BRX MPU Power Budgeting

In This Appendix...

BRX MPU Power Budget

The BRX MPU will automatically calculate the power budget, online or offline, taking into account the added expansion modules. However, since there is a limited amount of power available to supply the expansion modules, the power budget should be taken into account when designing a BRX system, to be sure that the system will perform as expected.

A general rule of thumb is that when there are 32 or more points of relay expansion modules in a system, a power budget calculation must be performed to ensure that there is enough available power to accommodate all expected modules.

On the following pages you will find a worksheet and power budget tables to help you determine your system total power budget requirement. If the calculations exceeds the total available power, you may need to consider using an additional MPU or using a Remote I/O solution to satisfy the system requirements.

Examples are also included to help show how the calculations should be performed.

NOTE: *The Power Budget calculation applies only to backplane power supplied by the MPU or Remote I/O controller. Some expansion modules also require external power supplied directly to the module, which is not included in this calculation.*

WARNING: It is extremely important to calculate the power budget. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

Power Budget Form

1. Find the Watts available for the BRX MPU that you will be using. Put this value in line 1 - MPU section of the worksheet.
2. If you are using a POM (Pluggable Option Module), find the watts consumed and put this value in line 2 - POM section of the worksheet.
3. For each Expansion Module that you will be using, find the watts consumed and put this value in the appropriate slot that the module will reside in, lines 3 through 10.
4. Add the values located in the POM Watts and Slot 1 through 8, lines 2 through 10. Write the value of this sum in line 11 - Total Watts Consumed.
5. Subtract line 11 - Total Watts Consumed from line 1 - MPU Watts Available. Write this value in line 12 - Watts Remaining.
6. If the value in line 12 - Watts Remaining is a negative number, your system is consuming more Watts than the MPU is capable of providing. This system would be unsafe as designed. You will need to reconsider your design. If the remaining wattage is zero or more than zero, the system design is good.

Power Budget Worksheet

Power Budget Worksheet			
Line	**Item**	**Part #**	**Watts**
1	MPU		
2	POM		
3	Slot 1		
4	Slot 2		
5	Slot 3		
6	Slot 4		
7	Slot 5		
8	Slot 6		
9	Slot 7		
10	Slot 8		
11	Total Watts Consumed (Add lines 2 thru 10)		
12	Watts Remaining (Line 1 – line 11)		

WARNING: It is extremely important to calculate the power budget. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

BRX MPU Available Expansion Power

The following tables show the available power for each of the BRX MPUs. Use the wattages shown as the total available power when calculating the power budget.

MPU Total Power Available			
Model	**# Built-in Inputs**	**# Built-in Outputs**	**Total Available Power (W)**
BX-DM1E-M	0	0	21.3
BX-DM1E-M-D	0	0	21.3
BX 10			
BX-DM1-10ED1-D	6	4	8.5
BX-DM1-10ED2-D	6	4	8.5
BX-DM1-10ER-D	6	4	8.3
BX-DM1-10AR-D	6	4	8.3
BX 10E			
BX-DM1E-10ED13-D	6	4	7.3
BX-DM1E-10ED23-D	6	4	7.3
BX-DM1E-10ER3-D	6	4	7.0
BX-DM1E-10AR3-D	6	4	7.0
BX 18			
BX-DM1-18ED1	10	8	20.2
BX-DM1-18ED2	10	8	20.2
BX-DM1-18ER	10	8	19.6
BX-DM1-18AR	10	8	19.6
BX-DM1-18ED1-D	10	8	20.2
BX-DM1-18ED2-D	10	8	20.2
BX-DM1-18ER-D	10	8	19.6

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MPU Total Power Available (continued)			
Model	**# Built-in Inputs**	**# Built-in Outputs**	**Total Available Power (W)**
BX 18E			
BX-DM1E-18ED13	10	8	18.8
BX-DM1E-18ED23	10	8	18.8
BX-DM1E-18ER3	10	8	17.9
BX-DM1E-18AR3	10	8	17.9
BX-DM1E-18ED13-D	10	8	18.8
BX-DM1E-18ED23-D	10	8	18.8
BX-DM1E-18ER3-D	10	8	17.9
BX 36			
BX-DM1-36ED1	20	16	18.7
BX-DM1-36ED2	20	16	18.7
BX-DM1-36ER	20	16	17.6
BX-DM1-36AR	20	16	17.6
BX-DM1-36ED1-D	20	16	18.7
BX-DM1-36ED2-D	20	16	18.7
BX-DM1-36ER-D	20	16	17.6
BX 36E			
BX-DM1E-36ED13	20	16	16.4
BX-DM1E-36ED23	20	16	16.4
BX-DM1E-36ER3	20	16	15.3
BX-DM1E-36AR3	20	16	15.3
BX-DM1E-36ED13-D	20	16	16.5
BX-DM1E-36ED23-D	20	16	16.5
BX-DM1E-36ER3-D	20	16	15.3

BRX I/O Controller Available Expansion Power

The following table shows the available power for each of the BRX I/O controllers. Use the wattages shown as the total available power when calculating the power budget.

