to allow the modules to be pulled apart.

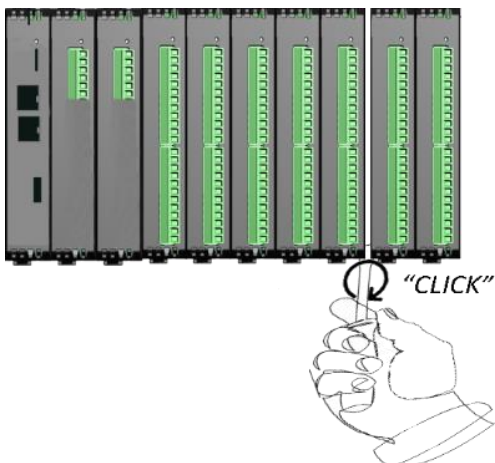


Figure 6



INSERTING A MODULE INTO BACKPLANE BUS MODULE

Gently slide the module into the backplane part.

*****Attention*****

Note: Power supply modules have a different backplane connector location to ensure I/O modules and CPU modules cannot be inserted by mistake into a power supply backplane module.

BUS Power supply module, Start.	BB-1PS.10
BUS Power supply module, Internal.	BB-1PI.10

Table 4

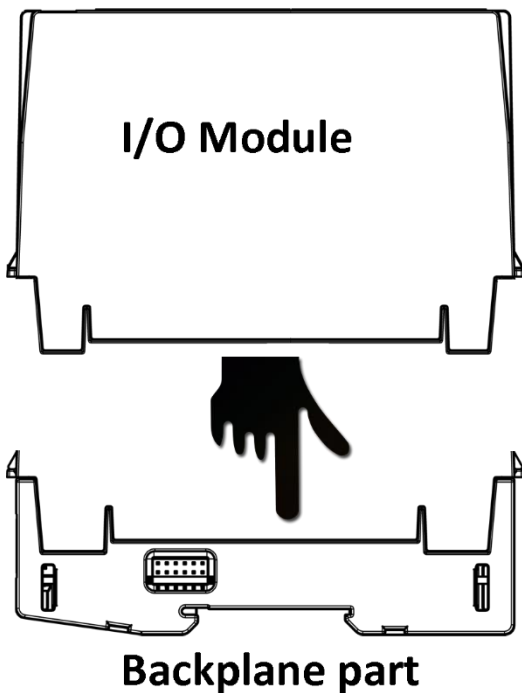


Figure 7

REMOVING A MODULE FROM A BACKPLANE MODULE

Take out Module
Push down + pull out.

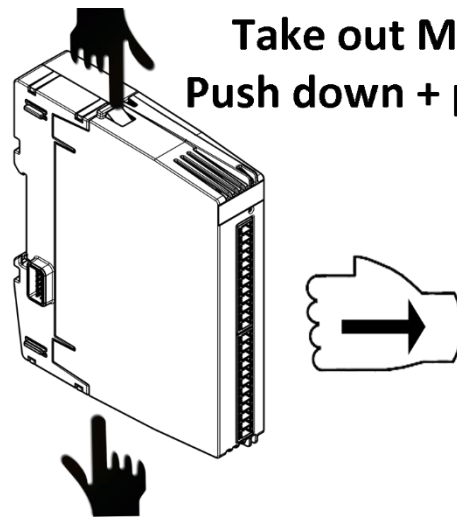


Figure 8

Backplane & I/O module side view

Backplane bus connector located in the circle marked with D.

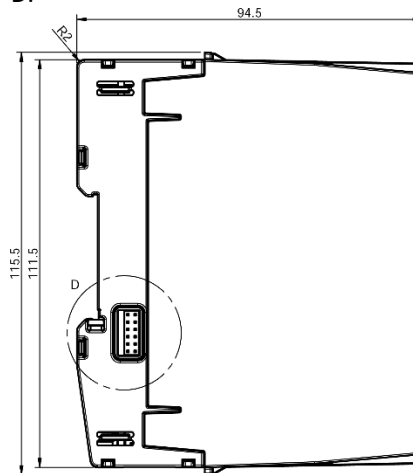


Figure 9

Backplane & I/O module top view

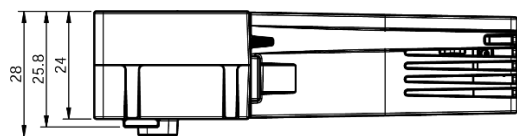


Figure 10



BACKPLANE BUS MODULES

Backplane Start Bus Module:

The Backplane Start base module has a RJ45 connector for connecting I/O modules to a RTU32N (not required with the backplane style CPU).

