



System Optimiser v1.1
Loading capacity verification manual





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1. General

At CODA Audio, we take customer safety very seriously. It is vital that our customers, and anyone attending their events, are kept safe at all times.

This is why we provide a number of tools to help our customers to check and ensure their safety. Using System Optimiser, it is simple to check the safety factor of your rigging setup, taking advantage of the software's automatic calculations and alerts.

Please Note:

CODA Audio is committed to providing support and tools to assist with safety, but the sole responsibility lies with the company and/or individuals installing the system.

Ensure you have referred to all local legislation and regulations regarding health and safety, and rigging safety factors. Laws vary by location.

If you are unsure whether a particular configuration of a system can be safely installed, please contact techsupport@codaaudio.com before proceeding.

In addition to the rigging calculations integrated into System Optimiser, CODA Audio provides supplementary Loading Capacity Sheets at <https://codaaudio.com/rigging> to provide users with another layer of security.

This manual explains when and how to use the Loading Capacity Sheets. For more information about the rigging calculations in System Optimiser, please refer to the System Optimiser manual at <https://docs.codasystemoptimiser.com/>.



2. Cases in which the Loading Capacity Sheet must be used

2.1. Minimum safety factor below 15

#	Type	Option	Dist.	Safety Factor	Link	
	FR-AR EXBAR Midd ▾			14.8		
1	AiRAY 90° 2WAY ▾	0° ▾	-	18.5	1 ▾	
2	AiRAY 90° 2WAY ▾	0° ▾	-	21.3	1 ▾	
3	AiRAY 90° 2WAY ▾	0° ▾	-	24.7	2 ▾	
4	AiRAY 90° 2WAY ▾	0° ▾	-	29.1	2 ▾	
5	AiRAY 90° 2WAY ▾	0° ▾	-	34.8	3 ▾	
6	AiRAY 90° 2WAY ▾	0° ▾	-	42.5	3 ▾	
7	AiRAY 90° 2WAY ▾	0° ▾	-	53.2	4 ▾	
8	AiRAY 90° 2WAY ▾	0° ▾	-	68.8	4 ▾	
9	AiRAY 90° 2WAY ▾	0° ▾	-	93.4	5 ▾	
10	AiRAY 90° 2WAY ▾	0° ▾	-	136.1	5 ▾	
11	AiRAY 90° 2WAY ▾	0° ▾	-	225	6 ▾	
12	AiRAY 90° 2WAY ▾	0° ▾	-	486	6 ▾	
12 x	Select entity ▾					

Bottom height (z): -4.35m
Bottom angle: 13.5°

Template State

When configuring large systems it is recommended to verify with CODA AUDIO's rigging calculator available at: <https://codaaudio.com/rigging>

The example above shows a system configuration in which one element (in this case the top Frame) has safety factor below 15.

If the safety factor of any element within an array is below 15, it must be verified with the Loading Capacity Sheets. The procedure is explained later in this document. To make the user aware of this, the note “When configuring large systems it is recommended to verify with CODA AUDIO’s rigging calculator available at: <https://codaaudio.com/rigging>” is shown.



2.2. Minimum safety factor below 10

Frame Family: AIRAY
 Pickpoint Mode: Dual
 First Pickpoint: EXBAR | 1
 Second Pickpoint: EXBAR | 17
 Site Angle: -8
 Total: 844.9kg
 Best Single PP: EXBAR | 17 (-0.1°)
 LAPTEQ
 Auto-Link: 2 Sp. per Group
 Override ✓

Hang Design

#	Type	Option	Dist.	Safety Factor	Link
1	AIRAY 90° 2WAY	0°	-	8.6	
2	AIRAY 90° 2WAY	0°	-	9.4	
3	AIRAY 90° 2WAY	0°	-	10.3	2
4	AIRAY 90° 2WAY	0°	-	11.3	2
5	AIRAY 90° 2WAY	0°	-	12.5	3
6	AIRAY 90° 2WAY	0°	-	13.9	3
7	AIRAY 90° 2WAY	0°	-	15.5	4
8	AIRAY 90° 2WAY	0°	-	17.5	4
9	AIRAY 90° 2WAY	0°	-	19.8	5
10	AIRAY 90° 2WAY	0°	-	22.7	5
11	AIRAY 90° 2WAY	0°	-	26.4	6
12	AIRAY 90° 2WAY	0°	-	30.9	6
13	AIRAY 90° 2WAY	0°	-	36.9	7
14	AIRAY 90° 2WAY	0°	-	44.8	7
15	AIRAY 90° 2WAY	0°	-	55.9	8
16	AIRAY 90° 2WAY	0°	-	71.9	8
17	AIRAY 90° 2WAY	0°	-	97	9
18	AIRAY 90° 2WAY	0°	-	140.3	9
19	AIRAY 90° 2WAY	0°	-	230.1	10
20	AIRAY 90° 2WAY	0°	-	480	10
4 x	Select entity				

Bottom height (z): -7.21m
 Bottom angle: 12.5°

Template State

☐ When configuring large systems it is recommended to verify with CODA AUDIO's rigging calculator available at: <https://codaaudio.com/rigging>