I/O Controller Total Power Available			
Model	**# Built-in Inputs**	**# Built-in Outputs**	**Total Available Power (W)**
BX-EBC100			
BX-EBC100-M	NA	NA	21.3
BX-EBC100-M-D	NA	NA	21.3
BX-DMIO			
BX-DMIO-M	NA	NA	21.3
BX-DMIO-M-D	NA	NA	21.3
BX-MBIO			
BX-MBIO-M	NA	NA	21.3
BX-MBIO-M-D	NA	NA	21.3

BRX MPU POM Power Consumed

The following chart shows the power consumed by each of the BRX POMs. Use the wattages shown as the amount to be subtracted from the total available wattage when calculating the power budget.

POM Power Consumption	
Model	**Consumption (W)**
BX-P-SER2-RJ12	0.2
BX-P-SER2-TERM	0.2
BX-P-SER2-TERMFC	0.2
BX-P-SER422-TERM	0.2
BX-P-SER4-TERM	0.2
BX-P-USB-B	0.1
BX-P-ECOMLT	0.4
BX-P-ECOMEX	0.2

BRX MPU Expansion Module Power Consumed

The following tables show the power consumed by each of the BRX Expansion Modules. Use the wattages shown as the total amount to be subtracted from the available wattage when calculating the power budget.

BRX Discrete Input Expansion Modules

BRX Discrete Input Expansion Modules Power Consumption			
Model	**Inputs/Module**	**Outputs/ Module**	**Consumption (W)**
BX-08NA	8	0	0.2
BX-08NB	8	0	0.2
BX-08ND3	8	0	0.2
BX-08NF3	8	0	0.2
BX-08SIM	8	0	0.2
BX-12NA	12	0	0.3
BX-12NB	12	0	0.3
BX-12ND3	12	0	0.3
BX-16NA	16	0	0.3
BX-16NB	16	0	0.3
BX-16ND3	16	0	0.3
BX-16NF3	16	0	0.3
BX-32ND3	32	0	0.4

BRX Discrete Output Expansion Modules

BRX Discrete Output Expansion Modules Power Consumption			
Model	**Inputs/ Module**	**Outputs/ Module**	**Consumption (W)**
BX-05TRS	0	5	1.8
BX-05TRS-1	0	5	1.8
BX-08TA	0	8	0.4
BX-08TD1	0	8	0.4
BX-08TD2	0	8	0.4
BX-08TR	0	8	1.7
BX-08TRZ	0	8	1.7

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Discrete Output Modules Power Consumption (continued)			
Model	**Inputs/ Module**	**Outputs/ Module**	**Consumption (W)**
BX-12TA	0	12	0.5
BX-12TD1	0	12	0.5
BX-12TD2	0	12	0.5
BX-12TR	0	12	2.5
BX-16TD1	0	16	0.5
BX-16TD2	0	16	0.5
BX-16TF2	0	16	0.9
BX-16TR	0	16	3.4
BX-16TRZ	0	16	3.4
BX-32TD1	0	32	1.0
BX-32TD2	0	32	1.0

BRX Discrete Input/Output Combination Expansion Modules

BRX Discrete Combination Expansion Modules Power Consumption			
Model	**Inputs/Module**	**Outputs/Module**	**Consumption (W)**
BX-08CD3R	4	4	1.0
BX-12CD3D1	8	4	0.3
BX-12CD3D2	8	4	0.3
BX-16CD3D1	8	8	0.4
BX-16CD3D2	8	8	0.4
BX-16CF3F2	8	8	1.0

BRX Analog Input/Output and Temperature Expansion Modules

BRX Analog Expansion Modules Power Consumption				
Type	**Model**	**Inputs/Module**	**Outputs/Module**	**Consumption (W)**
In	BX-04AD-1	4	0	0.1
In	BX-04ADM-1	4	0	0.1
In	BX-08AD-1	8	0	0.1
In	BX-16AD-1	16	0	0.3
In	BX-04AD-2B	4	0	0.1
In	BX-08AD-2B	8	0	0.1
In	BX-16AD-2B	16	0	0.3
In	BX-04AD-3	4	0	1.5
In	BX-08AD-3	8	0	2.5
In	BX-04THM	4	0	0.1
In	BX-08THM	8	0	0.1
In	BX-06RTD	6	0	0.1
In	BX-08NTC	8	0	0.1
In	BX-04UT	4	0	1.5
In	BX-08UT	8	0	1.5
Out	BX-04DA-1	0	4	0.1
Out	BX-08DA-1	0	8	0.1
Out	BX-04DA-2B	0	4	0.1
Out	BX-08DA-2B	0	8	0.1

