

G. RT 60 MEASUREMENT OF THE REVERBERATION TIME

The RT 60 analysis mode is an optional function of the **SVAN 959** instrument, which provide reverberation time of the 1/3 octave bands (from 31.5 Hz to 10 kHz) and three total RMS levels (**A**, **C** and **Z** weighted). Whole measurement process and calculations implemented in the **SVAN 959** instrument fulfil the **ISO 3382** standard.

The reverberation time of the room can be obtained via the **SVAN 959** instrument by two measurements methods: **IMPULSE** (Impulse Response Method) or **DECAY** (Interrupted Noise Method). The selection of the method depends on type of the sound source utilized by the user. The **IMPULSE** method is designed for measurement utilizing the impulse sound source (like pistol shot, petard explosion), whereas the **DECAY** method is intended for measurements when room is excited by broad or narrow band sound noise source (usually pink noise). For more details about the measurement and calculation process see **Appendix H**.

The reverberation time analysis applied in the instrument consists of two parts:

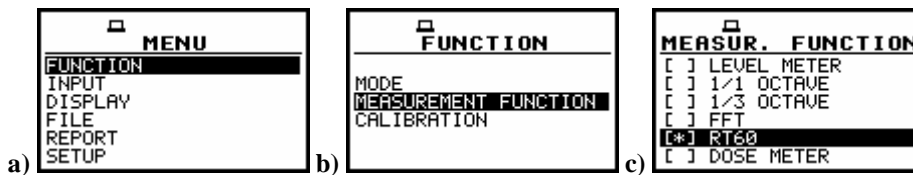
1. The measurement part in which the acoustic response of the room is registered.
2. The calculation part in which the reverberation time (**EDT**, **RT 20** and **RT 30**) is calculated for the measured room response.



Notice: It is recommended to familiarize with the **Appendix H** before proceeding. This chapter describes only the navigation of the instruments, whereas **Appendix H** depicts the definitions and description of the reverberation time measurement.

G.1 Selecting RT 60 mode

In order to select the **RT 60** analysis mode the user has to enter the **FUNCTION** list by pressing the **<Menu>** push-button, selecting by means of the **<▲>**, **<▼>** push-buttons the **FUNCTION** text and pressing the **<ENTER>**. Then, the user has to open the **MEASUREMENT FUNCTION** window (to select the **MEASUREMENT FUNCTION** text use the **<▲>**, **<▼>** push-buttons and press the **<ENTER>** one when this text is highlighted).



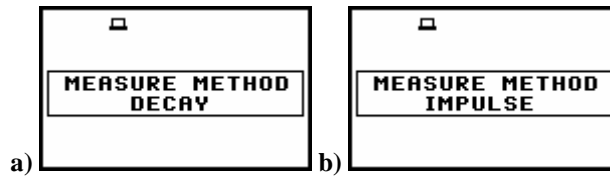
Main list with **FUNCTION** text selected (a), **FUNCTION** window opened with **MEASUREMENT FUNCTION** text selected (b), **RT 60** analysis mode selected in **MEASUREMENT FUNCTION** window (c)

To select the **RT 60** mode place the asterisk [*****] in the line with the **RT 60** text. The position of the character can be changed by the **<▲>**, **<▼>** and **<<>**, **<>>** push-buttons. After placing the asterisk in the line with the **RT 60** text the user has to press the **<ENTER>** push-button, which closes the **MEASUREMENT FUNCTION** window and confirms the selection. After pressing the **<ESC>** push-button the window is also closed but **all changes are ignored**.



Notice: It is not possible to change the mode during the measurement. The instrument displays in this case the text: **“measurement in progress / MEASUREMENT IN PROGRESS”** for about 2 seconds. **In order to change the mode the measurement must be stopped!**

When the **RT 60** mode is selected, in order to return to the data visualization display press the **<ESC>** push-button until one of the below views appear on the display:

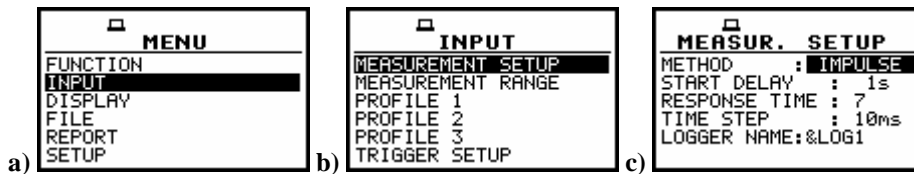


Displays present data visualization screen when no measurement was taken. Figure (a) when **DECAY** method is selected and (b) when **IMPULSE** method is selected

Each of the above displays indicates that the **RT 60** mode is selected. Depending on the currently selected method (*path: MENU / INPUT / MEASUREMENT SETUP*) screen (a) - **DECAY** or (b) - **IMPULSE** appears (the default is the **DECAY** method).

