Mezzo Software Suite

Building Acoustics Module

User Guide – v1.7.2

2017-01-05



Soft dB Inc. 1040, Belvedere Avenue, Suite 215 Quebec (Quebec) Canada G1S 3G3 Toll free: 1-866-686-0993 (USA and Canada) E-mail: <u>info@softdb.com</u>





Contents

1	Intro	oductio	n	1
2	Stan	dards		1
3	Buil	ding Ac	oustics System Description	2
	3.1	Comp	uter	2
	3.2	Mezzo	o Unit	2
	3.3	Micro	phone	2
4	Step	-by-Ste	p Examples	
	4.1	Start t	he Application	
	4.2	Config	gure the Microphone	4
		4.2.1	Set the Microphone Sensitivity	4
	4.3	Create	e a New Project	5
	4.4		Test	
		4.4.1	Performing an Airborne Sound Insulation Test	5
			Measuring the Source Noise Level	
			Measuring the Receiver Noise Level	
			Measuring the Background Noise Level	9
			Measuring the Reverberation Time	9
			Viewing the results	
		4.4.2	Performing an Impact Sound Level Test	13
			Measuring the Receiving Level	
			Importing the Background Level and Reverberation Time	
			Viewing the Results	15
		4.4.3	Performing a Reverberation Time Test	16
			Measuring the Reverberation Time	
			Viewing the Results	17
		4.4.4	Performing a Room Noise test	18
			Measuring the Room Noise	
			Viewing the Results	
		4.4.5	Performing a Speech Privacy for Open Office Test	20
			Measuring the Source Level	
			Measuring the Receiver Level	
			Measuring the Background Level	
			Viewing the Results	
		4.4.6	Performing a Speech Privacy Provided by a Closed Room Test	24

		Measuring the Source Level	
		Measuring the Receiver Level	
		Measuring the Background Level	
		Viewing the Results	
5	Add	itional Information	27
	5.1	Noise Source Setup	27
		5.1.1 Output Setup	27
	5.2	Exporting Data	27
	5.3	Record Setup	28

1 Introduction

Congratulations on your purchase of the Mezzo Building Acoustics Module.

Intended to be used with the Mezzo Precision Microphone, the Mezzo Building Acoustics Module is the perfect tool for the noise specialist providing an integrated project file with on-site reports:

- Airborne Sound Insulation,
- Impact Sound Level,
- Reverberation Time,
- Room Noise,
- Speech Privacy in Open Offices,
- Speech Privacy provided by a Closed Room.

The Mezzo Building Acoustics uses a project file approach combining measurements and test reports in a single file.

This approach makes it easy to manage a large quantity of measurement and provide on-site reports. The on-site reporting allows not only to view the test result instantly, but also to make sure that no measurement was forgotten.

The current user guide describes the functionalities of the Building Acoustics Module. For more information on the Mezzo Precision Microphone hardware, please refer to the Mezzo Precision Microphone user guide.

2 Standards

Test Type	Standards
Airborne Sound Insulation (ASI)	DW, DNW, DNTW, R'W (ISO 140-4:1998, ISO 717-1:2013) NIC, NNIC, ASTC (ASTM E 0336:2005, ASTM E 0413:2004)
Impact Sound Level (ISL)	L'NW, L'NTW (ISO 140-7:1998 - ISO 717-2:2013) FIIC (ASTM E 0989:2006, ASTM E 1007:2004)
Reverberation Time (RT)	T10, T15, Tdyn T20, T30, EDT (ISO 3382-2:2008) T25 (ASTM E 2235:2004) Interrupted noise method 1/1 Octave and 1/3 Octave
Room Noise (RN)	NC, RNC, RC MkII (ANSI S12.2:2008), RC, NCB (ANSI S12.2:1995) NR (ISO 1996:1971)
Speech Privacy in Open Offices	AI, PI (ASTM E1130:2002)
Speech Privacy provided by a Closed Room	FIIC (ASTM E 2638:2010)

3 Building Acoustics System Description

The following sub-sections describe the three main components of the Building Acoustics system: the computer, the Mezzo unit and the microphone.

3.1 Computer

The PC is at the heart of the monitoring station. Of course, this PC needs to have the Building Acoustics module installed.

ltem	Minimum Requirements
Operating System	Windows XP SP3, Windows Vista, Windows 7, Windows 8
CPU	Dual-Core at1.2 GHz
Memory	2 GB RAM
Hard drive	300 MB free hard disk space
Port	USB 2.0
Minimal Display resolution	800 x 600

3.2 Mezzo Unit

The Mezzo unit provides the interface for signal measurement. It is connected to the computer using the standard mini-B USB cable (included). The input of the Mezzo Precision Microphone is a SMB connector, which usually hosts a microphone.

3.3 Microphone

The Mezzo unit supports any IEPE compatible microphones. The following table give the recommended microphones. Recommended microphones are BSWA type MPA221 (Class 1) and BSWA type MPA225 (Class 2).

4 Step-by-Step Examples

This section describes how to use the Building Acoustics module through an example project.

4.1 Start the Application

The Mezzo Building Acoustics Module is part the Mezzo Suite installer. The latest release can be downloaded from the Soft dB website (http://www.softdb.com/software.php?mezzo). The installer installs the module and all the necessary drivers.

