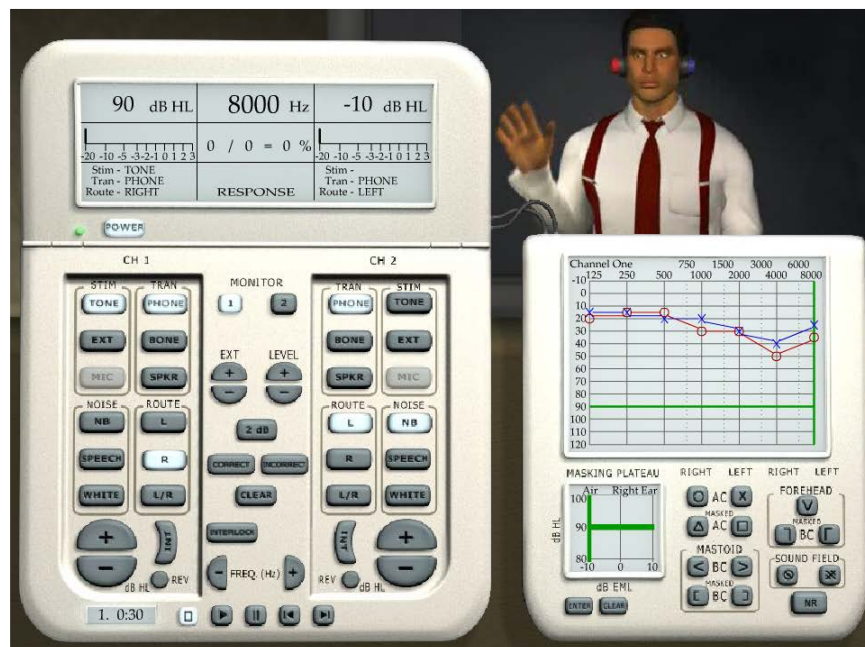


Virtual Audiometric Suite



Student Version



Virtual Audiometric Suite 2013
Instruction Manual

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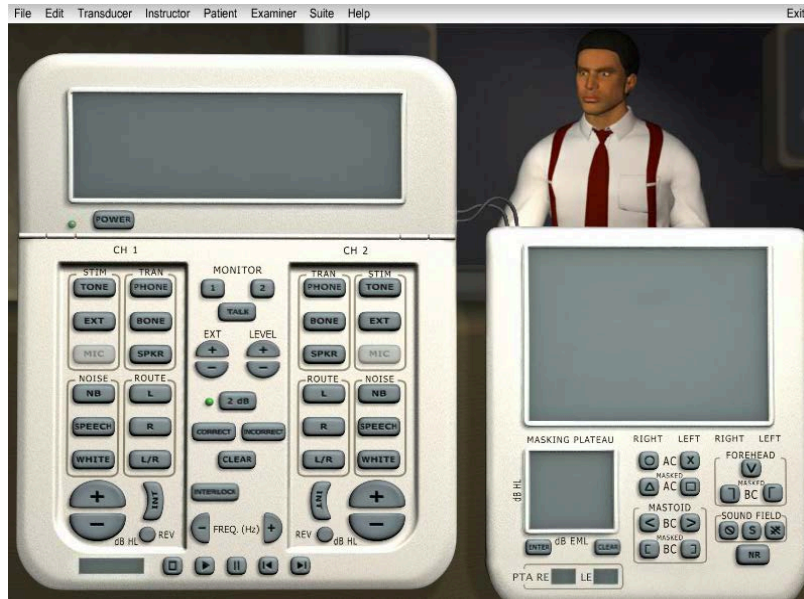


