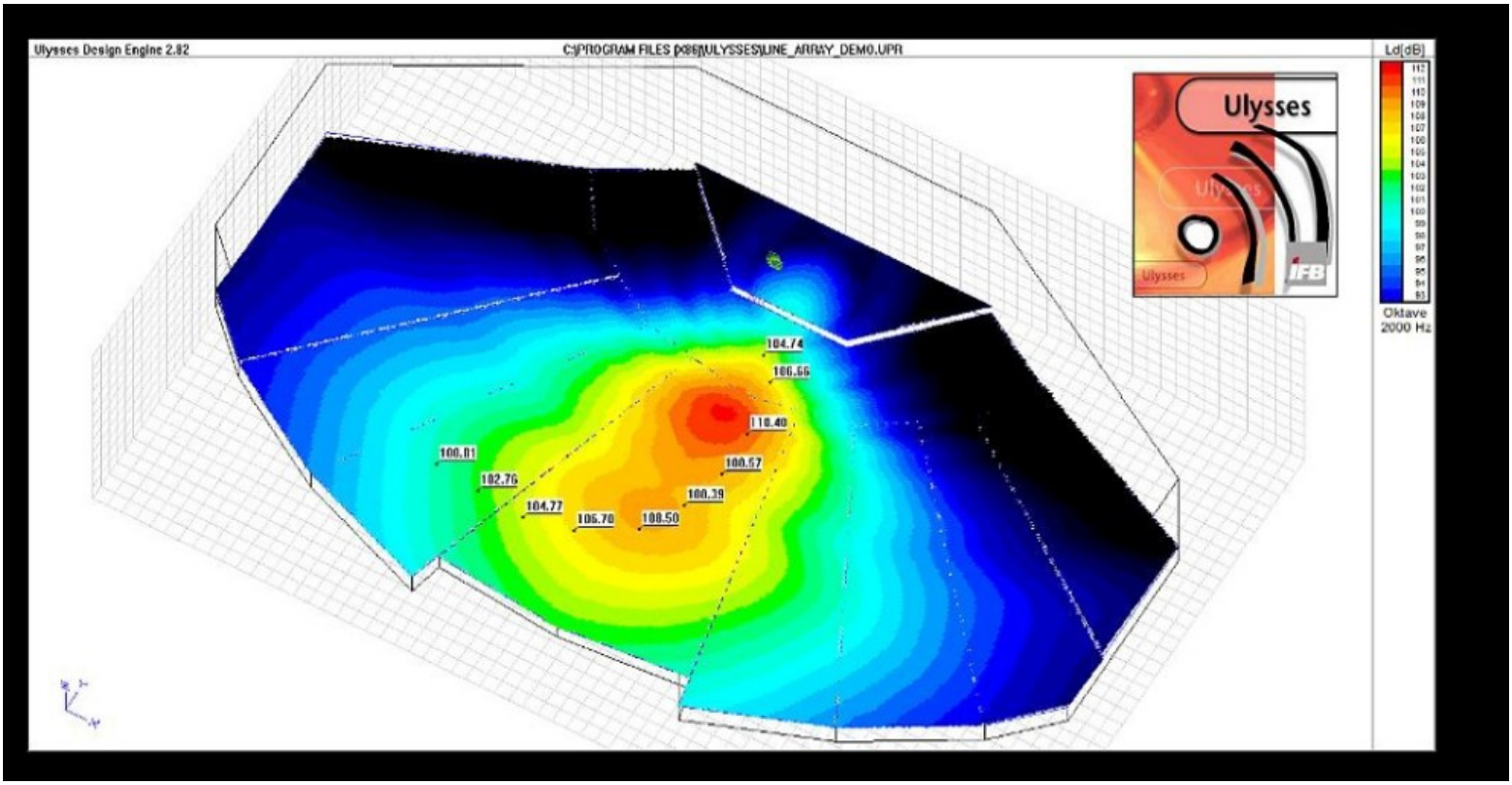
# Ulysses Help



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## Operating instructions



## Operating instructions, fundamentals

The ULYSSES world is modeled on three-dimensional coordinates. Each node of a room is defined by X, Y and Z values.

All input devices to register and alter room data, however, are two-dimensional only. Commands such as "move left 2cm, move up 5cm, move back 10cm" are impossible by mouse control. While the first two movements can be realized lifting the mouse from its pad - i.e. moving into the third dimension - cannot be registered by the computer.

Similar limitations exist for graphics: screen, printer or plotter are exclusively based on two-dimensional reproduction and fail at creating three-dimensional graphics.
By adequate conversion of three-dimensional data (perspective, concealing effects) depth (the third dimension) may be visualized in two-dimensional graphics, however this information is mathematically unreliable.

Most 3D edit mechanisms of past programs are based on numerical input and output of 3D nodes and their connecting borders. Data management is typically accomplished by numerical lists.
This approach of room reproduction requires a considerable amount of abstract thinking. Complex models depend on exact knowledge of three-dimensional relations, and every change of values must always be registered. Even minor alterations of a model (e.g. relocating, rotation) result in revising the numerical list again and again.

The ULYSSES user interface is both flexible and easy on abstract thinking. The 3D graphic editor features selectable work- and viewplanes. In combination with its cursor control options both an interactive mode (seemingly simultaneous graphic input and output) and practical numerical manipulation are easily accomplished.

## Coordinate input

The coordinate cursor (red crosshairs) can only be moved within one viewplane at one time by the input device (mouse, trackball etc.).
It controls coordinates only within the orthogonal planes XY, YZ and XZ. For that reason mouse movement within the 3D view does not result in changes of the coordinate display unless the NODE SNAP option is activated.
Current cursor coordinates are always displayed in red numerals in their control panel windows.

Example: the XY view has been selected as indicated in the control panel. Watch the coordinate display while moving the mouse and see the X and Y values change while the Z value remains. Activate the YZ view next by clicking on the YZ button or striking the F1 key. Cursor movement now changes the Y and Z values while the X value remains.

If coordinates are selected by mouse movement their range depends on several adjustable parameters:

1. The current viewplane -
for details see viewplane selection

2. The visible world detail -
this can be enlarged or scaled down by the zoom function, and relocated by the scrollbars right of and below the window.
For details see view control

3. The setting of the coordinate snap parameters -
this adjusts the interval between coordinates on which the cursor locks in.
For details see coordinate snap

4. The setting of the node snap parameters -
this adjusts the maximum distance to a given node on which the cursor locks in when moved close by.
For details see node snap

An alternative way of selecting coordinates is numerical input on the keyboard.
The following two methods are independent of the parameters for cursor control, i.e. viewplane, visible detail, coordinate and node snap.

1. **A**bsolute input
Strike the **A** key during a drawing or edit function to open the window for manual input of X, Y and Z values.

2. **R**elative input
Strike the **R** key during a drawing or edit function to open the window for manual input of X, Y and Z offset values. ULYSSES calculates the new 3D position by adding these to the previous coordinate entry.

The third input method is also independent of coordinate and node snap and the visible detail but depending on the activated viewplane.

3. **P**olar input
Strike the **P** key during a drawing or edit function to open the window for manual input of offset distance and angle. ULYSSES calculates the new 3D position by adding these offset values to the previous coordinate entry.
Polar input is valid for the orthogonal planes XY, YZ and XZ only. New coordinates cannot be calculated for the 3D view.