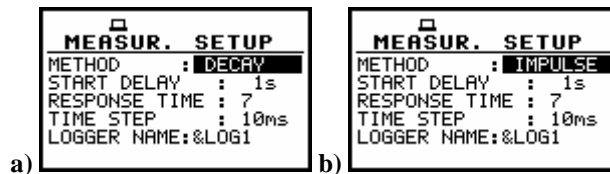
G.2 Selecting the method of RT 60 mode

In order to select the method of the **RT 60** mode the user has to enter the **INPUT** window by pressing the **<Menu>** push-button, selecting by means of the **<▲>**, **<▼>** push-buttons the **INPUT** text and pressing the **<ENTER>**. Then enter the **MEASUREMENT SETUP** in the same way.



Main list with **INPUT** text selected (a), **INPUT** window with **MEASUREMENT SETUP** text selected (b), **MEASUREMENT SETUP** window (c)

In the **MEASUREMENT SETUP** window the user selects the **RT 60** method by pressing **<◀>**, **<▶>** push-buttons.



MEASUREMENT SETUP window (a) – when **DECAY** method is selected, (b) – when **IMPULSE** method is selected

After selecting the desired method the user has to confirm the choice by means of the **<ENTER>** push-button, what closes the **MEASUREMENT SETUP** window. The **<ESC>** push-buttons also closes the **MEASUREMENT SETUP** window, but **all changes are ignored**. The default setting is the **DECAY** method.

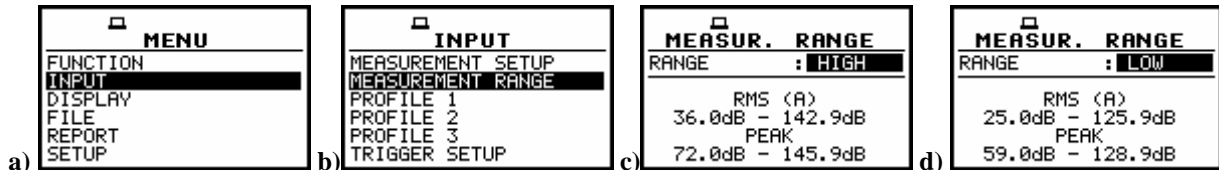
G.3 Setting measurement time, recording time and measurement range

The data recording options of the **RT 60** function are located in the **MEASUREMENT SETUP** window (*path: MENU / INPUT / MEASUREMENT SETUP*). By these options the user can set the total measurement time (**RESPONSE TIME**) and the time-step of the data recording (**TIME STEP**).

The view of the display with the **MEASUREMENT SETUP** window and the way to enter it is presented in the previous section. By pressing the **<▲>**, **<▼>** push-buttons the user can highlight the **RESPONSE TIME** and the **TIME STEP** text and then, by pressing **<◀>**, **<▶>** push-buttons, select the desired value of the parameters.

- **RESPONSE TIME** is used to set the recording time of the measurement data (sound pressure level decay curve). The data acquiring starts in the moment of the trigger condition appearance. The response time can be set in the range **1 ÷ 30 s** with **1 s** step (default **7 s**).
- **TIME STEP** is used to set the time-step of data registering (sound pressure level) in the logger. The parameter can be set to the value equal to **2, 5, 10, 20, 50, 100 ms** (default **10 ms**).

In the **RT60** mode, the instrument operates in **two ranges** – **HIGH** (36.0 dB – 142.9 dB) and **LOW** (25.0 dB – 125.9 dB).

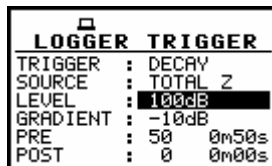


Main list with **INPUT** text selected (a), **INPUT** window with **MEASUREMENT RANGE** text highlighted (b), **MEASUREMENT RANGE** window when the range is set to **HIGH** (c), **MEASUREMENT RANGE** window when the range is set to **LOW** (d)

G.4 Trigger configuration of RT 60 mode

G.4.1 DECAy method

The **TRIGGER SETUP** window for the **DECAy** method (for more details about method selections see section G.2) is **only for indicating purpose** (the user cannot select anything) that the measurement will start when the total sound level value decreases by **10 dB** (*path: MENU / INPUT / TRIGGER SETUP*). To close the window press **<ENTER>** or **<ESC>** push-buttons.

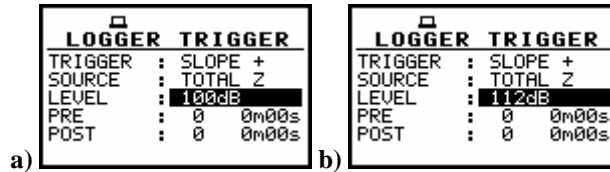


LOGGER TRIGGER window for **DECAy** method

G.4.2 IMPULSE method

In the **IMPULSE** method (for more details about the selecting method see section G.2) the trigger condition appears when the **TOTAL** sound pressure level exceeds the defined by the user threshold **LEVEL** value.

The **TRIGGER SETUP** window (*path: MENU / INPUT / TRIGGER SETUP*) for the **IMPULSE** method allows the user only to set the **LEVEL** value by pressing the **<◀>**, **<▶>** push-buttons. By holding the **<SHIFT>** and pressing the **<◀>**, **<▶>** push-buttons the change of the level value is accelerated. To close window and confirm the changes press the **<ENTER>** push-button or press the **<ESC>** push-button to close and ignore the changes. The parameter can be set in the range **24 ÷ 136 dB** with **1 dB** step (**100 dB** default value).