The Mezzo Building Acoustics Module can be loaded from Windows Start Menu \rightarrow All Programs \rightarrow Mezzo \rightarrow Building Acoustics.

Mezzo B	uilding Acous	tics 1.7.2														- 0	\times
Project	Setup																0
New Project	Open Project	Open Previous	Open Next	(1) Info	Save	Save As	Add Test	Delete Test	Add Measure	Edit Measure	Delete Measure	Export Test	Export Project	Close			
			^														
			~														

- Soft d B

4.2 Configure the Microphone

Connect the Mezzo unit to the computer using the provided standard USB cable (type Mini-B). A small window appears to indicate that the software is connecting to the Mezzo unit.

Mezzo B		tics 1.7.2														_	٥	\times
Project	Setup																	0
New Project	Open Project	Open Previous	Open Next	(1) Info	Save	Save As	Add Test	Delete Test	Add Measure	Edit Measure	Delete Measure	Export Test	Export Project	Close				
									ting Mezzo F	Precision Mir	rophone	×						

4.2.1 Set the Microphone Sensitivity

The sensitivity of the Mezzo unit must be set in the software. From the Setup tab of the main panel, press the Input Setup button to open the Input Setup interface. Then, press the Load From Mezzo button to update the microphone sensitivity from the factory calibrated value. It is also possible to perform a new calibration by clicking on the "calibrate" button.

ezzo Analyz recision Mic 115040801-0		Manufacturer	Microphone BSWA		
15040801-0					
SN M15040801-04			MP201-MA221		
		Serial Number	520778-520144		
Low	High	Sensitivity	50.92mV/Pa		
d 111.4dB	125.2dB	Calib. Date	2015/04/08 08:56		
e 31.8dBA	35.8dBA		Calibrate		
e 21.8dBA	31.8dBA		Load From Mezzo		
	Low d 111.4dB ge 31.8dBA ge 21.8dBA	d 111.4dB 125.2dB je 31.8dBA 35.8dBA	Low High Sensitivity d 111.4dB 125.2dB Calib. Date e 31.8dBA 35.8dBA		

4.3 Create a New Project

A Project File includes all the measurement and test reports from a measurement campaign. It's recommended to use a single project file for a measurement campaign.

To create a new project, click on the "New Project" button from the Project toolbar and enter a project name.

New Project		>
Name		
Lincoln_Building		
Comment		
	ок	Cancel

4.4 Add a Test

The measurements are related to tests of a certain type. Available test types are:

- Airborne Sound Insulation (ASI),
- Impact Sound Level (ISL),
- Reverberation Time (RT),
- Room Noise (RN),
- Speech Privacy in Open Offices (AI),
- Speech Privacy provided by a Closed Room (SPC).

4.4.1 Performing an Airborne Sound Insulation Test

Click on the Add Test button from the Project toolbar. Enter the test name and select "Airborne Sound Insulation" from the test type drop-down menu:

М	Add Test		×
	Test Name		
	Room 102 to 101		
	Airborne Sound Insulation	~	
	Performs an airborne sound insulation test according to the following standards: - ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements - ASTM E 336 - Standard Test Method for Measurement of Airborne Sound Attenuation between Roms in Building - ASTM E 431 - Classification for Reiting Sound Insulation	^	
	 ISO 140-4 - Measurement of sound insulation in buildings and of building elements- Part 4: Field measurements of airborne sound insulation between rooms 	*	
	OK	el -	

_

Once the test is created, you can enter the standard, partition area and the receiving room volume:

Mezzo Building Acoustics 1.7.2 [Lincoln_Building.mbac] (Lincoln_Building)	-	٥	×
Project Setup			?
New Project Open Project Open Previous Open Next Open Info Image Image			
ASI Room 102 to 101 ^ Info Measurements Results			
Test Name			
Room 102 to 101			
Standard Partition Area Receiver Room Volume			
ASTC (ASTM) \sim 15m ² 65m ³			
Partition Description			
Source Room Description			
Receiver Room Description			

Note that you can change these values afterwards.

Measuring the Source Noise Level

Click on the "Add Measure" button from the project toolbar. Select "Source Level" from the dropdown menu and click on "New Measurement".

M Add Measur	e	×
	New Measurement	
	Source Level	
	Load From Current Project	
	Load From Another Project	
	Cancel	
	Cancel	

This operation will launch the measurement interface:

- Soft d B



Place the noise source in the source room and turn it ON. When you are ready to perform a measurement, click on the "Run" button or press the top button on the microphone wand.



When you are ready to stop the measurement, click on the Stop button or press the middle button on the microphone wand.



If you are satisfied with the result, click on the "OK" button or press the middle button on the microphone wand.

Once accepted, the result will appear in the list in the measurements tab:

Mezzo Bu oject	Setup																				
New Project	Open Project	Open Previous	Open Next	() Info	Save	Save As	Add Test	Delete Test	Add E	dit D	elete easure	Export Test	Export Project	Clo							
Ro	oom 101 1	to 102	^	Info M	leasureme	ents Re	esults														
					* *														1k	(Hz : 9)	0.7
				100- 90-	1																
										_						_					
				80-																	
				70-																	
				70- 60-	D				00				1	k					10k		20
				70 - 60 - 50 -	Туре		Name	50	63	80	100	125	160	200	250	315	400	500	630	800	20
				70 - 60 - 50 -		evel	Name Src#1			80	100 76.4	125 76.9		200			400 86.1	5 00 92.3			
				70 - 60 - 50 -	Туре	evel		50	63				160	200			_		630	800	
				70 - 60 - 50 -	Туре	evel		50	63				160	200			_		630	800	

It's recommended to perform several source noise measurements. The software will average them automatically.