## Viewplane selection

Since mouse, trackball and digitizer are two-dimensional input devices a processing plane of the three-dimensional room must be selected to move the cursor in all three dimensions.
The program synchronizes the processing mode with its corresponding viewplane on the screen.

To select the desired viewplane
a) click on the corresponding button in the control panel. Keep the CTRL key pressed during selection to avoid third dimension value changes by cursor movement since this is no longer controllable in the new viewplane

or
b) strike the corresponding key.
F1 activates the XY view
F2 activates the YZ view
F3 activates the XZ view
F4 activates the 3D view

When opting for b) no cursor movement occurs during selection and the third dimension values that are no longer controllable in the new viewplane are maintained automatically.

When utilizing the drawing functions for drawing the ground plan of a room it is best to select the XY view. The side views YZ or XZ are recommended for drawing the face of a building.

Note: a new viewplane may be activated at any status of the graphic editor. For drawing functions, however, it is best to select the appropriate view before setting the first node of the respective function or unintended results might be obtained, especially for line or polygonal drawings.

-> see also
Transparent functions

# Screen display

The limited number of pixels on a computer screen requires flexible projection of real world coordinates on the screen.

In a window of 800 x 600 pixels, a room with a base of 100m x 50m can only be reproduced with inadequate precision. If it is enlarged to show even the finest details the window can only represent a fraction of the whole.

Solutions for this problem have been known from the earliest CAD programs:
ZOOMING and PANNING
ZOOMING greatly varies the scale world coordinates - screen coordinates.
PANNING relocates the visible detail while retaining the scale.

Zoom functions:
Zoom out: click on the Z- button in the control panel or strike F5. This reduces the scale by 2, i.e. it doubles the visible world range.
Zoom in: click on the Z+ button in the upper control panel or strike F6. The cursor becomes a magnifying glass positioned by the mouse. Place its center where you want the future detail center and click the left mouse key to achieve the desired enlargement. Now click the right mouse key or strike ESC.
Zoom all: click on the <> button in the upper control panel or strike F7. This adjusts the scale automatically to completely show the borders of all objects currently visible within the window.
Note: Sometimes this function must be repeatedly triggered to show all borders because of the varying numerical range between world and screen coordinates, especially after extreme zooming in.

For a more distinct view select the wire frame or hidden backfaces option. All lines are visible in the wire frame while the partially concealed view fades out all surfaces pointing away from the viewer. To select click on the H button in the control panel or strike F8.

- see also
Transparent functions

# Project detail visibility

Like most CAD programs ULYSSES groups different project details in layers. Assignment of functional groups to layers, however, is automatic. For safety reasons there is no access to layer management. Since simultaneous viewing of all project details is not always practical layers can be faded in and out from the VIEW menu. These are

| | |
|---|---|
| AUXILIARY DRAWINGS | any object ignored for calculation (DARK BLUE) |
| LISTENING AREAS | audience areas (LIGHT BLUE) |
| SPEAKERS | speaker enclosure drawings (on = GREEN, off = BLACK) |
| SPEAKER AIM | lines indicating the speaker axis target in the room (LIGHT RED) |
| GRID | variable three-dimensional grid to distinguish dimensions (LIGHT GREY)<br>- see also grid size setting |
| ROOM | surfaces, lines and solids to show room borders (BLACK) |

## Object selection

When utilizing an edit function to change, copy, rotate or relocate an object in your project you must select the object. Selection is accomplished by individual search cursors depending on the type of object:

The general search cursor (lines, solids, speakers, listening areas...)
is an initially small square cursor to select single objects. Clicking the left mouse key whenever parts of an object (nodes, lines) are within the square selects and marks the object (broken red lines). If several unmarked objects intersect the square a click each selects and marks the object.
If the cursor does not find an unmarked intersecting object it changes to a pull up search window.
Selection is either
Inclusive all objects fully within the window are selected if the window is pulled up from below or from right to left (window color RED) or
Intersecting all objects partially within the window are selected if the window is pulled up from above left to down right (window colors BLUE/BLACK).
If the pull up window finds no unmarked objects the program reverts to the small square cursor.

Node search cursor
All nodes are surrounded by a small green square for better visibility. The program selects and marks an object (broken red lines) whenever nodes of the object are within the square and the left mouse key is clicked. All nodes found are marked by a red cross.

Surface search cursor
The normal crosshair cursor appears.
The program selects a surface surrounding the point you click on and marks it with broken red lines.
In complex rooms various surfaces may surround a point. Several attempts may be necessary to find the proper surface. The program selects one surface after the other and marks them alternatively.
*Note: Extremely complicated projects may necessitate changing the viewplane or relocating details until the proper surface may be selected.*

To confirm object selection click the right mouse key or strike the ENTER key, to exit the edit function strike the ESC key or click on the CANCEL button.

## Transparent functions

To comfortably handle drawing and edit functions many setting functions have been implemented to be available while other commands are executed. These are called transparent functions. They may be accessed by the control panel or their respective function keys.

| Transparent function | control bar symbol | function key |
|---|---|---|
| Activate XY view | XY | F1 |
| Activate YZ view | YZ | F2 |
| Activate XZ view | XZ | F3 |
| Activate 3D view | 3D | F4 |

When 3D is activated, the viewing angle may be turned in 5° steps using the cursor keys

| | | |
|---|---|---|
| Zoom out drawing | Z- | F5 |
| Zoom in drawing | Z+ | F6 |
| Zoom all | <> | F7 |
| Hidden backfaces on/off | H | F8 |
| Coordinate snap on/off | C | F9 |
| Node snap on/off | N | F11 |

Use the scrollbars right and below to relocate detail.

For manual coordinate input during drawing and edit functions use the
**A**-key for absolute input
**P**-key for polar input
**R**-key for relative input

- see also

View control
Viewplane selection
Coordinate entry and cursor control

## Calculations

Reverberation time - Eyring method
Reverberation time - Fitzroy method
Reverberation time - Sabine method
Enter reverberation time

Level / time calculations
Display level / time calculation
Save level / time calculations
Load level / time calculations

Calculate loudspeaker cluster

Ray tracing

Transform and play WAV file

## Reverberation time by Sabine method

This function produces the original version of all RT60 calculations.

Calculation is based on the formula

RT60 = 0.161 * V / (Sa)

and may be used if a project contains surfaces. It is useful only if the room is basically closed.
If there are substantial gaps within the room or the sequence of borders is counterclockwise (- invert surfaces) the calculation form will show a statistical survey of errors.

If the room volume is negative the sequence of several or all borders has been entered incorrectly.

Two curves are shown:

RT60 total including air absorption @ 60% relative humidity (GREEN)
RT60 excluding air absorption (PURPLE)

- see also
Reverberation time - Eyring method
Reverberation time - Fitzroy method
Enter reverberation time

## Reverberation time by Eyring method

This function produces the RT60 calculation as modified by Eyring.

Calculation is based on the formula

RT60 = 0.161 * V / (-S * ln(1-a))

and may be used if a project contains room surfaces. It is useful only if the room is basically closed.
If there are substantial gaps within the room or the sequence of its borders is counterclockwise (- invert surfaces) the calculation form will show a statistical survey of errors.
If the room volume is negative the sequence of several or all edges has been entered incorrectly.