LOGGER TRIGGER window for IMPULSE method, LEVEL selection



Notice: For more details about the trigger conditions appearance see **Appendix H**.

G.5 Setting the auxiliary parameters of RT 60 mode


The user can influence on the results of the reverberation time calculation by setting the sound pressure level decay curve averaging (**SMOOTHING**) and requesting additional margin value to the background noise level (**NOISE MAR.**). In order to select the **RT 60 OPTIONS** the user has to enter the **SETUP** window by pressing the **<Menu>** push-button, selecting by means of the **<▲>**, **<▼>** push-buttons the **SETUP** text and pressing the **<ENTER>** and then enter the **RT 60 OPTIONS** in the same way.



Main list with **SETUP** text selected (a), **SETUP** window with **RT 60 OPTIONS** text highlighted (b), **RT 60 OPTIONS** window (c)

By pressing the **<▲>**, **<▼>** push-buttons the user switches the highlighting between the **SMOOTHING** and the **NOISE MAR.** text and then by pressing the **<<<>**, **<>>>** push-buttons the user changes to desired value of the parameters.

- **SMOOTHING** is used to set the number of samples which are taken to averaging process of the sound pressure level decay curve. **Notice: this parameter influences the reverberation time results.** The parameter can be set in the range **0 ÷ 15** with **1** sample step (default **3** samples).
- **NOISE MAR.** is used to set the value which demands the additional margin value to the calculated noise level (for more detail see **Appendix H**). This parameter can be set in the range **0 ÷ 20 dB** with **0.1 dB** step (default **10 dB**).



Notice: The noise merging is required to be set to 10 dB (or greater value) if the measurement have to fulfilled the **ISO 3382** standard requirements.

G.6 Setting the results display mode

Each of the results display levels can be suited to user needs. The options of the levels visualization are located in the **RT 60 RESULTS** window (*path: MENU / SETUP / RT 60 RESULTS*) and additional options for level **3** in the **DISPLAY MODES** window (*path: MENU / DISPLAY / DISPLAY MODES*). For more details about the visualization levels see section G.10.

By utilizing the **RT 60 RESULTS** window the user selects which reverberation time results (**EDT**, **RT 20** or **RT 30**) to which 1/3 octave bands will be presented in the visualization levels. In order to select the **RT 60 RESULTS** window the user has to enter the **SETUP** window by pressing the **<Menu>** push-button, selecting by means of the **<▲>**, **<▼>** push-buttons the **SETUP** text and pressing the **<ENTER>** one and then enter the **RT 60 RESULTS** in the same way.



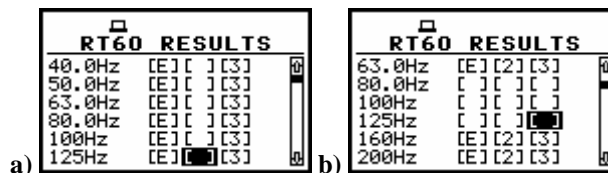
Main list with **SETUP** text selected (a), **SETUP** window with **RT 60 RESULTS** text highlighted (b), **RT60 RESULTS** window (c)

By marking ([E], [2], [3]) or unmarking ([], [], []) the options, the user can set to each 1/3 octave band which of the reverberation time results will be presented in the visualization levels:

- **[E]** (EDT) - the **EDT** reverberation time is marked,
- **[2]** (RT 20) - the **RT 20** reverberation time is marked,
- **[3]** (RT 30) - the **RT 30** reverberation time is marked.

By pressing the **<▲>**, **<▼>**, **<◀>**, **<▶>** push-buttons the user can highlight the one of three options **[E]**, **[2]**, **[3]** to each 1/3 octave band. For faster scroll between the rows press the **<Shift>** push-button and while holding it, press the **<▲>**, **<▼>** ones. To mark or unmark the desired options, first highlight it and then, while holding the **<Shift>** push-button, press one of the **<◀>**, **<▶>** push-buttons to mark or unmark.

Notice: For more details about obtaining the **EDT**, **RT 20** and **RT 30** reverberation time see **Appendix H**.

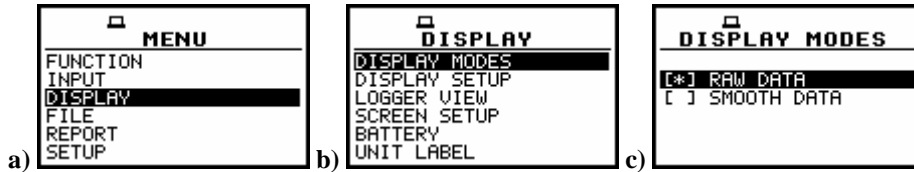


Displays in **RT 60 RESULTS** window; the (a) figure presents the case when for 40, 50, 63, 80, 100 and 125 Hz 1/3 octave bands the **EDT** and **RT 30** reverberation time are marked; the (b) figure illustrates situation when for 63, 80, 160 and 200 Hz 1/3 octave bands the **EDT**, **RT 20** and **RT 30** reverberation time are marked

By **DISPLAY MODES** window the user can select which data (the sound pressure level versus time decay curve) are plotted in visualization level **3** (more details about visualization levels in G.10). The user can chose between: raw data, smooth data or integrated data (impulse method only).