- Soft dB

Measuring the Receiver Noise Level

Leave the noise source ON in the receiving room and go in the receiving room. Click on "Add Measure" from the Project Toolbar, select "Receiver Level" from the drop-down menu and click on "New Measurement". Perform the measurement in a similar way as for the source level.

It's recommended to perform several receiver level measurements. The software will average them automatically.

Measuring the Background Noise Level

Turn the noise source OFF in the source room and return in the receiving room. Click on "Add Measure" from the Project Toolbar, select "Background Level" from the drop-down menu and click on "New Measurement". Perform the measurement in a similar way as for the receiver level.

It's recommended to perform several background level measurements. The software will average them automatically.

Measuring the Reverberation Time

Move the noise source in the receiving room. Click on "Add Measure" from the Project Toolbar, select "Reverberation Time" from the drop-down menu and click on "New Measurement".



Click on the "RT-60 Setup" button to select how to perform the test and select the measurement mode from the drop-down menu:

M RT-60 Setup ×	M RT-60 Setup ×
Mode Manual Interrupted V Noise-ON Threshold 70.0dBA Noise-OFF Threshold 50.0dBA	Mode Auto Interrupted Decay Time 3.0s Nb Decay 5
OK Cancel	OK Cancel

The manual mode uses two threshold levels to detect the Noise source ON and OFF states. The user must manually turn off the noise source to create the interruption.

The automatic mode uses the audio output of the tablet PC to control the source. The decay time indicates the time to leave the noise source ON and OFF and the number of decays indicates how many decay curves will be averaged. For 5 decays at 3s decay time, the measurement duration will be 30s long. This method is faster and more reliable than the manual mode.

For the purposes of this example, the automatic mode will be used.

Click on the loudspeaker button to adjust and test the sound source:

Μ	Source Setup		×
	Speakers (Conexant 20585 SmartAudi	o HD) 🗹 Mono 🗸 💽	
	63 125 250 500 1k 2k 4k 8k Master 10	63 125 250 500 1k 2k 4k 8k Master 10 5	
		OK Cancel	

Click on the blue "Play" button to test the volume and adjust the volume accordingly.

Click on "OK" to go back to the measurement interface.



Click on the "Run" button to start the measurement.



At the end of the measurement, click on the "OK" button to accept the measurement:



Viewing the results

Once all the measurements are taken, the result will appear in the "Results" tab.

ct Setup												
Open Project	Open Op Previous Ne	en .	1 Info	Save	Save As	Add Test	Delete	Add Measure	Edit Del Measure Mea		Export Project Close	
Room 102	to 101 ^ Info	Meas	suremer	nts Res	ults							
		ASTC 25	5							100- 95-		Ls (dB)
			Ls (dB)	Lr (dB)	Lb (dB)	T (s)	Lr Corr.	ATL (dB)	Ref. Cont ^	90-		Lr Corr. (dB)
		125	71.2	57.0	39.5	0.36	57.0	11	9	85 -		Lb (dB)
		160	74.2	58.1	41.7	0.54	58.1	15	12	80-		ATL (dB)
		200	77.0	55.4	36.0	0.59	55.4	21	15	75-		Ref. Contour (dB)
		250	78.7	50.0	32.9	0.51	50.0	27	18	70-		
		315	81.8	56.9	32.2	0.74	56.9	25	21	65-		
		400	80.4	53.9	28.7	0.54	53.9	25	24	55-		\sim
		500	82.8	54.3	28.7	0.56	54.3	27	25	50-		\sim
		630	81.4	50.7	27.1	0.46	50.7	29	26	45-		
		800	78.6	47.1	26.1	0.45	47.1	30	27	40-		
		1k	75.6	43.3	24.4	0.48	43.3	31	28	35 -		\sim
		1.25k	72.7	42.7	24.3	0.46	42.7	28	29	30-		
		1.6k	69.3	40.6	24.0	0.47	40.6	27	29	25-	$ \land \land$	
		2k	67.0	38.9	24.0	0.46	38.9	26	29	20-	\wedge	
		2.5k	66.3	37.5	24.7	0.47	37.5	27	29	15-		
		3.15k	62.3	36.7	24.0	0.43	36.7	24	29 🗸	10- 5-		
		<							>			

Note that should you want to view the data against other standards, just select a different standard from the "standard" drop-down menu from the Info tab.