Two curves are shown:

RT60 total including air absorption @ 60% relative humidity (GREEN)
RT60 excluding air absorption (PURPLE)

- see also
Reverberation time - Fitzroy method
Reverberation time - Sabine method
Enter reverberation time

## Reverberation time by Fitzroy method

This function produces the RT60 calculation as modified by Fitzroy.

This method dissects the plane vectors of all room surfaces into their X,Y and Z components and divides the Sa values proportionally for each component.
This method is especially useful to evaluate rooms with a particularly unstatistical distribution of absorption.

Calculation is based on the formula

RT60 = (Sx/S)*(0.161*V/(Sax)) + (Sy/S)*(0.161*V/(Say)) + (Sz/S)*(0.161*V/(Saz))

and may be used if a project contains room surfaces. It is useful only if the room is basically closed.
If there are substantial gaps within the room or the sequence of its borders is counterclockwise (- invert surfaces) the calculation form will show a statistical survey of errors.
If the room volume is negative the sequence of several or all borders has been entered incorrectly.

Two curves are shown:

RT60 total including air absorption @ 60% relative humidity (GREEN)
RT60 excluding air absorption (PURPLE)

- see also
Reverberation time - Eyring method
Reverberation time - Sabine method
Enter reverberation time

## Enter reverberation time

This function provides entry of the reverberation time actually measured in an existing room, and for what if... comparisons for later Alcons and STI calculations.

The total Sa values including air absorption are calculated reversing the Sabine formula

(Sa) = 0.161 * V / RT60

and may be used if a project contains surfaces. It is useful only if the room is basically closed.
If there are substantial gaps within the room or the sequence of its borders is counterclockwise (- invert surfaces) the calculation form will show a statistical survey of errors.
If the room volume is negative the sequence of several or all borders has been entered incorrectly.

- see also
Reverberation time - Eyring method
Reverberation time - Fitzroy method
Reverberation time - Sabine method

## Level and time calculations

Calculations are possible after entering loudspeaker and listening area data.

The essential parameters may be set in a dialog window:

GRID SIZE defines the resolution for scanning the listening areas. At the MINIMUM setting 16.000 equally spaced check points are automatically generated across all listening areas.

SIGNAL COHERENCE defines the influence of phase relations on the calculation.

RANDOM calculates the geometrical total when all phase angles are offset by 90°, total = SQRT(E1²+E2²+...)
*This method should be used for distributed sound systems only.*

SINGLE FREQUENCY includes the octave center frequency phase relations, total = SQRT((E1*SIN(wt1)+E2*SIN(wt2)...)²+(E1*COS(wt1)+E2*COS(wt2)...)²)
*This method mainly illustrates dramatical interference effects.*

OCTAVE BAND includes the phase relations of the three 1/3 octave bands at the octave center. A separate total will be calculated for each octave band. Overall total is their mean value.
*This method is the most realistic and should be used preferably.*

SHADING includes obstacles between loudspeakers and check points. If there is no direct line between loudspeaker and target the level received is set at 0dB. This method is purely optical and does not include refraction and diffraction.

1.REFLECTIONS includes all 1st order reflections arriving within the first 35 ms in the addition of the direct sound field. They are added according to the method chosen under SIGNAL COHERENCE.

Subsequently the program scans all listening area check points and evaluates sound pressure levels and their time of arrival. Evaluation depends on a time/level window of 35ms and 25dB, i. e. a pulse arriving more than 35ms after another is not evaluated as a direct pulse. However, if its level is 25dB above the first pulse it is evaluated as initial pulse, the 35ms window relative to it.

Calculation may take from a few seconds to several minutes depending on computer speed, room complexity (shading & 1st reflections), number of sound sources and grid resolution. Calculation progress is shown in per cent in a status window. To CANCEL calculation click on the corresponding button. All previous calculations are deleted in this case.

After calculation ULYSSES directly opens the level / time display which is later accessible by last level calculation on the menu when a calculation has been completed.

- see also
Save level / time calculation
Load level / time calculation

## Display level and time calculations

After a level / time calculation has been completed the results are accessible.

Buttons for the octave band display and an average button are left of the window. To exit this mode click on the corresponding button above these or strike the ESC key.

Further buttons below the window select conversion to the desired display functions (direct level, total level etc.)

Buttons may only be activated if their conversion function is available. The 125Hz button cannot be activated if no level data have been calculated for its frequency band (e.g. horns with a frequency range 500Hz activated only). Also, displays depending on room data (total level, % Alcons, STI) are not available if listening area data have been entered without room data.

Other buttons select finer or rougher scaling of the values on display, printout and copying to the clipboard .

Displayable functions are:

| BUTTON | description |
|---|---|
| dB dir | total direct level |
| Time | arrival of first pulse |
| dB tot | total direct and indirect levels |
| ALC | Articulation Loss of Consonants in % |
| STI | Speech Transmission Index |
| Ld-Lr | difference direct level indirect level |

Selective points on the audience areas can be marked by clicking them with the left mouse button.
A numerical value is stored and displayed at this point. These selected measurement points will be kept with the calculation result until they are deleted using the appropriate button below the window or the array of audience areas becomes changed.

Clicking the right mouse button on an audience area causes the same marker function as the left button, but in addition, a quick realtime auralization process is triggered. This auralization process uses 1st order reflections and appends dithered impulses according to statistical RT60.
If no input WAV file has been selected yet, a standard file selection dialog will enable you to do it.
The input WAV file must be in 16 bit mono format and 22 or 44 khz sample rate.
You will need a sound card in your PC and some loudspeakers connected to it to listen to the result.
Although this quick auralization cannot be very accurate, it is quite handy to have a first impression of what your result might sound like at a certain listener location.
Due to the limited reflection order, the audible result may contain effects like echoes which might probably not exist if calculation had taken place using higher reflection orders.
In that case we advise to use a local reflection calculation followed by an auralistion method available after that process.
A quite effective method can be calculation reflections of 3rd .. 5th order accompanied by the RTA-process which automatically appends statistical reverberation.

*Note: room dependent functions are always based on the reverberation time calculated or entered last.*
If no reverberation time has been entered or calculated it is automatically calculated by the Sabine method.
I f you only change room data after a level / time calculation that might affect reverberation time a new calculation to indicate value changes regarding Alcons, STI etc. is unnecessary. Click last level calculation on the menu to recall.

## Save level and time calculations

After a level / time calculation has been completed the results may be saved. This is especially useful to compare alternatives and their respective results.
First, enter a comment on the current calculation. This will be shown when reloading to better identify the file.
A standard dialog to select the file name and target file follows.

*Note: the calculation file only saves check point coordinates and their level / time values without accompanying speaker and room data. For a complete configuration the project must be saved and loaded.*

*The project file contains all information.*

- see also
Load level/time calculations

## Load level and time calculations

Level / time calculations can be saved and loaded separately to quickly compare different configurations.
A standard dialog to select the file appears.
After that your comment on the calculation will be shown (if entered).

*Note: the calculation file only saves check point coordinates and their level / time values but not their accompanying speaker and room data. For a complete configuration the project must be saved and loaded The project file contains all information.*

-> see also
Save level / time calculations

## Ray tracing, reflection calculations

This function calculates room reflections up to the 40th order and provides oscilloscope patterns (energy / time diagrams).