G.6.1 DECAY method

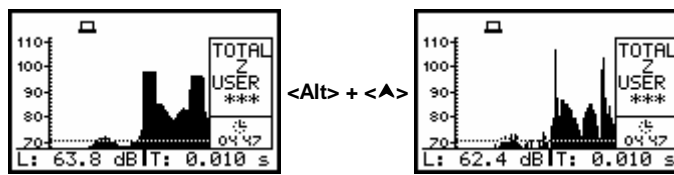
In order to select the **DISPLAY MODES** the user has to enter the **DISPLAY** window by pressing the **<Menu>** push-button, selecting by means of the **<▲>**, **<▼>** push-buttons the **DISPLAY** text and pressing the **<ENTER>** one and then enter the **DISPLAY MODES** in the same way.



Main list with **DISPLAY** text selected (a), **DISPLAY** window with **DISPLAY MODES** text highlighted (b), **DISPLAY MODES** window (c)

By pressing the **<▲>**, **<▼>** push-buttons the user can select between the **RAW DATA** and **SMOOTH DATA** by placing the asterisk [*] in the proper line and then press the **<ENTER>** push-button to close the window and confirm the selection. The **<ESC>** push-buttons also closes the **DISPLAY MODES** window, **but the selection is ignored**. The smooth data is the default setting.

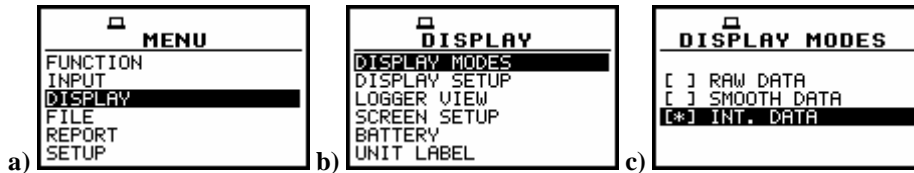
It is also possible to switch between presented data (**SMOOTH DATA**, **RAW DATA**) by pressing **<Alt> + <▲>** push-buttons.



Change of the available data presentation modes by pressing **<Alt>+<▲>**

G.6.2 IMPULSE method

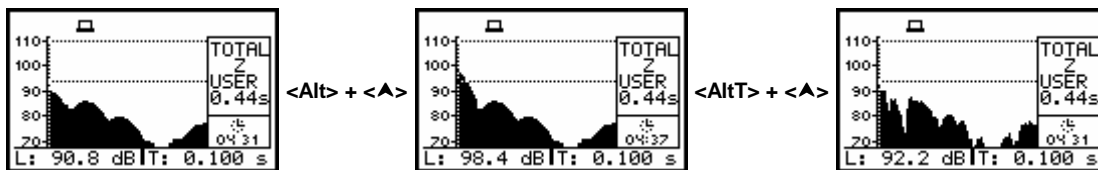
In order to select the **DISPLAY MODES** the user has to enter the **DISPLAY** window (*path: MENU / DISPLAY / DISPLAY MODES*) like it is explained in the section G.6.1 for the decay method.



Main list with **DISPLAY** text selected (a), **DISPLAY** window with **DISPLAY MODES** text highlighted (b), **DISPLAY MODES** window (c)

By pressing the **<▲>**, **<▼>** push-buttons the user can select between the **RAW DATA**, **SMOOTH DATA** and **INT. DATA** by placing the asterisk [*] in the proper line and then press the **<ENTER>** push-button to close the window and confirm selection. The **<ESC>** push-buttons also closes the **DISPLAY MODES** window, **but the selection is ignored**. The integrated data is the default setting.

It is also possible to switch between presented data (**SMOOTH DATA**, **INT. DATA**, **RAW DATA**) by pressing **<Alt> + <▲>** push-buttons.



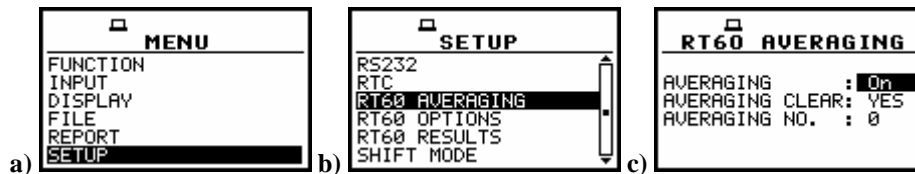
Change of the available data presentation modes by pressing **<Alt>+<▲>**



Notice: For more details about **RAW DATA**, **SMOOTH DATA** and **INTEGRATED DATA** see **Appendix H**.

G.7 The RT 60 results averaging function

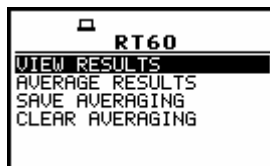
The **RT 60** mode allows the user to average the reverberation time results from several measurements. To enable averaging the user needs to enter the **SETUP** list by pressing the **<Menu>** push-button, selecting by means of the **<▲>**, **<▼>** push-buttons the **SETUP** text and pressing the **<ENTER>** one and then enter the **RT 60 AVERAGING** in the same way.