Backplane Expand or End module

The Expand base module is also the End module. The Expand module has a RJ45 connector for Backplane bus expansion. It can be used for expansion to the next I/O block that is local/nearby, or for future expansion. The maximum overall system bus length is 5 meters.

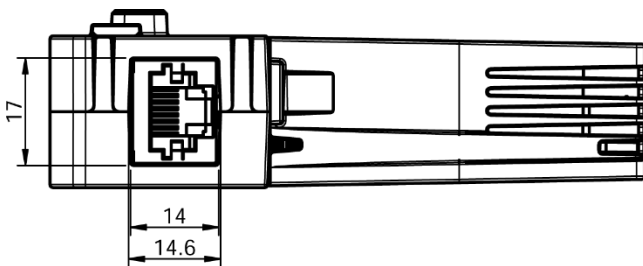


Figure 4

Part numbers for backplane bus start/end modules

BUS I/O module Start	BB-1LS.10
BUS I/O module, Expansion (End)	BB-1LE.10

Backplane middle with I/O module

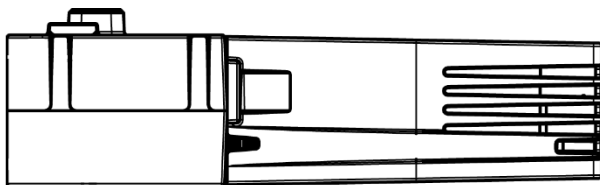


Figure 5

Part number for backplane bus module middle (no RJ45)

BUS I/O module, Internal (middle)	BB-1LI.10
--	------------------

Backplane Power Supply Bus Module

The backplane power supply bus module can only be used with power supply modules BB-1PI.10 and BB-1PS.10.

The connector on the backplane power supply bus module is located in a different position to ensure I/O cards cannot be inserted by mistake. The power supply can be redundant like all the rest of the modules (load is shared across the two power supplies).

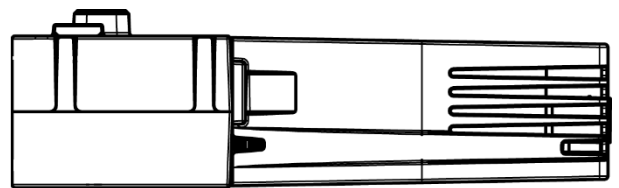


Figure 6

Part number for backplane bus power supply module.

BUS Power Supply module, Start	BB-1PS.10
BUS Power Supply module, Middle	BB-1PL.10



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. It can be found on our webpage or by pressing this link: [VIDEO](#)

Module configurator Toolbar

Figure 7 shows the I/O configurator toolbar with icon explanations.

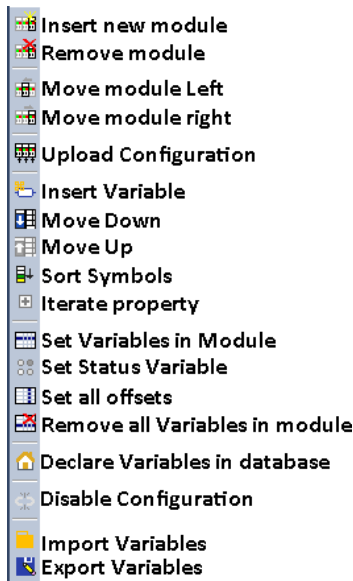


Figure 7

Inserting a module in Brodersen Worksuite

To open the I/O configurator press the ICON in the top menu bar “open I/Os”

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
- An existing module can be copied using Windows copy paste commands “Ctrl+C” & “Ctrl + V”.