Calculation is based on an algorithm which is a hybrid of two traditional methods:
1. Mirror source method
The sound sources are successively mirrored on the room surfaces and possible paths are traced via the intersecting points in between.
2. Particle method
This method calculates if rays shot spherically from a sound source hit the target after room reflections or are in such proximity to still be considered on target.

Both methods have advantages and shortcomings:
While the mirror source method is 100% on target, i.e. it finds all possible paths within the given maximum number of reflections, the calculation effort increases exponentially by approximately [surfaces ^ order]. When utilizing the particle method the increase in calculation effort is linear by approximately [surfaces x order] but it yields incomplete results. Since the number of rays cannot be infinite not all possible paths are found. Precision is linearly dependent on the number of rays traced. Since particles drift apart if time of flight increases this method also depends on time and distance. It becomes continuously less effective with increasing time of flight.

ULYSSES combines both methods:
Lower orders are calculated according to the mirror source method, for higher orders the particle method is applied. The takeover point is set automatically at [surfaces ^ order][surfaces * order * K]. K is the number of rays which is approximately 64.000 / 1° grid.

Calculation progress is shown in a window including a button to CANCEL calculation before completion.

Calculation may take a few seconds up to several days depending on computer speed, maximum reflection order, number of sound sources and surfaces.

*Note: screen savers may be nice to look at but use up considerable computing power. To shorten complex reflection calculations turn off your monitor or select a screensaver that automatically switches your monitor to standby.*

A reflection display window to evaluate reflection paths and energy / time diagrams opens after calculation.

## Reflection display, energy / time diagrams

This mode is accessible in two ways:
1. ULYSSES automatically changes to the display after a reflection calculation has been completed.
2. Load a reflection calculation that has been stored on hard disk. Choose the appropriate file from the file selection dialog.

The reflection files exclusively contain geometry information on surface and loudspeaker indices involved and surface reflection points to avoid new calculations when changing absorber materials or loudspeakers. Operative and inoperative changes are as follows:

Loudspeakers
Operative:
change type, angle (aim), time (delay), level, on/off, delete.
*Note: speakers that are on are assigned automatically.*

Inoperative:
relocate, mirror and copy (the original is operative, copies are disregarded).
Note: speakers that have been relocated are not assigned automatically.

Surfaces
Operative:
change absorber material

Inoperative:
all other

When loading the file ULYSSES links source points and speakers as well as reflection points and absorber materials. Subsequently all reflection paths are sorted by time.

Loading, linking and sorting may take several seconds. If no reflection paths are found whose order is 1 the message can´t evaluate mean free path time must be confirmed see also energy / time display.

All paths are shown in the following reflection window. Use the scrollbar below to navigate thru the separate reflection paths and viewplane selection to view all reflection path details.

Button functions right of the scrollbar are

PRINT to print results
COPY to copy the current view to the clipboard
ETC to access the energy / time display while maintaining the currently selected path

# Energy / time display

This mode can be accessed in the reflection path display only after calculation has been completed or after loading a reflection file.

A pulse diagram with horizontal time and vertical energy axes will be shown. Energy values will be shown logarithmically in dB (0 dB = 20 microPascal), the scaling of both axes is depending on maximum pulse and time.

The window also provides information on the reverberation time calculated from the pulse sequence and the resulting speech comprehensibility (in % Alcons).

*Note: other than measuring devices allowing similar evaluations ULYSSES does not establish reverberation time by a Schröder integration for two reasons:*

1. Because of the particle method, limited maximum order etc. only an incomplete number of pulses are registered leading in all probability to false results.
2. Other than a measuring device the ray tracer knows the pulse paths.

*The ray tracer calculates reverberation time (RT60) from the mean free path (MFP) based on the formula*

RT60 = 6 * ln(10) / ( -ln(1-a) / ( c / (MFP*kMFP) ) )

while
a = mean absorption of the paths when reflected off surfaces
c = sonic speed
k = frequency dependent absorption constant of air at 60% relative humidity

It follows that reliable evaluation of reverberation time and speech comprehensibility is possible only if a sufficient number of reflections is calculated. Tests have shown the calculated values start to correlate when reflection orders are >5.

The frequency buttons for the octave bands are left of the window. Click on the button below these evaluate the average of all octave bands weighted according to Peutz.

RTA triggers a real time auralization process. If no input *.WAV file has been selected yet, a standard dialog box enables you to do it...
APF lets you save an audio processing file, calculated from the current impulse response. This file can be used to do an auralization later on.

Use the scrollbar below the window to maneuver thru the separate pulses.

Button functions right of the scrollbar are

PRINT to print results
COPY to copy the current view to the clipboard
RAY to access the reflection path display while maintaining the currently selected pulse

-> see also
Transform and play WAV-file

# Transform and play WAV-file

This calculation can be accessed after reflection calculation or after loading a reflection file.
If you want to listen to the file, you will need a sound card in your PC.
From the reflection display, press the ETC button to open the Energy/Time window.
Two buttons on the left side of the ETC window are provided :

RTA Lets you do an instant real time auralization. Except the choice of an input WAV file, no further steps are required.

APF Lets you save an audio processing file, contain all impulse info for frequencies from 125 to 8000 Hz. After leaving the reflection mode, follow the steps using the main menu :

1. Select a previously stored transformation file (*.UAP)
2. Select an input audio file (*.WAV).

The WAV-file must be in 16 Bit mono format, sample rate must be 22050 or 44100 Hz. It should contain dry material without reverb and echoes.

3. From the menu, select Process and play

Calculations can take from a few seconds up to several hours. The duration of this process depends on sample rate, original file length, reflection count and -of course- your computer´s speed. -As a rule of thumb, we can calculate :
On a Pentium MMX 200 MHz PC calculation for a 44.1 kHz file will take
ORIGINALSECS x REFLECTIONS / 16.
After computation has finished, the transformed WAV file will be stored and played. Transformed WAV file will be stored under the same prefix name and same directory as the transformation file it is based on.

You can now compare input file and output file, using the appropriate menu items.

Notes :

Both processes :
In the current status, calculation is mono(22 kHz sample rate) and does not consider any ear functions. The output can be compared to the signal which an omnidirectional measuring microphone would receive if it was placed in the receiver position.

APF process :
Currently used algorithm works brut force and uses no simplifications to cut calculation time. Each and every single impulse is fed into the computation for all 7 octave bands. There are no statistical fills .
The calculated transformation scheme is stored in a separate file (*.UAP). Multiple WAV files can be transformed using this prestored scheme, without the need for recalculation of the impulse response.
Hint :
The output file length is identical to the input file length. If you want to hear a typical room decay, you should add 2 - 3 secs of silence to the end of your input file.

RTA process :
The real-time auralization must make some additional compromises in order to enable the machine to work on an unlimited amount of reflections :
Impulses are pre-added into time windows of max. 20 ms.
This reduction, accompanied by a maximum time buffer of 5 secs leads into a maximum of 500 impulses, limiting the machine´s workload.
A statistical reverb tail is appended to the last impulses, using dithered impulses according to the theoretical Schroeder´s inverse integration curve of RT60. The output format is 16 Bit Mono / 22 kHz. To achieve an uninterrupted audio datastream, your PC should at least perform like on equipped with a Pentium MMX 166 MHz. If further applications are running simultanously, the audio stream can be interrupted as well due to increased processor load.