Main list with **SETUP** text selected (a), **SETUP** window with **RT 60 AVERAGING** text highlighted (b), **RT 60 AVERAGING** window (c)

By pressing the **<▲>**, **<▼>** push-buttons the user can highlight the **AVERAGE RESULTS** and **CLEAR AVERAGING** options and then by pressing the **<<>**, **<>>** push-buttons set **On** text in line with **AVERAG.** word and press the **<ENTER>** push-buttons to confirm. The **<ESC>** push-button returns to the previous menu but **all selections are ignored**.

- **AVERAGING** is used to switch **On** and **Off** the averaging process of the reverberation time results. When this option is **On** the additional visualization level **0** appears on the display after each measurement:



Display in the visualization level **0**

If this option is **Off** then after taking the measurement the visualization level **1** appears on the display (for more details about the visualization see section G.10). The default setting is **On**.

- **AVERAGING CLEAR** resets the averaging process. The whole averaged results are lost if not saved. By pressing the **<<>**, **<>>** push-buttons the **Yes** or **No** text can be set in line. If selection is **YES** the reset will be done after closing the window by pressing the **<ENTER>** push-button (the **<ESC>** push button closes list without clearing averaged results).
- **AVERAGING NO.** (averaging number) is only for indicating purpose. It shows how many measurements were taken to the averaging process calculation.

G.8 Taking measurements by DECAY method

Reverberation time measurement process (**DECAY** method) in steps:

- First the user has to select the **RT 60** mode (more details in section G.1) with the **DECAY** method (more details in section G.2).

- Optionally, the user can configure the options to this method or performs the measurement with the default settings.

Default settings:

- **RESPONSE TIME = 7 s** – section G.3
- **TIME STEP = 10 ms** – section G.3
- **MEASUREMENT RANGE – HIGH** – section G.3
- **SMOOTHING = 3 samples** – section G.5
- **NOISE MAR. = 10 dB** – section G.5
- **AVERAG.: - On** – section G.7



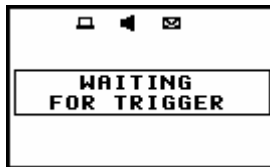
Notice: The default measurement time of the decay curve registering (**RESPONSE TIME**) is 7 seconds. It can be insufficient in some applications. It is recommended to set this value to be at least two times longer than expected reverberation time. For details see section G.3 and **Appendix H**.

- Place the sound power source in the measured room (for the sound power source location - see the reverberation time measurement ISO standard).
- Place the microphone in one of the selected measurement points (for the measurement points location see the reverberation time measurement ISO standard).
- Switch on the sound power source.



Notice: It is necessary to switch on the sound source before starting the measurement because of the trigger requirements (for more details see **Appendix H**). If there is need to start the instrument before switching on the sound source it is recommended to use the **DELAY** option (path: MENU / INPUT / MEASUREMENT SETUP / DELAY) to handle this needs.

- Start the measurement process in the **SVAN 959** instrument by pressing the **<Start/Stop>** push-button. The display indicating that the instrument is waiting for the trigger condition fulfilment appears on the instrument.



Display when the instrument is waiting for the trigger conditions fulfilment



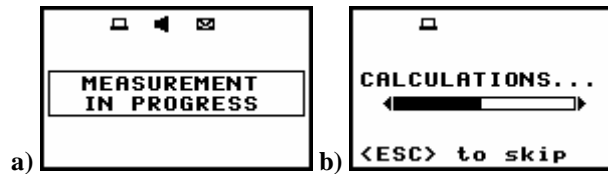
Notice: For more details about the trigger conditions fulfilment see **Appendix H**.

- Switch off the sound power source (the source should work enough long to obtain the acoustic field stabilization). After the trigger condition fulfilment the instrument starts to collect data.



Notice: During the data collections in the investigated room all other sources of sound should be suppressed to not affect the measurements.

- After the data recording process ends, the instrument starts the calculation of the reverberation time results.



Displays when the instrument: (a) is collecting data, (b) is calculating the reverberation time

To break the data recording process press the **<Start/Stop>** push-button, whereas to break the calculation process press the **<ESC>** push-button.

- When the averaging process is enabled the visualization screen of level 0 appears on the display. The user can view the results (**VIEW RESULTS**), if they are acceptable, include them to the averaging process by the **AVERAG RES.** function in level 0. Then proceed with the next measurements which could be averaged with the previous results (for more details about averaging process see section G.10 level 0). To save averaged results enter the **SAVE AVERAG.** window (level 0). To save last (current) measurement results enter the **SAVE** window (path: MENU / FILE / SAVE) or utilize the **AUTO SAVE** options (path: MENU / FILE / SAVE OPTIONS).
- If the averaging process is disabled the visualization display of level 1 appears on the display (for details about results visualization see section G.10). To save results enter the **SAVE** window (path: MENU / FILE / SAVE) or utilize the **AUTO SAVE** options (path: MENU / FILE / SAVE OPTIONS).