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Purpose of the Audiometer

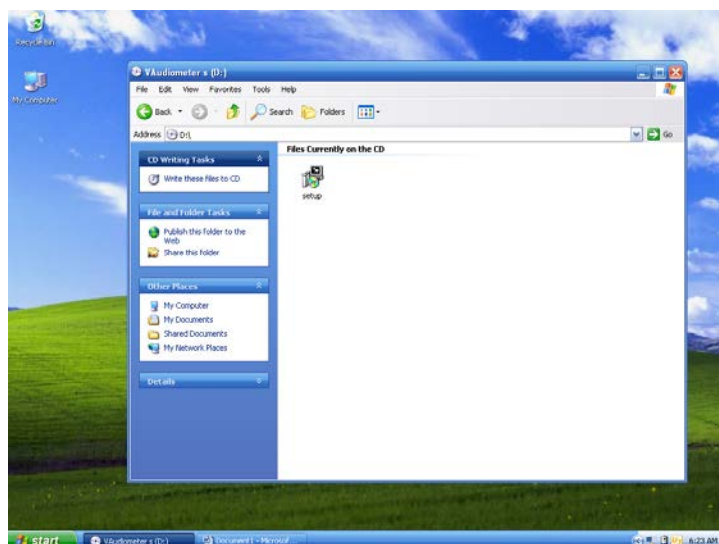
The purpose of the Virtual Audiometer is to provide a setting for students to apply hearing evaluation techniques. The Virtual Audiometer software contains virtual patients with realistic hearing impairments. The basic functions that a clinical audiometer contains are found in the Virtual Audiometer. The student is able to familiarize him or herself with the basic audiometric functions by performing hearing tests and evaluations on the virtual patients at their own pace.



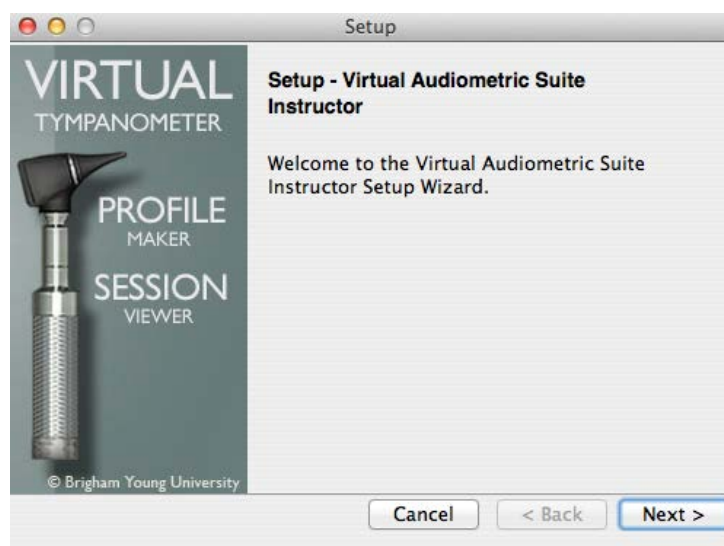
How to Download the Virtual Audiometric Suite

Step 1: Insert the Virtual Audiometric Suite DVD into the CD/DVD drive of the computer.

Step 2: Open the CD drive under “My Computer.”



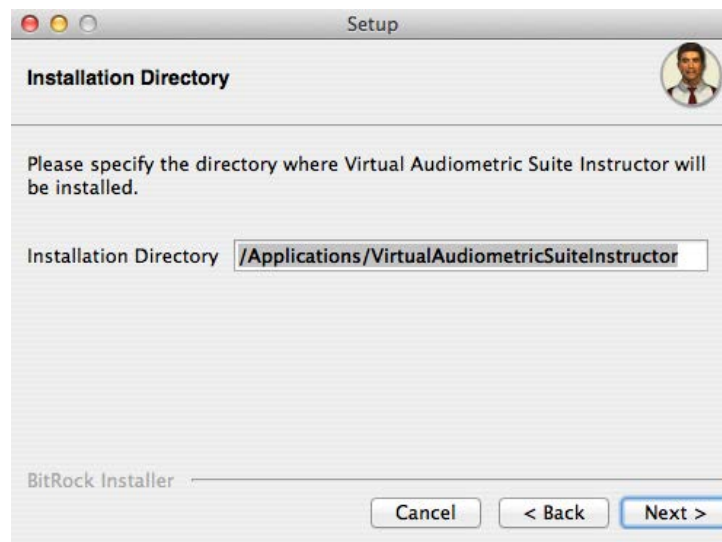
Step 3: Double Click on “Setup” and then click “Next” as prompted.