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BRX Analog Expansion Modules Power Consumption (continued)				
Type	**Model**	**Inputs/Module**	**Outputs/Module**	**Consumption (W)**
Out	BX-04DA-3	0	4	2.4
Out	BX-08DA-3	0	8	5.5
Combo	BX-02AD2DA-1	2	2	0.3
Combo	BX-04AD2DA-1	4	2	0.3
Combo	BX-02AD2DA-2B	2	2	0.1
Combo	BX-04AD2DA-2B	4	2	0.3
Combo	BX-02AD2DA-3	2	2	2.5
Combo	BX-04AD4DA-3	4	4	3.75
Combo	BX-4RTD4DA-1	4	4	0.1
Combo	BX-4THM4DA-1	4	4	0.3
Combo	BX-4UT4DA-3	4	4	2.65
Combo	BX-4UT4TD1	4	4	2.5
Combo	BX-4UT4TD2	4	4	2.5
Combo	BX-4UT4TR	4	4	2.5

BRX Specialty Modules

BRX Motion Control and Communications Modules Power Consumption			
Model	**Inputs/Module**	**Outputs/Module**	**Consumption (W)**
BX-HSIO1	8	8	2.2 W
BX-HSIO2	8	8	2.2 W
BX-HSIO4	8	8	2.6 W
BX-SERIO	4 serial ports		1.2 W
BX-SERIO-2	4 serial ports		2.0 W
BX-SERIO-4	4 serial ports		1.2 W
BX-APAD	Filler module, no I/O		0 W

Power Budget Examples

Example 1

Power Budget Worksheet			
Line	**Item**	**Part #**	**Watts**
1	MPU	BX-DM1-18ED1	20.20
2	POM		
3	Slot 1	BX-08ND3	0.20
4	Slot 2	BX-16ND3	0.30
5	Slot 3	BX-16TR	3.40
6	Slot 4	BX-16TR	3.40
7	Slot 5		
8	Slot 6		
9	Slot 7		
10	Slot 8		
11	Total Watts Consumed (Add lines 2 thru 10)		7.30
12	Watts Remaining (Line 1 – line 11)		12.90

This example shows that the selected configuration is within the power budget. This is a sound configuration and will work as designed.

WARNING: It is extremely important to calculate the power budget. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

Example 2

Power Budget Worksheet			
Line	**Item**	**Part #**	**Watts**
1	MPU	BX-DM1E-36ER3	15.30
2	POM	BX-P-ECOMLT	0.40
3	Slot 1	BX-08NA	0.20
4	Slot 2	BX-16ND3	0.30
5	Slot 3	BX-16ND3	0.30
6	Slot 4	BX-16TD1	0.50
7	Slot 5	BX-16TD1	0.50
8	Slot 6	BX-16TR	3.40
9	Slot 7	BX-05TRS	1.80
10	Slot 8	BX-05TRS	1.80
11	Total Watts Consumed (Add lines 2 thru 10)		9.20
12	Watts Remaining (Line 1 – line 11)		6.10

This example shows that the selected configuration is within the power budget. This is a sound configuration and will work as designed.

WARNING: It is extremely important to calculate the power budget. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

Example 3

Power Budget Worksheet			
Line	**Item**	**Part #**	**Watts**
1	MPU	BX-DM1E-36ER3	15.30
2	POM	BX-P-SER2-TERM	0.20
3	Slot 1	BX-16NA	0.30
4	Slot 2	BX-16NA	0.30
5	Slot 3	BX-16NA	0.30
6	Slot 4	BX-16TR	3.40
7	Slot 5	BX-16TR	3.40
8	Slot 6	BX-16TR	3.40
9	Slot 7	BX-16TR	3.40
10	Slot 8	BX-16TR	3.40
11	Total Watts Consumed (Add lines 2 thru 10)		18.10
12	Watts Remaining (Line 1 − line 11)		-2.80

This example shows that the selected configuration will exceed the power budget. This is an unsafe configuration and will not work as designed. One way to correct this is to add Remote I/O to this system for additional I/O capability.

WARNING: It is extremely important to calculate the power budget. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.