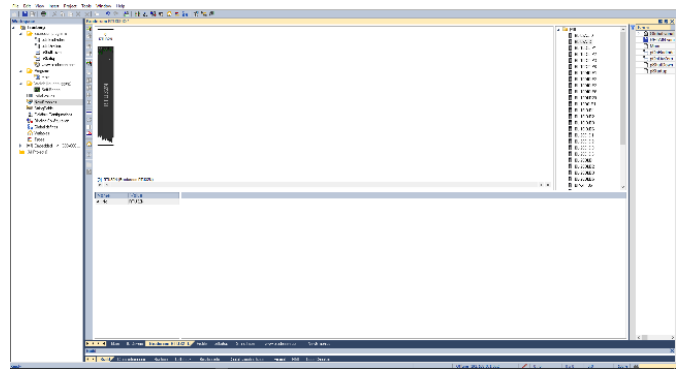


Figure 8

Move a module in Brodersen Worksuite


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

Remove a module in Brodersen Worksuite

- Modules can Removed/Deleted by placing the mouse cursor on the module, then press the right mouse button and select “Remove Module”.
- Modules can Removed/Deleted by placing the mouse cursor on the module and then pressing Delete on the keyboard.



Add variables to a module in Brodersen Worksuite

In the left pane of the I/O module window, the icon  “Set Variables In Module” opens the variables editor. 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 suitable syntax, or make your own.

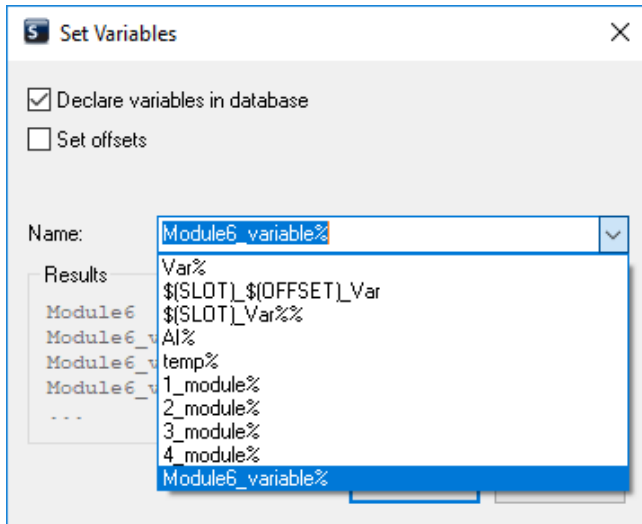


Figure 9

For example, if the syntax `$(SLOT)_$(OFFSET)_VAR` is selected, the variables will be as shown below for an 8 channel 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 10

The way the syntaxes are used allows flexibility to engineer your own variable names. Eg. the syntax could be:

`Module_Nr_$(SLOT)_Analogue_In_$(OFFSET)`

This creates eight variables named;

- ‘Module_Nr_2_Analogue_In_1’
- ‘Module_Nr_2_Analogue_In_2’
- ‘Module_Nr_2_Analogue_In_3’
- ‘Module_Nr_2_Analogue_In_4’
- ‘Module_Nr_2_Analogue_In_5’
- ‘Module_Nr_2_Analogue_In_6’
- ‘Module_Nr_2_Analogue_In_7’
- ‘Module_Nr_2_Analogue_In_8’

Rename auto generated variables

In cases where variable names can’t be easily generated through a syntax, they can be created/edited manually by placing the mouse cursor on the variable and using DoubleClick to access the editor, as shown below.

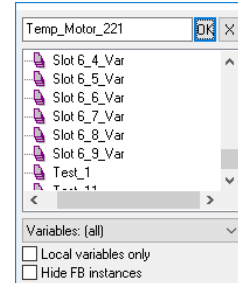


Figure 11

The user can then change the name of the variable or create a new variable, as shown below.

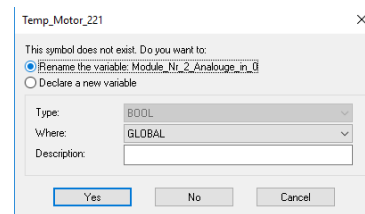


Figure 12

Configure Modules

This is a general document for all modules. As there will be new features on modules, use the datasheet of the module to see what specific features are. In this example a combination DI/DO module and an AI module are shown.