– Soft d B

4.4.2 Performing an Impact Sound Level Test

Click on the Add Test button from the Project toolbar. Enter the test name and select "Impact Sound Level" from the test type drop-down menu:

Test Name	
Room 201 to 101	
Impact Sound Level	~
Performs an impact sound level test according to the following standards:	^
- ASTM E 1007 - Standard Test Method for Field Measurement of Tapping	
Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures	
 - ASTM E 989 - Standard Classification for Determination of Impact Insulation Class 	
- ISO 140-4 - Measurement of sound insulation in buildings and of building	
elements - Part 7: Field measurements of impact sound insulation of floors - ISO 717-2 - Rating of sound insulation in buildings and of building elements -	~
elements - Part 7: Field measurements of impact sound insulation of floors	,

Once the test is created, you can select the standard and enter the receiver room volume:

Mezzo Building Acoustics 1.7.2 [Lincoln_B	uilding.mbac]	-	٥	×
Project Setup				?
New Open Project Provious Net	pen lafe Suis Suis Add Delete Add Edit Delete Export Export Class			
ASI Room 102 to 101	^ Info Measurements Results			
ISL Room 201 to 101	Test Name Room 201 to 101 Standard Receiver Room Volume IIC (ASTM) For 65m ³ Partition Description			
	Source Room Description			
	Receiver Room Description			

Note that you can change these values afterwards.

Measuring the Receiving Level

Click on the "Add Measure" button from the project toolbar. Select "Receiver Level" from the dropdown menu and click on "New Measurement".

Position the Normalized Tapping Machine¹ at the first position on the source room floor and turn it ON.

Click on "Run" on the measurement interface and perform the measurement in a similar manner as for the receiver level of the airborne sound insulation test performed previously.

Move the tapping machines for the other positions required by the standard and perform the measurement(s).

Importing the Background Level and Reverberation Time

The receiver room being the same as for the airborne sound insulation test, we will use the same background level and reverberation time measurements for this test to save time.

Click on the "Add Measure" button from the project toolbar and click on "Load From Current Project".

Туре	Name	Date	Comment	
Background Level	Bck#4	2017-01-04 1:57		
Background Level	Bck#5	2017-01-04 1:58		
Background Level	Bck#6	2017-01-04 1:58	:18 PM	
Receiver Level	Rcv#1	2017-01-04 1:48	:59 PM	
Receiver Level	Rcv#2	2017-01-04 1:49	:12 PM	
Receiver Level	Rcv#3	2017-01-04 1:49	:26 PM	
Receiver Level	Rcv#4	2017-01-04 1:56	:36 PM	
Receiver Level	Rcv#5	2017-01-04 1:56	:51 PM	
Receiver Level	Rcv#6	2017-01-04 1:57	:09 PM	
Receiver Level	Rcv#7	2017-01-04 2:13	:21 PM	
Receiver Level	Rcv#8	2017-01-04 2:13	:38 PM	
Receiver Level	Rcv#9	2017-01-04 2:13	:56 PM	
Receiver Level	Rcv#10	2017-01-04 2:14	:15 PM	
RT-60	RT#1	2017-01-04 1:45	:41 PM	
RT-60	RT#2	2017-01-04 2:01	:13 PM	
<				>

Select the measurements you wish to import and click on "Add Selection". Once imported, the measurements will appear in the list on the Measurements tab.

¹ The tapping machine must conform to specifications given in appendix A of ISO 140-7 (1998) standard.



Project	t Setup																	
New Project	Open Project	Open	Open Next	1 Info	Save Save As		elete Add Fest Measu	Edit	Delete Measure	Export Test	Export Project	Close						
	Room 102 t		^ Ir	nfo Me	asurements	Results												
SL I	Room 201 t	to 101																
				•	* *											1	kHz:3	9.2
				80-														
				70-	•													_
			_	60-														_
				50 -				Г										
				50 -			100				1k					10k		20
				50- 40- 30- 10	Гуре	Name	100	63	80	100	1k 125	160	200	250	315	10k 400	500	201
				50- 40- 30- 10	Type Receiver Level	Name Rcv#7		63 63.7	80	100		160 59.9	200 57.6	250 54.1	315 47.0			
				50- 40- 30- 10 T	21		50				125		_		_	400	500	
				50- 40- 30- 10 T F	Receiver Level	Rcv#7	50 61.0	63.7	67.1	54.5	125 63.1	59.9	57.6	54.1	47.0	400 47.4	500 44.9	
				50- 40- 30- 10 F F F F	Receiver Level Receiver Level Receiver Level Receiver Level	Rcv#7 Rcv#8 Rcv#9 Rcv#10	50 61.0 60.3 63.7 63.4	63.7 58.5 63.0 59.5	67.1 63.3 62.1 58.3	54.5 54.3 59.5 56.4	125 63.1 60.5 69.0 62.7	59.9 60.6 65.3 60.4	57.6 55.1 53.2 54.0	54.1 52.4 45.9 49.1	47.0 45.3 45.4 46.4	400 47.4 45.6 44.1 45.5	500 44.9 44.3 43.6 43.4	
				50- 40- 30- 10 F F F F F F F F F	Receiver Level Receiver Level Receiver Level Receiver Level Background Lev	Rcv#7 Rcv#8 Rcv#9 Rcv#10 el Bck#4	50 61.0 60.3 63.7 63.4 40.5	63.7 58.5 63.0 59.5 42.2	67.1 63.3 62.1 58.3 42.6	54.5 54.3 59.5 56.4 38.3	125 63.1 60.5 69.0 62.7 39.6	59.9 60.6 65.3 60.4 41.7	57.6 55.1 53.2 54.0 35.8	54.1 52.4 45.9 49.1 32.1	47.0 45.3 45.4 46.4 32.3	400 47.4 45.6 44.1 45.5 27.6	500 44.9 44.3 43.6 43.4 28.3	
				50- 40- 30- 10 F F F F E E E	Receiver Level Receiver Level Receiver Level Receiver Level	Rcv#7 Rcv#8 Rcv#9 Rcv#10 el Bck#4 el Bck#5	50 61.0 60.3 63.7 63.4	63.7 58.5 63.0 59.5	67.1 63.3 62.1 58.3	54.5 54.3 59.5 56.4	125 63.1 60.5 69.0 62.7	59.9 60.6 65.3 60.4	57.6 55.1 53.2 54.0	54.1 52.4 45.9 49.1	47.0 45.3 45.4 46.4	400 47.4 45.6 44.1 45.5	500 44.9 44.3 43.6 43.4	