# File

Print
New project
Load project file
Save project file
Exit program

Import / export functions

Speaker export to EASE
Speaker import from EASE
Surface export to EASE
Surface import from EASE

# New

prepares the system for generating a new project.
If a project is currently loaded in the program memory it is deleted with all data.
A safety query appears. Click on the CANCEL button to return to the current project first and save data.
Click on OK to delete the project.

# Open

opens the standard windows dialog to select and load a file.
If a project is currently loaded in the program memory it is deleted with all data.

# Save as...

opens the standard windows dialog to determine file name and tree for saving the project. If level, time and RT60 have been calculated these are saved with the project. All current parameters for node snap, cursor snap, level scan, grid, last RT60 method and project layer view will also be saved to be immediately at hand after loading the project.

Note :
Because of the potential danger of overwriting template files, we decided not to implement the popular, quicker function SAVE. Using the SAVE AS... function always forces us to know what we are doing ...

## Print...

first loads the printer selection dialog, the printout parameter dialog to select scale, drawing detail and to enter LABEL data (date, project, person in charge) follows.
*Note: scaled printout is only possible in the orthogonal planes XY, YZ and XZ.*

## Raumflächen-Import von EASE

enables loading an EASE surface export file (*.EXP).

This process is not exclusive, i.e. current project data are not deleted, surfaces in the selected file are added to the project and any room data in the memory.
*Note: only geometry data are transfered via the import/export interface, but not the accompanying material data. These must be assigned in the target program.*

## Surface import from EASE

enables loading an EASE speaker export file (EASE version 2.xx, format *.EXP).

This process is not exclusive, i.e. existing project data are not deleted, speaker parameters in the selected file are added to the project and any speakers in the memory.
A ULYSSES speaker database must be loaded at this time to align data since speaker specifications (SPL, power handling, directivity) are not transfered via this interface. The loaded data contain information on speaker placement, aim, drive level and delay. Aim is automatically converted to the appropriate coordinate system (EASE 0° horiz. = -Y, ULYSSES 0° horiz. = +X).

## Surface export to EASE

enables saving an EASE surface import file (*.IMP).

No file is generated for safety reasons if any number of surface borders is 10 since the maximum number of edges and nodes respectively is 10 in EASE versions 1.xx and 2.xx. In this case split the surfaces concerned into several smaller ones.
*Note: only geometry data are transfered via the import / export interface, but not the accompanying material data. These must be assigned in the target program.*

- see also
Split surface

## Loudspeaker export to EASE

enables saving an EASE speaker import file (*.IMP).
A ULYSSES speaker database must be loaded at this time to align data
since speaker specifications (SPL, power handling, directional characteristics) are not transfered via this interface. The loaded data contain information on speaker placement, aim, drive level and delay. Aim is automatically converted to the appropriate coordinate system (EASE 0° horiz. = -Y, ULYSSES 0° horiz. = +X).

## Exit

terminates the program.

If the current project data have not been saved a safety query appears. Click on the CANCEL button to return to the current project and save data. Clicking on OK deletes all data that have not been saved.

## Edit

**General**

Turn
Copy
Erase
Scale
Mirror
Move

Copy to clipboard
Undo

**Surfaces**
Invert
Erase
Split
Generate listening areas

Select material database
Assign material
Surface list

**Solids**
Generate extrusion solid
Generate rotation solid
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**Loudspeakers**
Aim at target
Aim by central perspective
Switch off
Select speaker database
Edit speaker
Switch on
EQ
Copy
List
Add speaker
Mirror
Move
Set delay time
Align to target

## Erase

This function is available in the EDIT submenu of the layers ROOM, LISTENING AREAS, LOUDSPEAKERS and AUXILIARY DRAWING. It deletes the selected object.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Move

This function is available in the EDIT submenu of the layers ROOM, LISTENING AREAS, LOUDSPEAKERS and AUXILIARY DRAWING. It relocates objects to a selected location.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or striking the ENTER key.

First enter the relocating base point, then the relocating offset point.

The selected object is relocated from base to offset point according to their 3D coordinate difference.

Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering the base point the object can relocated by mouse movement (interactive positioning).

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Copy

This function is available in the EDIT submenu of the layers ROOM, LISTENING AREAS, LOUDSPEAKERS and AUXILIARY DRAWING. It copies objects to a selected location.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

First enter the copy base point, then the copy offset point.

The copy of the selected object is relocated from base to offset point according to their 3D coordinate difference.

Base and offset points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering the base point the object can be copied by mouse movement (interactive positioning).

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

*Note: when utilizing the copy function for LOUDSPEAKERS a new set of copies is generated after each copy which can be relocated relative to the last offset point to conveniently create large arrays. Strike the ESC key, the ENTER key or click the right mouse key if all copies have been positioned.*

## Turn

This function is available in the EDIT submenu of the layers ROOM, LISTENING AREAS and AUXILIARY DRAWING. It rotates objects around a chosen axis.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

Since rotating can only be accomplished in the XY, YZ or XZ views select one of the orthogonal planes.

Enter the rotation axis pole by crosshair cursor position or absolute coordinate input. Strike the A key for absolute coordinate input. The viewing axis of the current plane is automatically chosen as axis (Z axis for XY plane, X axis for YZ plane and Y axis for XZ plane the 3D view is inoperative for rotating).

Next enter the rotation angle in the superimposed dialog.

The selected object is rotated around the chosen axis by the angle entered.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Mirror

This function is available in the EDIT submenu of the layers ROOM, LISTENING AREAS and AUXILIARY DRAWING. It mirrors an object along a chosen axis.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

Since mirroring can only be accomplished in the XY, YZ or XZ views select one of the orthogonal planes.

Enter the initial and final points of the mirror axis.

Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering the base point the object can be mirrored by mouse movement (interactive positioning).

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Scale

This function is available in the EDIT submenu of the layers ROOM, LISTENING AREAS, LOUDSPEAKERS and AUXILIARY DRAWING. It scales the extensions of the selected object in its dimensions.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

First enter the scaling base point by crosshair cursor position or by absolute coordinate input. Strike the A key for absolute coordinate input.

Next, enter the scaling factors X, Y and Z in the superimposed dialog.

Example:
To turn a circle in the XY plane into an ellipse with a 2:1 (X : Y) axis ratio
1) leave the Y and Z factors at 1.0 and enter 2 in the X panel
2) leave the X and Z factors at 1.0 and enter 0.5 in the Y panel

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Invert surface

This function is available in the EDIT submenu of the layers ROOM and AUXILIARY DRAWING. It inverts the sequence of surface borders.

Since ULYSSES aligns surfaces according to their border sequence (normal vector) the invert function determines if a surface faces the inside or outside of a solid or room. T correctly calculate room volume all surfaces should point to the outside. This is the case if the node sequence of a surface is clockwise when viewed from the outside.
The **hidden backfaces** view shows only those surfaces pointing away from the room/solid volume to the outside to identify proper sequence.