G.9 Taking measurements by IMPULSE methods

Reverberation time measurement process (**IMPULSE** method) in steps:

- First the user has to select the **RT 60** mode (more details in section G.1) with the **IMPULSE** method (more details in section G.2).
- Optionally, the user can configure the options to this method or perform measurements with the default setup.

Default settings:

- **RESPONSE TIME = 7 s** – section G.3
- **TIME STEP = 10 ms** – section G.3
- **MEASUREMENT RANGE – HIGH** – section G.3
- **SMOOTHING = 3 samples** – section G.5
- **NOISE MAR. = 10 dB** – section G.5
- **AVERAG.: - On** – section G.7
- **TRIGGER LEVEL = 100 dB** – section G.4.2



Notice: The default measurement time of the decay curve registering (**RESPONSE TIME**) is 7 seconds. It can be insufficient in some application. It is recommended to set this value to be at least two times longer than expected reverberation time. For details see section G.3 and **Appendix H**.



Notice: The proper value of the sound level trigger threshold should be set well above the background noise and significantly below the maximum sound level emitted by the impulse source.

- Place the microphone in one of the selected measurement points (for the measurement points location see reverberation time measurement ISO standard).

- Start the measurement process in the **SVAN 959** instrument by pressing the **<Start/Stop>** push-button. The display indicating that the instrument is waiting for the trigger condition fulfilment appears on the instrument.



Displays when the instrument is waiting for the trigger conditions fulfilment



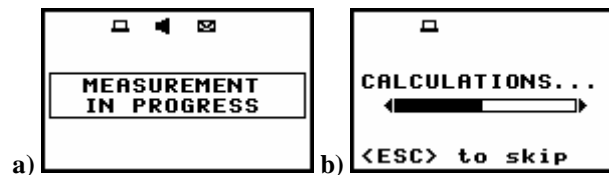
Notice: For more details about the trigger conditions fulfilment see **Appendix H**.

- Fire the impulse sound power source. If the trigger condition are fulfilled the instrument starts to collect data.



Notice: During the data collections in the investigated room all other sources of sound should be suppressed to not affect the measurements.

- After the data recording process ends, the instrument starts the calculation of the reverberation time results.



Displays when the instrument: (a) is collecting data, (b) is calculating the reverberation time

To break the data recording process press the **<Start/Stop>** push-button, whereas to break the calculation process press the **<ESC>** one.

- When the averaging process is enabled the visualization screen of level **0** appears on the display. The user can view the results (**VIEW RESULTS**), if they are acceptable, include them to the averaging process by the **AVERAGE RESULTS** function in level **0**. Then proceed with the next measurements which could be averaged with the previous results (for more details about averaging process see section G.10 level **0**). To save averaged results enter the **SAVE AVERAGING** window (level **0**). To save last (current) measurement results enter the **SAVE** window (*path: MENU / FILE / SAVE*) or utilize the **AUTO SAVE** options (*path: MENU / FILE / SAVE OPTIONS*).
- If the averaging process is disabled the visualization display of level **1** appears on the display (for details about results visualization see section G.10). To save results enter the **SAVE** window (*path: MENU / FILE / SAVE*) or utilize the **AUTO SAVE** options (*path: MENU / FILE / SAVE OPTIONS*).

G.10 Visualization of the RT 60 measurements results

The reverberation time measurement results can be viewed on the instrument display by advanced system of the visualization screens. The results presentation is divided into three levels (1/3 octave bands plot, text and decay curve plot).

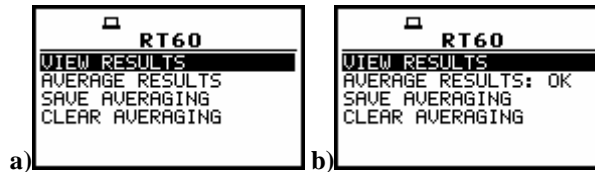


Notice: The third visualization level (level 3) give possibility to calculate the user defined (RT USER) reverberation time. More details in the next part of this section.

The navigation and detailed capabilities of each of the level is described below:

➤ LEVEL 0 (optional)

The level 0 is an optional level and this dialog display appears only when the **averaging function** is enabled (for more details about averaging see sections G.7 and G.10) and this display appears after the end of each measurement.

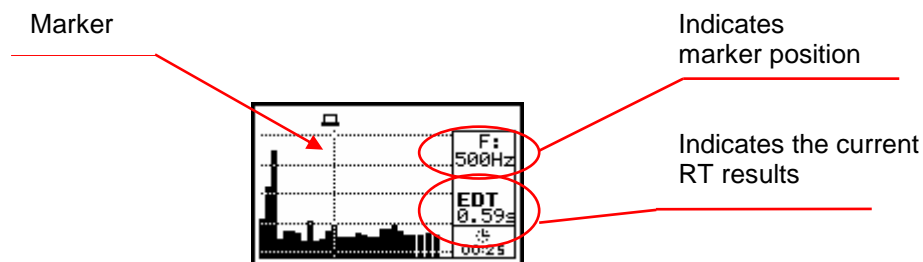


Display (when averaging function is enabled) after the measurement end; (a) display presents the default situation whereas (b) after setting the last result to averaging process

By pressing the <▲>, <▼> push-buttons the user highlights the desired options and by means of the <ENTER> push-buttons enters or activates each of the options detailed below.