Viewing the Results

Once all the measurements are taken, the result will appear in the "Results" tab.

oject Setup													
New Open roject Project F	Open Op Previous Net	en ,	1 Info	FF Save	Save As	Add Test	Delete Test	Add Measure	Delete Measure	Export Test	Export Project Close		
Room 102 to		Meas	suremen	ts Resu	ılts								
Room 201 to	101												
	_	IIC 50								10-		Lr Corr. (dB)	~
			Lr (dB)	Lb (dB)	T (s)	Lr Corr.	LN (dB)	Ref. Contour (dB)		75-		Lb (dB)	
		100	56.7	39.1	0.35	56.6	61	62				LN (dB)	\mathbf{Y}
		125	65.1	39.5	0.36	65.1	70	62		55-		Ref. Contour (dB)	~
		160	62.2	41.7	0.54	62.1	65	62	6	50 -			
		200	55.3	36.0	0.59	55.3	58	62	5	i5-			
		250	51.4	32.9	0.51	51.4	54	62	5	50 -			
		315	46.1	32.2	0.74	45.9	47	62	4	15 -			
		400	45.8	28.7	0.54	45.7	49	61	4	10 -			
		500	44.1	28.7	0.56	44.0	47	60		35-	$\langle \rangle$		
		630	42.7	27.1	0.46	42.6	46	59		10-	\sim		
		800	40.0	26.1	0.45	39.9	44	58		25-			
		1k	38.5	24.4	0.48	38.3	42	57					
		1.25k	38.0	24.3	0.46	37.8	41	54		20-		N	
		1.6k	36.7	24.0	0.47	36.5	40	51	1	15-			
		2k	35.7	24.0	0.46	35.4	39	48	1	10-			
		2.5k	36.2	24.7	0.47	35.9	39	45	,	5-			
		<						>		0-			

Should you want to view the data against other standards, just select a different standard from the "standard" drop-down menu from the Info tab.

4.4.3 Performing a Reverberation Time Test

Click on the Add Test button from the Project toolbar. Enter the test name and select "Reverberation Time" from the test type drop-down menu:

	Test Name	
Performs a reverberation time - ASTM E 2225 - Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods - ISO 3382-2 - Measurement of room acoustic parameters Part 2: Reverberation	Room 101	
ASTM E 2235 - Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods - ISO 3382-2 - Measurement of room acoustic parameters Part 2: Reverberation	Reverberation Time	~
	- ASTM E 2235 - Standard Test Method for Dete Sound Insulation Test Methods - ISO 3382-2 - Measurement of room acoustic p	rmination of Decay Rates for Use in

Once the test is created, you can select the standard and select the spectrum type.

M Mezz	Building Acousti	cs 1.7.2 [Linco	oln_Buildin	g.mbac] (Linc	oln_Buildin	g)										-	٥	×
Proje	t Setup																	?
New Projec	Open t Project	Open Previous	Open Next	() Info	F Save	Save As	Add Test	Delete Test	Add Measur	Edit Measure	Delete Measure	Export Test	Export Project	Close				
ASI	Room 102 t		^	Info Me	asureme	nts Res	sults											
ISL	Room 201 tr	0 101		Test Name Room 10 Standard T20 (ISO Room Descri)		Spectrum 1/3 Oc			Y								
			~															

Note that you can change these settings afterwards.

Measuring the Reverberation Time

Since the room under test is the same as the receiving room for the Airborne Sound Insulation test, we will simply import the reverberation time measurements which were already performed. For a detailed process on how to measure the reverberation time, refer to section Measuring the Reverberation Time, p. 9.

Click on the "Add Measure" button from the project toolbar and click on "Import From Current Project". Select the appropriate measurements from the list and click on "Add Selection".

Viewing the Results

Go to the "Results" tab to view the resulting Reverberation time for each octave band or fractional octave band.

Proje	ct Setup							
New Projec		Open Next	Info Sa			elete Add Edit Delete Export Export Export fest Measure Measure Test Project Close		
SI	Room 102 to 10' ^	Info Me	asurements	Results				
SL	Room 201 to 10'							
T	Room 101		Dyn (dB)	Tdyn (s)	R ²			
		50	17.52	1.15	0.996	0.9-0.8-		
		63	20.28	0.93	0.997	0.7-		
		80	22.08	0.86	0.982	0.6-		
		100	25.76	0.41	0.998	0.5-		
		125	32.84	0.33	0.995	0.3-		
		160	30.32	0.47	0.964	0.2-		
		200	33.31	0.56	0.987	0.1-		
		250	35.63	0.57	0.978	10 100 1k	10k	20
		315	37.02	0.61	0.971			
		400	41.60	0.59	0.973	0- m Charles and a start and a start and a start a sta		
		500	44.48	0.58	0.979	-10-		
		630	43.16	0.53	0.973	-20-		
		800	44.27	0.51	0.987			
		1k	46.98	0.54	0.991	-30-		
			44.17	0.55	0.990	-40-		
		1.6k	42.71 40.14	0.52	0.994	-40-	mon	4
		<	20112	0.51	0.991	> -60-		

The "Dyn" column indicates the dynamic which is the difference between the source level and the background level. The TX represents the RT-60 reverberation time in seconds and R² indicates the correlation coefficient between the measured decay curve and the linear regression curve.