Surface selection is accomplished by moving the crosshair cursor into and clicking on the surface and confirmed by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key. Since several surfaces may often be superimposed it may be necessary to click thru to select the appropriate one.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Erase surface

This function is available in the EDIT submenu of the layers ROOM and AUXILIARY DRAWING. It deletes the selected surface.

This may be necessary to remove an end face from a 180° **rotation solid** or an **extrusion solid** if further surfaces are to be added.

Surface selection is accomplished by moving the crosshairs cursor into and clicking on the surface and confirmed by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key. Since several surfaces may often be superimposed it may be necessary to click thru to select the appropriate one.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Split surface

This function is available in the EDIT submenu of the layers ROOM and AUXILIARY DRAWING. It divides the selected surface.

This may be necessary to model doors, windows or balconies into the outside surfaces of an **extrusion solid**.

Surface selection is accomplished by moving the crosshairs cursor into and clicking on the surface and confirmed by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key. Since several surfaces may often be superimposed it may be necessary to click thru to select the appropriate one.

After selection a dividing line must be drawn across the surface. Select one of the orthogonal views XY, YZ or XZ. Both dimensions of the selected view and its two-dimensional intersections with the surface borders are taken into account, the third dimension of these is automatically calculated.

Enter the initial and final points of the dividing line. Both points should at least be on the surface borders. Due to the computers limited resolution of the numerical range it is advisable to select points outside the surface to correctly calculate the nodes intersecting the border lines.

The selected surface is now split into two separate surfaces with common borders. Their sequence is automatically generated from that of the previous single surface.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Generate listening areas across surfaces

This function is available in the LISTENING AREAS menu. It generates listening areas semi-automatically.

First, enter the desired height across the surfaces in the superimposed dialog window.
*Note: Typical height is 1.2 m for seated and 1.6 m for standing audiences.*

Next, select the surfaces on which listening areas are to be generated. To generate all listening areas with a common height in a single function ULYSSES remains in query mode until you strike the ESC or ENTER keys or click on the OK or CANCEL buttons in the lower control panel.

- see also
Search cursor functions

## Generate rotation solids

This function is available in the EDIT submenu of the layers ROOM and AUXILIARY DRAWING. It generates
a) rotation arrangements of surfaces from line drawings
and / or
b) rotation solids surrounded by surfaces.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

Since rotation can only be accomplished in the XY, YZ or XZ views select one of the orthogonal planes.

Enter the rotation axis pole by crosshair cursor position or absolute coordinate input. Strike the A key for absolute coordinate input. The viewing axis of the current plane is automatically chosen as axis (Z axis for XY plane, X axis for YZ plane and Y axis for XZ plane the 3D view is inoperative for rotating).

Enter the rotation angle and the number of segments to be generated within this angle next in the superimposed dialog.

The selected object is rotated around the chosen axis by the angle entered.

If the original object is a closed surface and the rotation angle is 360° the rotation solid is furnished with end faces.

The sequence of all surfaces of the solid generated is automatically corrected to their normal vectors pointing outside to obtain a positive volume.

*Example: To convert a rectangle in the XZ plane into a torus with a Z axis select the rectangle and confirm. Change to the XY plane. Click on any node of the imaginary prolonged side line of the rectangle.*

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Generate extrusion solids

This function is available in the EDIT submenu of the layers ROOM and AUXILIARY DRAWING. It generates solids surrounded by surfaces.

The surface corners are copied into a 3D room by a chosen offset, the surface is mirrored across the offset distance. Connecting surfaces are then generated between mirror and original. The sequence of all surface borders is automatically corrected to their normal vectors pointing outside to obtain a positive volume.

Object selection is accomplished by the cursor window and confirmed by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

Enter the extrusion base before entering the extrusion offset.
Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

*Example: To convert a rectangle in the XY plane into a 5 m high parallelotope select the rectangle and*

*confirm. Enter any point as base point. Strike the R key for relative coordinate input. Enter 5 in the Z panel of the superimposed window. Z offset is calculated relative to the base point. A parallelotope of 5 m height is generated from the selected base rectangle.*

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Split solids

This function is available in the EDIT submenu of the layers ROOM and AUXILIARY DRAWING. It divides a solid into its enveloping surfaces without relocating them as in an exploded view. All enveloping surfaces that constitute the solid and their borders may now be addressed, selected as object and changed separately.

Select the object with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

## Merge solids

This function is available in the EDIT submenu of the layers ROOM and AUXILIARY DRAWING. It assigns several isolated surfaces to a common object without relocating them and combines them to a solid with enveloping surfaces. All surface nodes with a distance of 1mm are combined.

Select the object with the cursor window and confirmed by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

## Assign material

This function is available in the ROOM menu and assigns absorber material to surfaces.

First, select the desired material from the material list, then select all surfaces to be fitted with the material with the search cursor.

To assign a common absorber material may be to all listening areas with a single function ULYSSES remains in query mode until you strike the ESC or enter key or click on the OK or CANCEL button in the lower control panel.

- see also

Surface list
Object selection

## Surface list

This is available in the ROOM menu.
The superimposed list window shows surface details such as content in m² and absorber material assigned. It allows changing the material and printing the list.

Any surface selected from the list is marked by a broken red line in the drawing for clear allocation. The list window may be relocated on the screen to avoid concealing.
The dialog window zoom in/zoom out button fades in and out additional functions and information.

By enlarging the dialog window both surface and total room absorption values can be accessed and the selected surface or complete project material can be replaced by another from the superimposed list window.

All transparent sreen parameters remain accessible while the dialog window is open. You may change the viewplane anytime to closely inspect possible concealed drawing details.

*Note: Both replace functions are powerful commands. They may not be canceled by a dialog window command. This is only possible via PROCESS - REVERSE in the menu which deletes all previous changes in the list dialog, however. It is recommended to make replacements step by step and examine results for RT60 etc. in between.*

- see also
Select absorber material file
Assign material

## Select material database

This function is available in the ROOM menu and selects an absorber database for further use in your project from a standard file selection dialog.

*Note: you can change the absorber database any time within a project. ULYSSES permanently maintains two databases: the project database and the absorber database currently selected. The former remains unchanged even if a newly selected absorber database contains identically named material as the project database., i.e. there is no data exchange when changing absorber databases.*
*Material replacement must be forced by an appropriate edit command. For reasons of data consistency a material of the same name is not replaced in this case. To force exchange*
1. *replace the respective material by a differently named material that is not used in the project and*
2. *replace the newly entered material by the one to be actually used.*

- see also
Surface list
Assign material

## Undo

This command cancels the previous editing step.

## Copy to clipboard

This command copies the current program view to the clipboard.

## Aim loudspeaker on target

This function aims one or several loudspeakers axially at a target within the room.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

Next enter the desired target node by the crosshair cursor position or by striking the A key for absolute coordinate entry.

## Aim loudspeaker by central perspective

This function aims one or several loudspeakers by central perspective. Your viewing position is from the loudspeaker center along its axis into the room. The viewing window size is approximately +/-45° off axis horizontally. This mode displays the 3dB (GREEN), -6dB (ORANGE) and -9dB (RED) isobar contours of the loudspeakers directivity within the window if possible.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

All speakers selected are shown in succession in the central perspective window. Striking the left / right and up / down cursor keys respectively aims each loudspeaker horizontally and vertically. Both angles can also be adjusted by the horizontal and vertical scrollbars of the window.