- **VIEW RESULTS** – By pressing the <ENTER> push button when this text is highlighted the user enters to level 1 of the visualization system to the graphical view (bar graph) of reverberation time results (for more details of level 1 see next point of this section).
- **AVERAGE RESULTS** – By pressing the <ENTER> push-button on this text the user activates the selection of the current reverberation time result (last measurement) to be included to averaging process. The current results are averaged with the results previously averaged or the results prepared to average with the upcoming results (the results which would be obtained in the next measurements).
- **SAVE AVERAGING** (Save averaged result) – By pressing the <ENTER> push-button the user can save averaged result (only the values after the last averaging process). This option is available (the text can be highlighted) only when the averaging process was performed (what is indicated by appearing the **OK** text in the end of the line **AVERAGE RESULTS:** - see picture (b) above).
- **CLEAR AVERAGING** (Clear averaging process) – By pressing the <ENTER> push-buttons on this text and confirming the clearing in appearing dialog box, the user starts the new averaging process (all data obtained in averaging process will be lost if they were not saved by the **SAVE AVERAGING** function).

➤ LEVEL 1



Display in level 1 with the legend

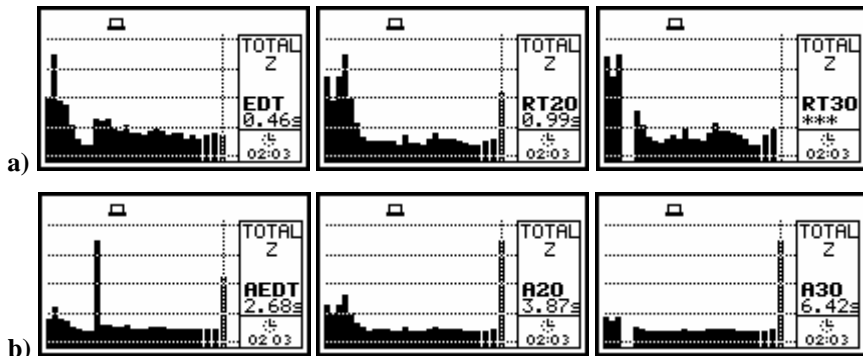
The level 1 view appears on the display after the measurement end when the averaging process is disabled, or when the user enters to this level from level 0. The default view of this display is presented in the table “DEFAULT SCREEN” column “level 1” row. The legend is shown below.



Notice: If in the RT indicator field appear “* * *” that means that for this 1/3 octave band with the selected parameters (**NOISE MARGIN**) the required measurement conditions were not fulfilled to obtain the results (for more details see section G.3 and **Appendix H**).

The navigation keys:

- <ENTER> push-button – Enter upper level 2, where on the display three (EDT, RT 20 and RT 30) RT 60 results are presented for the current marker position in level 1.
- <ESC> push-button – Return to lower level 0 (if the averaging process is enabled).
- <▲>, <▼> push-buttons – switch the data presented on the bar graph. Explicitly between the reverberation time results obtained by the different definitions of the RT 60: EDT, RT 20 and RT 30 (for more detail about that see **Appendix H**). If the averaging process is enabled the averaged data of the RT 60 function are also available to view AEDT (averaged EDT), A 20 (averaged RT 20) and A 30 (averaged RT 30). The all possibilities are presented below:

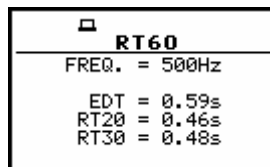


Displays in level 1: (a) current measurement results (b) averaged results

- <<>, <>> push-buttons – Move the marker in the left and right direction on the bar graph. The current position of the marker and the reverberation time at its position is indicated in the right region of the display (see figure above – the indicating positions).

➤ **LEVEL 2**

The display of level 2 visualization system presents three reverberation time results (EDT, RT 20, RT 30) for the 1/3 octave band (or total level) pointed by the marker on the level 1.



Display in level 2

The navigation keys:

- <ENTER> push-button – Enter upper level 3, where on the display the decay curve for current 1/3 octave band (or total level) is presented.


- **<ESC>** push-button – Return to lower level 1. The marker position at level 1 will be set to the currently presented 1/3 octave band (or total level) in level 2.
- **<▲>**, **<▼>** push-buttons – scroll up and down the presented 1/3 octave bands (or total level) reverberation time results (for more details see the table).