Tag	Linear Regression Range	Minimum Dynamic Range	Standard
Tdyn	-5 to*	15 dB	
EDT	0 to -10 dB	25 dB	ISO 3382-2
T10	-5 to -15 dB	30 dB	
T15	-5 to -20 dB	35 dB	
T20	-5 to -25 dB	40 dB	ISO 3382-2
T25	-5 to -30 dB	45 dB	ASTM E 2235
Т30	-5 to -35 dB	50 dB	ISO 3382-2

The following table shows the different available RT-60 metrics:

* Tdyn uses all the available dynamic range to evaluate the decay curve.

4.4.4 Performing a Room Noise test

Click on the Add Test button from the Project toolbar. Enter the test name and select "Room Noise" from the test type drop-down menu:

Add Test	
Test Name	
Room 101	
Room Noise	~
Performs a background noise test according to the following standards:	^
- ANSI S12.2 - Criteria for Evaluating Room Noise	
- ISO 1996-1 - Description, measurement and assessment of environmental noise - Basic Quantities and assessment procedures	
	~

Once the test is created, you can select the standard from the drop-down menu.

M Mezz	o Building Acous	tics 1.7.2 [Linc	oln_Buildin:	ıg.mbac] (Linc	oln_Buildir:	ig)										-	٥	×
Proje	ct Setup																	?
New Projec	Open Project	Open Previous	Open Next	() Info	FFF Save	Save As	Add Test	Delete Test	Add Measure	Edit Measure	Delete Measure	Export Test	Export Project	Close				
ASI	Room 102		^	Info Me	asureme	ents Res	ults											
ISL RT RN	Room 201 Room 101	to 101		Test Name Room 10 Standard NC (ANS Room Descri	51)													
			~													 		

Note that you can change this setting afterwards.

Measuring the Room Noise

Since the room under test is the same as the receiving room for the Airborne Sound Insulation test, we will simply import the background noise measurements which were already performed.

Click on the "Add Measure" button from the project toolbar and click on "Import From Current Project". Select the appropriate measurements from the list and click on "Add Selection".

- Soft d B

Viewing the Results

_

Go to the "Results" tab to view the resulting Room Noise criteria.

oje	ect Setup												
Nev Proje	W Open	Open O Previous N	Dpen Next	1 Info	Save Save As	Add Delete Test Test	Add Measure	Delete Measure	Export Test	Export Project Close			
SI	Room 102 t	o 101	^ Ir	nfo Me	asurements R	lesults							
5L	Room 201 t	o 101											
RT .	Room 101								100-				
RN	Room 101			NC-30					95-			Ref. Contour (dB)	
					Avg (dB)	Ref Curve (dB)		^	90-			Noise Level (dB)	\sim
				16	50.7	81.0			85 -				
				31.5	46.2	68.0			80 -	\mathbf{X}			
				63	46.9	57.0			75- 70-				
			_	125	45.2	48.0			65-				
			_	250	39.1	41.0			60-				
				500	33.2	35.0			55-				
				1k	29.7	32.0			50 -	$\langle \rangle$			
			_	2k	29.0	29.0			45 -		\searrow		
			_	4k	26.6	28.0			40 -				
			_	8k	20.1	27.0			35 -			<u> </u>	
			_						30-				
			_						25- 20-				\smallsetminus
			_						15-				
			_						10-				
			_					~	5-				
			_	<				>	0-				

Note that you can view the dataset against another standard curve by selecting another metric from the "Standard" drop-down menu from the Info tab.

🕅 Mezzo Building Acoustics 1.7.2 [Lincoln_Building.mbsc] 🛛 (Lincoln_Building)	-	٥	×
Project Setup			$\overline{\mathbf{O}}$
New Project Open Project Open Next Open Next Info III Save IIII Save IIIII Save IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			
ASI Room 102 to 101 ^ Info Measurements Results			
ISL Room 201 to 101 RT Room 101 RN Room 101 Standard NC (ANSI) ✓ NC (ANSI) RC (ANSI) RC (ANSI) RC (ANSI) NC (ANSI) NR 1/1 (ISO) NR 1/3 (ISO)			