To enter aim as adjusted confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Switch off

This function switches off loudspeakers selectively without the necessity of adjusting
their drive levels for each of the seven octave bands. Thus they respond as if their amps were switched off during calculations. If you later use the **switch on** function
these loudspeakers respond normally without the necessity of readjusting their drive levels.

Loudspeaker status display is GREEN for on" and BLACK for off".

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

## Switch on

This function switches on loudspeakers selectively without the necessity of readjusting their drive levels for each octave band and corresponds with the **switch off** function. They respond to the original adjustment during calculations

Loudspeaker status display is GREEN for on" and BLACK for off".

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

## Edit

This function provides an edit mask to modify all loudspeaker parameters. These are

- type
- placement
- horizontal, vertical and axial rotation angles
- delay time
- drive power ( 125Hz 8kHz)
- polarity

- on/off

Drive power is entered in the **EQ dialog**. It registers the maximum value for each octave band while current adjustment values are displayed in dB below full drive.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

A separate edit mask appears for each loudspeaker selected.

## Equalizer

Modeled on a graphic EQ this function allows the adjustment of loudspeaker drive levels for each of the seven octave bands.
The EQ dialog registers the maximum value for each octave band while current adjustment values are displayed in dB below full drive.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

If several loudspeakers have been selected the setting of their EQ parameters can be mapped, for individual adjustment separate EQ modules are provided for each loudspeaker. Select individual or mapped in the corresponding window.

The EQ module response is dependent on the selected mode:
**Individual mode**
the EQ functions in absolute scale, i.e.
maximum level (0dB) = maximum drive power of the individual loudspeaker. The fader position is correspondent to the current level / maximum level ratio.
**Mapped mode**
The EQ functions in relative scale, i.e.
maximum level (xx dB) = headroom of the selected group of loudspeakers. The fader position is correspondent to the current group headroom / possible group headroom ratio.

## Copy

This function copies loudspeakers to a selected location. The newly generated speakers retain all parameters (power, delay time, aim...) apart from their position.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel or the right mouse key or by striking the ENTER key.

Enter the relocating base point before entering the relocating offset point.

The copies of the selected objects will be relocated from base to offset point according to their 3D coordinate difference.

Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering the base point the loudspeaker copies can be relocated by mouse movement (interactive positioning).

A new set of copies is generated after each copy which can be relocated relative to the last offset point to conveniently create large arrays. Strike the ESC key, the ENTER key or click the right mouse key if all copies have been positioned.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Loudspeaker list

This command provides a dialog window including loudspeaker information and various manipulation functions.

It contains a list which can be scrolled thru. A loudspeaker marked in the list is also marked in drawings. The window can be enlarged to provide additional information on single loudspeakers and configurations. The enlarged window contains to function buttons. REPLACE TYPE replaces the currently selected loudspeaker by another type and REPLACE ALL replaces all loudspeakers of the currently selected type. Especially the latter command is a very powerful one if e.g. the response of a 230 loudspeaker distributed system is to be tested with completely different types.

The dialog also enables printout of the complete loudspeaker list.

## New

Loudspeakers of a project can be copied, mirrored and edited infinitely. Sometimes, however, a new type must be added to be contained in the project. At this stage a loudspeaker database must be selected - see also select loudspeaker database.

First, placement must be determined. Place the loudspeaker by crosshair cursor position or strike the A key for absolute coordinate input.

Next, an edit window appears to adjust all loudspeaker parameters.

A 3D drawing of the new loudspeaker is automatically loaded and used for all loudspeakers of this type in the project if the database tree contains a drawing file (*.SCF). A specific symbol (mid-size 12” cabinet) is placed in the loudspeaker position if no drawing file is present.

## Select database

A loudspeaker database (*.USB) must be selected before assigning a loudspeaker to a project.

Select the desired database from the file selection mask.

*Note: for safety reasons and a clear arrangement it is recommendable to keep a separate directory for each manufacturers databases since specific 3D drawing files might exist for each loudspeaker in a database. In that case the drawing bears the database loudspeaker name with the extension .SCF. You can generate a drawing utilizing the USB (ULYSSES Speaker Builder) extension program and enter it in the appropriate database directory if the cabinet dimensions are known but no drawing is available. If all manufacturers databases are kept in the same directory identically named drawing files might be overwritten.*

*You can change the loudspeaker database any time within a project. ULYSSES permanently maintains two databases: the project database and the loudspeaker database currently selected. The former remains unchanged even if a newly selected loudspeaker database contains an identically named model as the project database., i.e. there is no data exchange when changing loudspeaker databases. Loudspeaker replacement must be forced by an appropriate edit command. For reasons of data consistency a loudspeaker of the same name is not replaced in this case. To force exchange*

1. *replace the respective loudspeaker by a differently named loudspeaker that is not used in the project and*
2. *replace the newly entered loudspeaker by the one to be actually used.*

## Mirror

This function mirrors loudspeakers along a chosen axis.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or by striking the ENTER key.

Since mirroring can only be accomplished in the XY, YZ or XZ views select one of the orthogonal planes.

Enter the initial and final points of the mirror axis.

Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering the base point the loudspeaker/s can be mirrored by mouse movement (interactive positioning).

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Move

This function relocates loudspeakers to a selected location.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or striking the ENTER key.

First enter the relocating base point, then the relocating offset point.

The selected loudspeaker/s is/are relocated from base to offset point according to their 3D coordinate difference.

Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering the base point the loudspeaker/s can relocated by mouse movement (interactive positioning).

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

## Set delay time

This command determines the delay time of selected loudspeakers.

Select the loudspeaker/s with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or striking the ENTER key.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

Delay time can be entered in milliseconds in a query window after selection. The new values are absolute and not added to previous values.

## Match delay time

This command automatically determines and matches the delay time of selected loudspeakers for

simultaneous signal arrival at a common target.

Select the loudspeakers with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or striking the ENTER key.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

Enter the target next by crosshair cursor position or strike the A key for absolute coordinate input.

The new values are absolute and not added to previous values.

## Calculate Cluster

This command unites selected loudspeakers to a single virtual loudspeaker. ULYSSES calculates its geometrical center from the geometrical centers of all loudspeakers selected and scans a sphere of 100 m radius around the new center in 5° steps.
Calculation generates complex SPL sum of all selected loudspeakers in the octave bands from 125 Hz to 8 kHz. Each octave band is calculated by the mean complex value of its three 1/3 octave frequencies.

Select the loudspeakers with the cursor window and confirm by clicking on the OK button in the lower control panel, the right mouse key or striking the ENTER key.

Strike the ESC key or click on the corresponding button in the lower control panel to CANCEL this function.

After calculation, the new virtual loudspeaker can be stored as a database file, consisting of a single record.You can comment this record.

*Note :*
*As this function uses the same data buffer as the SPL map calculator, any former data in this buffer will be overwritten. In this case, you cannot access the function SHOW LAST CALCULATION immediately after a cluster calculation. You will need to recalculate your SPL map instead.*

-> see also :
Display level / time calculation

## Settings, options

Coordinate snap – on / off
Coordinate snap – interval
Circle segments
Node snap – on / off
Node snap – distance
Grid size

Enter comment

## Options-coordinate snap on / off

Status can be set in the OPTIONS menu or by a transparent command clicking on the **K** button in the upper control panel or striking **F9**.