- Second Pickpoint load exceeds maximum load, resulting in safety factor below 10!
- Safety factor is less than 10 for top frame
- Safety factor is less than 10 for element at position 1
- Safety factor is less than 10 for element at position 2

enter the angle of frame FR AR					
-8					
enter the number of cabinets from 1 up to 20					
20	AIRAY				k-safety factor
	enter the value of a-angle			front	rear
1	0	from -2 to 4		32.95	1.17
2	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		39.23	1.15
3	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		47.66	10.26
4	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		59.43	11.32
5	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		76.78	12.91
6	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		104.46	13.92
7	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		154.46	15.57
8	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		205.46	17.55
9	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		252.96	19.94
10	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		339.14	22.87
11	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		414.94	26.52
12	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		505.56	31.15
13	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		610.91	37.17
14	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		735.89	45.23
15	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		885.49	56.41
16	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		1065.54	72.71
17	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		1282.96	96.17
18	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		1545.47	142.29
19	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		1855.46	233.79
20	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8		2448.59	516.87

The example above shows a system configuration in which more than one element in the array has a safety factor below 10. Because System Optimiser's layout is space constrained, only the minimum of the safety factor



of both front and rear rigging components is shown. However, in this case it may be useful for the user to know which part of the rigging (front or rear) is overloaded in order to make the necessary changes and achieve a safety factor above 10. The appropriate Loading Capacity Sheet should be used to acquire this information.



3. Loading capacity Sheet overview

In general, cells with a red background colour indicate an overload (e.g. safety factor below 10, etc..) or green if no critical conditions were detected.

The example below shows that multiple components are overloaded, resulting in safety factors below 10.

In the example below, the Loading Capacity Sheet provides the following information:

1. System angle must be changed
2. Extension bar must be used to achieve the desired site angle
3. Negative force / load on pickpoints
4. Safety Factor below 10

enter the angle of frame FR AR	change the angle of frame or of cabinets	1.
20	USE EXBAR AR AT THE FRONT	2.
enter the number of cabinets from 1 up to 20		
20	AIRAY	
enter the value of a-angle		
1	0	from -2 to 4
2	0	0; 0.5; 1; 2; 2.5; 3; 4; 5; 6; 7; 8
		use the locking pin
		use the locking pin

negative force at the motor	safety factor of FR AR
OVERLOAD	6,02
negative force at the motor	safety factor of FR AR
OVERLOAD	4,66
negative force at the motor	safety factor of FR AR
OVERLOAD	3,66
OVERLOAD	safety factor of FR AR
	9,13

k - safety factor	
front	rear
6,02	6,02
4,66	4,66



4. System verification with the Loading Capacity Sheet

4.1. Select the worksheet tab for your system configuration



Once the system is defined in System Optimiser you may need to verify the load situation and the safety factors of each system component in detail. The Loading Capacity spreadsheets for the respective systems provide various worksheet tabs for most system configurations.

4.2. Transfer values from System Optimiser into the Loading Capacity Sheet

The values must be transferred manually.

enter the angle of frame FR AR	
-6	
enter the number of cabinets from 1 up to 20	
20	AiRAY
enter the value of a-angle	
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0,5
11	0,5
12	0,5
13	1
14	2
15	3
16	4
17	5
18	6
19	7
20	8

The values must be transferred manually.



4.3. Validate information

enter the angle of frame FR AR					
-6					
enter the number of cabinets from 1 up to 20					
20	AIRAY				
	enter the value of a-angle			k - safety factor	
				front	rear
1	0	from -2 to 4		37,69	2,25
2	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		42,77	2,52
3	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		48,81	10,34
4	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		55,99	11,16
5	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		64,53	12,08
6	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		74,65	13,11
7	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		86,50	14,26
8	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		100,11	15,57
9	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		115,18	17,04
10	0,5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		130,96	18,72
11	0,5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		150,84	20,75
12	0,5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		175,29	23,22
13	1	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		203,59	26,25
14	2	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		240,16	30,14
15	3	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		303,78	35,96
16	4	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		443,34	43,73
17	5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		897,91	57,17
18	6	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		103790,08	82,23
19	7	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		1210,27	140,03
20	8	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		964,16	351,26

The Loading Capacity calculation shows that the rear hardware of the arrayed system has a safety factor below 10. As an example, the system's site angle could be adjusted to achieve a minimum safety factor above 10:

enter the angle of frame FR AR					
-4					
enter the number of cabinets from 1 up to 20					
20	AIRAY				
	enter the value of a-angle			k - safety factor	
				front	rear
1	0	from -2 to 4		106,76	10,89
2	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		126,34	11,61
3	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		150,63	12,41
4	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		180,52	13,28
5	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		216,62	14,25
6	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		258,42	15,33
7	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		303,10	16,52
8	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		344,20	17,85
9	0	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		372,06	19,34
10	0,5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		379,93	21,01
11	0,5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		395,57	23,02
12	0,5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		413,37	25,47
13	1	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		426,02	28,47
14	2	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		451,99	32,35
15	3	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		536,70	37,80
16	4	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		803,86	46,10
17	5	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		2256,66	59,83
18	6	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		2547,31	85,51
19	7	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		976,00	144,69
20	8	0; 0,5; 1; 2; 2,5; 3; 4; 5; 6; 7; 8		913,42	359,71