Soft	dB
------	----

Proje	ect Setup									
Nev Proje	w Open Open	Onen		Save Save As	Add Delete Ac Test Test Mea	d Edit Delete	Export Exp Test Proj	ort		
SI	Room 102 to 101	^ In	fo Meas	urements R	esults					
SL	Room 201 to 101									
RT	Room 101		D.C. 24 (1)	,			100-			
RN	Room 101		RC-31 (H)			95 - 👢		Ref. Contour (dB	
				Avg (dB)	Ref Curve (dB)	^	90-		Noise Level (dB) 🔼
			16	50.7	56.0		85-			
			31.5	46.2	56.0		80-			_
			63	46.9	51.0		75 - 70 -			
			125	45.2	46.0		65-			
			250	39.1	41.0		60-			
		_	500	33.2	36.0		55-			
		_	1k	29.7	31.0		50-			
		_	2k	29.0	26.0		45-			
		_	4k	26.6	21.0		40-			_
		_					35-			
		_					30- 25-			
		_					20-		\sim	
							15-			
		_					10-			
						*	5-			
			<			>	0-	100		

4.4.5 Performing a Speech Privacy for Open Office Test

Click on the Add Test button from the Project toolbar. Enter the test name and select "Articulation Index" from the test type drop-down menu:

м	Add Test	×
	Test Name	
	Room 101 A to B	
	Articulation Index	~
	Performs a speech privacy test according to the following standards: - ASTM E 1130 - Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index	^
		~
	OK	el

M Mezzo	Building Acoustics 1.7.2 [Lincoln_Build	ling.mbac] (Lincoln_Building)	_	٥	×
Projec	t Setup				?
New Projec	Open Project Previous Next	Info Save Save Add Test Delete Test Mad Add Test Delete Test Mad Delete Measure Delete Edit Measure Delete Equit Measure Delete Export Eport Project Close			
	Room 102 to 101 ^	Info Measurements Results			
	Room 201 to 101	Test Name			
	Room 101	Room 101 A to B			
	Room 101				
Al	Room 101 A to B	Voice Type			
		Normal			
		Source Position Description			
		Workstation A			
		Receiver Position Description			
		Workstation B			

Measuring the Source Level

The sound source level must be previously measured in an anechoic room on the loudspeaker axis at 0.6m, 0.9m and 1.2m from the source point. The volume settings must be noted and must be able to be reproduced on the site in a reliable and precise way.

To record the source levels, install the sound source in an anechoic room and set the volume correctly. Create an empty Project and add an Articulation Index test. Measure the source levels by adding 3 measurements at respectively 0.6m, 0.9m and 1.2m from the sound source. This Project will be used later to import these measurements.

Back to the field measurements, click on "Add Measure" and select "Load from Another Project":

M Add Meas	ıre	×
	New Measurement	
	Source Level ~	
	Load From Current Project	
	Load From Another Project	
	Cancel	

Browse to the previously created Project file containing the sound source calibration measurements:



r				
		E		
Name	1	Date modified	Туре	
M Articulation Index Source Cali		2017-01-04 2:33 PM	MBAC File	
<				
	Name Articulation Index Source Cali	Name	Name Date modified Articulation Index Source Cali 2017-01-04 2:33 PM	Name Date modified Type Mane Date modified Type Articulation Index Source Cali 2017-01-04.2:33 PM MBAC File

Select the 3 source measurements and click on "Add Selection".

ist of Measurem		Sc	ource Test ALL	~
	Name	Date	Comment	
Type Source Level	0.9m	2017-01-04 2:32:49 PM		
Source Level	0.6m	2017-01-04 2:32:49 PN		
Source Level	1.2m	2017-01-04 2:33:33 PM	M	
¢				>

Measuring the Receiver Level

Back to the field, position the sound source at the talker location at a 1.2 m height above the floor. The source shall be oriented towards the listener location and at 25° above horizontal. Set the volume at the same position as it was during the anechoic calibration.

Position the microphone at the listener location at 1.2m above the floor.

Click on "Add Measurement", select "Receiver Level" from the drop-down menu and click "New Measurement".

Perform the measurement as described in section Measuring the Source Noise Level, p.6.

- Soft d B

Measuring the Background Level

Click on "Add Measurement", select "Background Level" from the drop-down menu and click "New Measurement".

Perform the measurement as described in section Measuring the Source Noise Level, p.6.

Alternatively, the background level could be loaded from a previously made measurement if applicable.

Viewing the Results

Go to the "Results" tab to view the resulting Articulation Index and Privacy Index values.

roje	ct Setup												
New Proje		Open Next	Info Sa	ve Save As	Add Test	Delete Test	Add I	idit Delete Measure	Export Test	Export Project Close			
SI	Room 102 to 101	^ II	nfo Measu	rements F	lesults								
5L	Room 201 to 101												
Т	Room 101								100-				
N	Room 101		AI 0.054 (PI 95%) "No	ormal"				1			Lsrc	\sim
M.	Room 101 A to B			Lsrc (dB)	Lrec (dB)	Lred (dB)	Lyce (dB)	Lspch (d ^	80-			Lrec	
			200	67.4	57.3	10.2	60.0	49.8	60-			Lred	
			250	71.2	54.5	16.6	64.0	47.4				Lvce	
			315	70.4	59.4	11.0	63.0	52.0	40-			Lspch	×
			400	72.1	57.5	14.7	65.0	50.3	20-			SNR	
			500	77.8	55.4	22.4	66.0	43.6			~		~
			630	76.4	59.7	16.6	64.0	47.4	0	~	1k		
			800	77.9	56.6	21.3	58.0	36.7	0.1-				
			1k	76.5	53.2	23.3	58.0	34.7	0.09- 1			AI	\sim
			1.25k	74.7	50.7	24.0	59.0	35.0	0.08-				
			1.6k	73.3	51.6	21.7	56.0	34.3	0.07-				
			2k	72.8	46.9	25.9	52.0	26.1	0.06 -				
			2.5k	73.3	43.4	29.9	53.0	23.1	0.05 -				
			3.15k	73.2	42.4	30.8	53.0	22.2	0.04 -				
			4k	74.5	39.0	35.6	50.0	14.4	0.03 -				
			5k	73.8	37.4	36.4	46.0	9.6	0.01 -		\wedge		