Coordinate snap determines the world intervals on which the cursor locks in.

It can be activated and deactivated without re-entering the coordinate snap interval.

## Options-coordinate snap intervals

The coordinate snap interval can be set in the OPTIONS menu or by a transparent command clicking on the **K** button in the upper control panel or striking **F9**.

Coordinate snap determines the world intervals on which the cursor locks in.

Enter **1** in the dialog window if 1 meter intervals are to be accessed by mouse movement, **0.01** for centimeters etc.

*Note: Setting intervals is not retroactive. If the XY view is selected after positioning the cursor on coordinates x : 15.300, y : 23.100, z : 10.721 in the XZ view and the interval is set at 0.5 the Z value (10.721) does not change. Only if the YZ or XZ view is selected next the cursor locks in on multiples of 0.5 (10.500, 11.000, 11.5000 etc.) when moving the mouse.*

## Options-circle segments

The resolution for drawing circles can be set in the OPTIONS menu.

Since circles can only be approximated in a 3D system because of the necessity for supporting nodes this determines the precision and number of steps within a range of 3 - 360. ULYSSES is preset at 36 steps.

At low resolution settings isosceles polygons can be generated. To generate a hexagon e.g.

1) set the number of segments at **6** and
2) enter the draw circle command. Pull up the hexagon to the desired dimensions.

*Note: Resetting circle segments is not retroactive. Setting the resolution at 10 after drawing a circle of 36*

*segments does not alter the number of segments (36) or that of any copies. Only circles drawn after resetting are divided into 10 steps.*

## Options-node snap on / off

Status can be set in the OPTIONS menu or by a transparent command clicking on the **P** button in the upper control panel or striking **F 11**.

When activated the nodes in a drawing attract the cursor like a magnet. This node snap is selective: if an edit or drawing function of the ROOM menu is activated the nodes of the room attract the cursor, if a function of the AUXILIARY DRAWING menu is activated nodes of the AUXILIARY DRAWING layer attract it only.

*Note: node snap is dependent on the current viewplane. The cursor locks in two-dimensionally in the orthogonal planes XY, YZ and XZ, e.g. X and Y if the XY view is activated since only these two dimensions can be manipulated.*
*Only if the 3D view is activated the cursor actually locks in three-dimensionally on all three world coordinates of the attracting node. Besides, this is the only possibility to position the cursor in the 3D view by mouse movement.*

The effective magnetism" distance (in pixels) can be set in the OPTIONS menu -node snap -distance

## Options-node snap distance

Distance can be set in the OPTIONS menu.

When activated the nodes in a drawing attract the cursor like a magnet. This node snap is selective: if an edit or drawing function of the ROOM menu is activated the nodes of the room attract the cursor, if a function of the AUXILIARY DRAWING menu is activated nodes of the AUXILIARY DRAWING layer attract it only.

The effective magnetism" distance is set **in pixels** by entering the desired number in the superimposed dialog window. ULYSSES is preset at 10 pixels.

*Note: node snap is dependent on the current viewplane. The cursor locks in two-dimensionally in the orthogonal planes XY, YZ and XZ, e.g. X and Y if the XY view is activated since only these two dimensions can be manipulated.*
*Only if the 3D view is activated the cursor actually locks in three-dimensionally on all three world coordinates of the attracting node. Besides, this is the only possibility to position the cursor in the 3D view by mouse movement.*

-see also
Node snap on/off

## Options-grid size

Grid size can be set in the OPTIONS menu.

A grid can be superimposed to better distinguish dimensions in all views. Grid size (in meters) is determined by entering the desired intervals in the dialog window, e.g. **5** for 5 meter grids and **2.3** for 2.3 meter grids. ULYSSES is preset at 1 meter grids.

Grid intensity is dependent on the setting selected in the VIEW menu.

-see also
Detail view

## Add comment

Comments can be entered on all situations with the exception of the RT60 and energy / time windows by clicking on the **Cmt** button in the upper control panel.

Comments are superimposed in the current window and included in printouts and copies to the clipboard. They are an effective guidance for creating extensive project documentations.

Comments remain activated until they are deleted, replaced or reset by the FILE -NEW function when clicking on the comment button again.

## Requirements

| detail | minimum requirements | recommended |
|---|---|---|
| processor | 80486DX | Intel Core I5, AMD Ryzen 5... |
| clock frequency | --- | the faster the better... (> 166 MHz for real time auralization) |
| operating system | Windows 95 | >= Windows 10/11 |
| RAM (Win 95) | 16 MB | = 1 GB |
| graphic card resolution | 640 x 480 | =Full HD |
| graphic card colors | 256 | = 65536 (HiColor) |
| input devices | mouse, trackball, digitizer | |

| | |
|---|---|
| soundcard | 16 Bit, 44.1 kHz (only required for auralization) |

*Note: ULYSSES does not necessarily require latest generation processors with up-to-date clock frequencies to calculate results in acceptable time. Also, 16GB RAM are not really required to just" calculate the response of a rectangular room with six surfaces and two loudspeakers...*
*To calculate the acoustics of a room modeled from 8357 surfaces and a 283 loudspeaker distributed sound system, however, slightly faster units (200+ MHz, 32 MB RAM) are recommended they are better for your physical (less coffee ...) and mental health...*

## Draw

Circle
Lines
Polygon
Rectangle
Text

## Lines

This function is accessible in the DRAWING submenus of the layers ROOM, LISTENING AREAS and AUXILIARY DRAWING and generates continuous lines that do not close.

The initial and final points of the line are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

To end the line drawing click on the OK button in the lower control panel, the right mouse key. or strike the ENTER key

To erase the drawing click on the CANCEL button in the lower control panel or strike the ESC key.

## Polygon

This function is accessible in the DRAWING submenus of the layers ROOM, LISTENING AREAS and AUXILIARY DRAWING and generates closed continuous lines.

The initial, corner and final points of the line are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

To end the line drawing click on the OK button in the lower control panel, the right mouse key. or strike the ENTER key

To erase the drawing click on the CANCEL button in the lower control panel or strike the ESC key.

## Circle

This function is accessible in the DRAWING submenus of the layers ROOM, LISTENING AREAS and AUXILIARY DRAWING and generates circles and isosceles polygons (surfaces with equal node distance of their borderlines).

The actual shape generated is always an isosceles polygon whose number of corners is preset in OPTIONS : circle segments. To emulate a circle resolution should be =36.

Enter the circle / polygon center before defining a radius point.

Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering its center the circle / polygon pulls up" when the cursor is moved by the mouse.

## Rectangle

This function is accessible in the DRAWING submenus of the layers ROOM, LISTENING AREAS and AUXILIARY DRAWING and generates rectangles.

After entering a corner point define the point located diagonally across.

Both points are entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

After entering its initial point the rectangle pulls up" when the cursor is moved by the mouse.

## Draw text

This function is accessible in the AUXILIARY DRAWING menu.

After entering the lower left starting point enter text size and text in the superimposed dialog.

The starting point is entered by crosshair cursor position or by absolute, relative or polar coordinate input. Strike the A key for absolute coordinate input, the R key for input relative to the previous point or the P key for polar input (angle and distance) relative to the last point.

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