➤ **LEVEL 3**

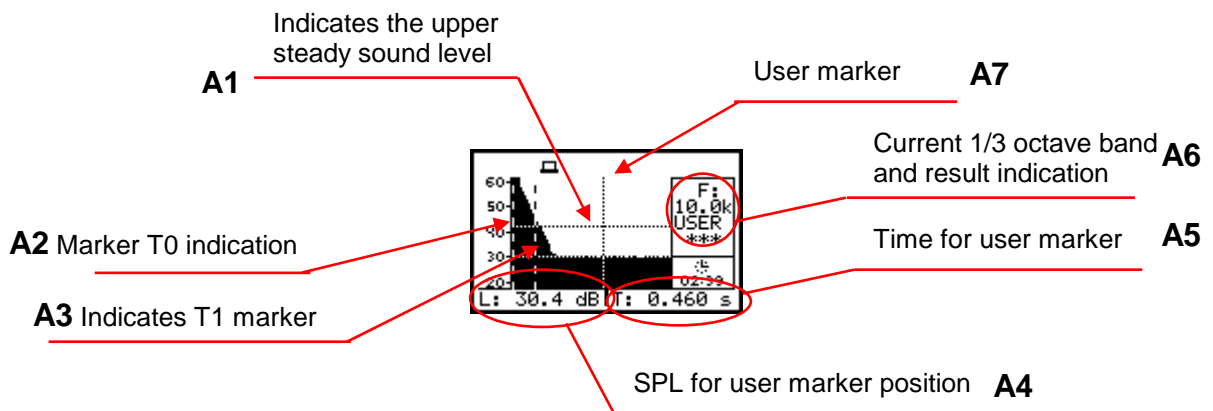
The level 3 is the highest level of the results visualization system. At this level the display presents the plot in which the decay curve of the sound pressure level versus time is illustrated. The graph is plotted for current 1/3 octave band or (total level) which was indicated in the previous level 2. This level allows calculating the user reverberation time by placing the marker **A5** on the decay curve. The display view and the description of it are shown in the picture below.

The legend for the figure below:

- **A1** – This horizontal dotted line indicates the calculated steady sound level value. In the crossing point of this line with the decay curve, the marker T0 (**A3**) is placed. This marker is used as a starting point to all three (and the **RT USER**) reverberation time calculations (for more details see **Appendix H**).
- **A2** – This line indicates the T0 marker position. This marker is used as a starting point to all three (and the **RT USER** also) reverberation time calculations (for more details see **Appendix H**).
- **A3** – This line indicates the T1 marker position. On the display this marker position is labelled (indicator **A7**) as **EDT**, **RT 20** or **RT 30** according to which the most restricted definition of the RT condition is fulfilled (for more details see **Appendix H**).
- **A4** – This field shows the **SPL** (sound pressure level) in the current marker (**A5**) position.
- **A5** – This field denotes the current user marker position and shows label of the marker (when the user marker current position is the same as T0 marker or T1 marker the upper line indicates it).
- **A6** – Text placed in this field indicates which 1/3 octave band (or total level) decay curve is plotted on the display.
- **A7** – This vertical dotted line indicates the user marker position. By placing this marker the user can calculate the own reverberation time indicated as the **RT USER** (for more details see **Appendix H**)



Notice: The data to plot the graph of the decay curve can be selected between **RAW DATA**, **SMOOTH DATA** or **INT. DATA** (for more details see section G.6).



Display in level 3 with the legend

The navigation keys:

- **<ESC>** push-button – Return to the lower level **2** keeping the current 1/3 octave band (or total levels) position.
- **<▲>**, **<▼>** push-buttons – Switch the data presented on the graph between 1/3 octave bands (or total levels), the **A6** indicates currently plotted data.
- **<Shift> + <▲>** push-buttons – Scroll the decay curve graph in up vertical directions.
- **<Shift> + <▼>** push-buttons – Scroll the decay curve graph in down vertical directions.
- **<◀>**, **<▶>** push-buttons – Move the marker in horizontal directions (left / right) and also scroll the decay curve plot in the horizontal direction if the user tries to move the marker outside the visible area of the display. By holding the **<Shift>** push-button the move of the marker is accelerated.
- **<ESC>** push-button – Enter to the level **2** and level **2'** and calculate the user reverberation time for current marker position.

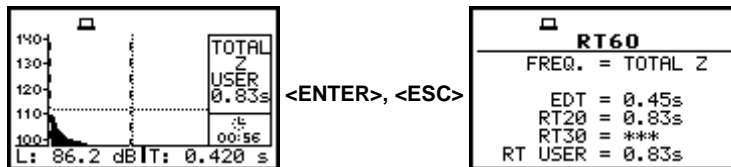
Procedure of obtaining RT USER (user reverberation time) in steps:

- Select the 1/3 octave band or one of the total levels, for user reverberation time calculation process.
- Set position of the marker for reverberation time calculation.



Notice: The marker has to be located on the right side of the T0 marker (**A2**) but not in the noise background region (for more details about the reverberation time calculation see Appendix H).

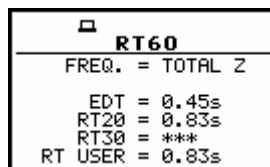
- When the marker position is located press the **<ENTER>** to confirm, then **<ESC>** push-button.
- The view of level **2'** with the calculated user reverberation time (**RT USER** at the bottom) will appear on the display. The exemplary display is presented below.



Display after user reverberation time (RT USER) calculation – level **2'**

➤ **LEVEL 2'**

The level **2'** is in principle the same as the mentioned above level **2** but it is extended of the user reverberation time value presented at the bottom of the display. Therefore the navigation of all keys and functionality is the same as in level **2**.



Display in level **2'**