The following table lists the criteria against subjective ratings of speech privacy:

AI	PI	Subjective Rating
AI ≤ 0.05	PI ≥ 95	Confidential
$0.05 < AI \le 0.2$	95 > PI ≥ 80	Normal
$0.2 < AI \le 0.3$	$80 > PI \ge 70$	Poor
$0.3 < AI \le 0.4$	$70 > PI \ge 60$	Bad
0.4 < AI	60 > PI	No Privacy

Should you want to evaluate the privacy level for another type of speech, simply select the appropriate speech type from the "Speech" drop-down menu from the Info Tab.

4.4.6 Performing a Speech Privacy Provided by a Closed Room Test

Click on the Add Test button from the Project toolbar. Enter the test name and select "Speech Privacy Class" from the test type drop-down menu:

Room 102 to 101		
Speech Privacy Class		-
Performs a speech privacy test acco - ASTM E 2638 - Standard Test Meti Privacy Provided by Closed Room	ording to the following standards: hod for Objective Measurement of the Speech	'
		,

Mezzo Building Acoustics 1.7.2 [Lincoln_Building.mbac]	– 0 ×
Project Setup	0
New Project Open Project Open Next Open Next Open Info Image <	
ASI Room 102 to 10 ⁻ ^ Info Measurements Results	
ISL Room 201 to 10' Test Name	
RI Room 101 Room 102 to 101	
RN Room 101 AI Room 101 A to E Source Room Description	
SPC Room 102 to 10	
Receiver Position Description	
v	

Measuring the Source Level

Position the sound source in the source room and turn it ON.

Click on "Add Measurement", select "Source Level" from the drop-down menu and click "New Measurement".

Perform the measurement as described in section Measuring the Source Noise Level, p.6.

Measuring the Receiver Level

With the source still ON in the source room, go to the receiving room and position the microphone at the listener location.

Click on "Add Measurement", select "Receiver Level" from the drop-down menu and click "New Measurement".

Perform the measurement as described in section Measuring the Source Noise Level, p.6.

Measuring the Background Level

Click on "Add Measurement", select "Background Level" from the drop-down menu and click "New Measurement".

Perform the measurement as described in section Measuring the Source Noise Level, p.6.

Alternatively, the background level could be loaded from a previously made measurement if applicable.

Viewing the Results

Go to the "Results" tab to view the resulting Speech Privacy Class value.



– Soft d B

The following table lists the Speech Privacy Class criteria against subjective ratings of speech privacy:

SPC	Subjective Rating
70	Minimal Privacy
75	Standard Privacy
80	Standard Security
85	High Security
90	Very High Security

5 Additional Information

5.1 Noise Source Setup

It is possible to use the audio output of the tablet PC to feed the noise source not only for the RT-60 but also for the source and receiver levels. To use the audio output, click on the "Noise Source Setup" button in the measurement interface and check "Use Audio Output".

Source Set	up		×
Use Auc	dio Output	t 🔽 🛛	() 0
	ОК	Cancel	

Using this option, the noise source will turn ON and OFF automatically when performing the measurement.

5.1.1 Output Setup

M Source Setup	×
Speakers (Conexant 20585 SmartAudio	o HD) 🕥 Mono 🗸 💿
¹⁰ ⁶³ ¹²⁵ ²⁵⁰ ⁵⁰⁰ ^{1k} ^{2k} ^{4k} ^{8k} ^{Master} ¹⁰ ⁵ ⁵ ⁶ ⁶ ⁶ ⁶ ⁶ ⁶ ⁶ ⁶ ¹⁰ ⁶ ¹⁰ ⁶ ¹⁰	G3 125 250 500 1k 2k 4k 8k Master 10
	OK Cancel

The output setup allows to configure the audio output of the tablet PC to be used as a noise source for the STC tests and RT-60 tests. The generator outputs a pink noise for both audio channels. Two equalizers can be added to customize the sound on each channel. As an example, one channel can be connected to an omni-directional speaker (dodecahedron) while the other can be used with a low-frequency speaker. Hence, two different equalizers can be used for better performance.

5.2 Exporting Data

The data can be exported to a text file (tab delimited) for a single test or the complete project. Click on the "Export Test" button to export a single test or "Export Project" to export all the tests from the project.

– Soft dB

5.3 Record Setup

Click on the "Record Setup" button from the "Setup" tab to access the record parameters.

Save Mode	Save Every	
Automatic ~	1 minute 🗸	
Record Directory		
C:\Users\T510_1\D	ocuments\Mezzo\BAC	~

The automatic save mode will automatically create a project file in the record directory upon creating a project and will automatically save the file every X minutes.

In manual mode, the user must manually save the project to a file.

The automatic mode is recommended to avoid losing any data.