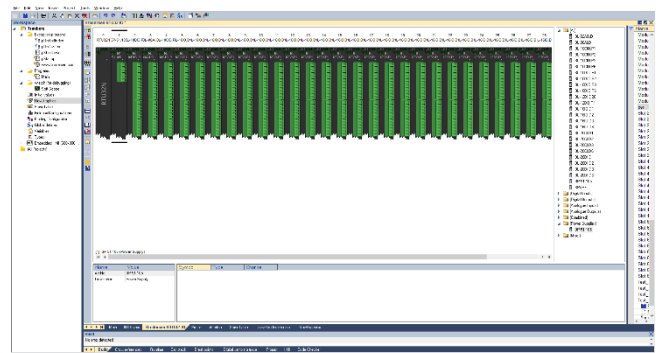


Figure 13

DoubleClick on a module in the I/O configurator to access the module I/O editor.



Configure Combination DI/DO module example

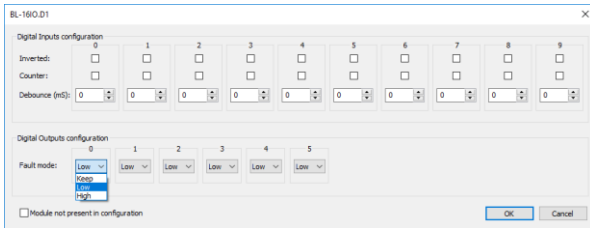


Figure 14

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

Configuration Fields - Inputs and Outputs:

- **Inverted:** Select if input is to be inverted.
- **Counter:** Select if input is a counter. Note: If an input is receiving a 5 KHz pulse/count, but not defined as a counter, the I/O bus will be spammed with 5000 pulses/sec!
- **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 when the module loses contact with the 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

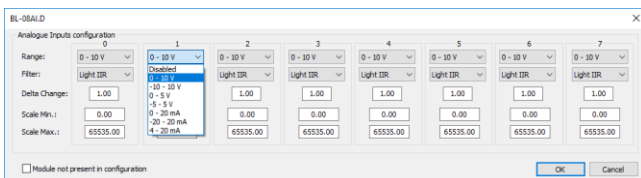


Figure 15

In the above example an eight channel AI module has been selected.

Configuration Fields - Inputs and Outputs:

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

Export/Import Module variables.

Export:

Select the I/O module of interest and then select the Export Variables icon in the toolbar on the left to create a CSV export file that can be edited in EXCEL.

The file includes Scale min, Scale Max, Variable name etc.

	A	B	C	D	E	F	G	H
1	NAME	TYPE	OFFSET	SCALEMIN	SCALEMAX	HWMIN	HWMAX	#F
2	4_module1	IX	0.0	0.0	65535.0	0	65535	-1
3	4_module2	IX	1.0	0.0	65535.0	0	65535	-1
4	4_module3	IX	2.0	0.0	65535.0	0	65535	-1
5	4_module4	IX	3.0	0.0	65535.0	0	65535	-1
6	4_module5	IX	4.0	0.0	65535.0	0	65535	-1
7	4_module6	IX	5.0	0.0	65535.0	0	65535	-1
8	4_module7	IX	6.0	0.0	65535.0	0	65535	-1
9	4_module8	IX	7.0	0.0	65535.0	0	65535	-1
10	4_module9	IX	8.0	0.0	65535.0	0	65535	-1
11	4_module10	IX	9.0	0.0	65535.0	0	65535	-1
12	4_module11	QX	0.0	0.0	65535.0	0	65535	-1
13	4_module12	QX	1.0	0.0	65535.0	0	65535	-1
14	4_module13	QX	2.0	0.0	65535.0	0	65535	-1
15	4_module14	QX	3.0	0.0	65535.0	0	65535	-1
16	4_module15	QX	4.0	0.0	65535.0	0	65535	-1
17	4_module16	QX	5.0	0.0	65535.0	0	65535	-1

Figure 16

Import:

Select the Import Variables icon in the toolbar on the left to read in updates from a CSV file.

Firmware update I/O modules

Firmware update of LB2 modules is done through the Firmware update utility in the Brodersen WorkSuite. The Firmware version is displayed in the Brodersen WorkSuite.

Check www.brodersen.com for new firmware releases or contact support at support@brodersen.com



Module status LED flashing codes.

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

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 5

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 6

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 7