Step 4: Read the license agreement and select “I agree”



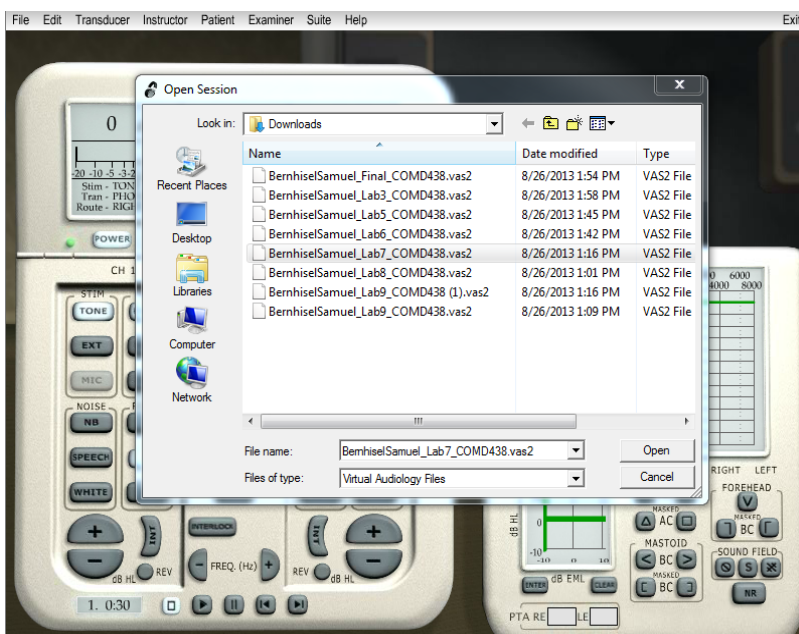
Step 5: Choose an area on the hard drive to install the software and click “next.”



Step 6: Choose where you would like to have the shortcut application appear and click “install.”

Step 7: Click “Close.”

Opening Virtual Profiles



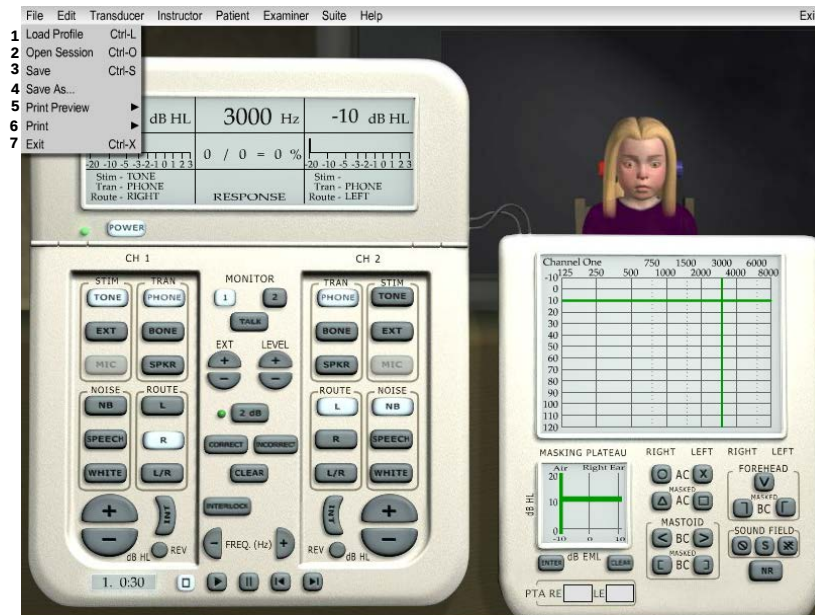
Step 1: Turn on the Virtual Audiometer or Tympanometer by pushing the power button.

Step 2: In the “File” menu click on “Load Profile” for a new session or “Open Session” for one that already been modified by the user. The “Load Profile” option only opens files ending in .vap2 (virtual audiometer *profile*). These are files received from the instructor that haven’t been altered. “Open Session” will only allow files ending in .vas2 (virtual audiometer *session*) to be opened. .vas2 files are created after a .vap2 file has been altered by the user and saved. .vas2 files will be the file type that students submit for grading.

Step 3: Double click on the desired profile or session to begin work.

IMPORTANT NOTE: .vap2 and .vas2 files should **NOT** be saved in the “Virtual Audiometric Suite” system folder that contains the applications and associated files. It is recommended that users create a file on either their desktop or another safe place to store these files.

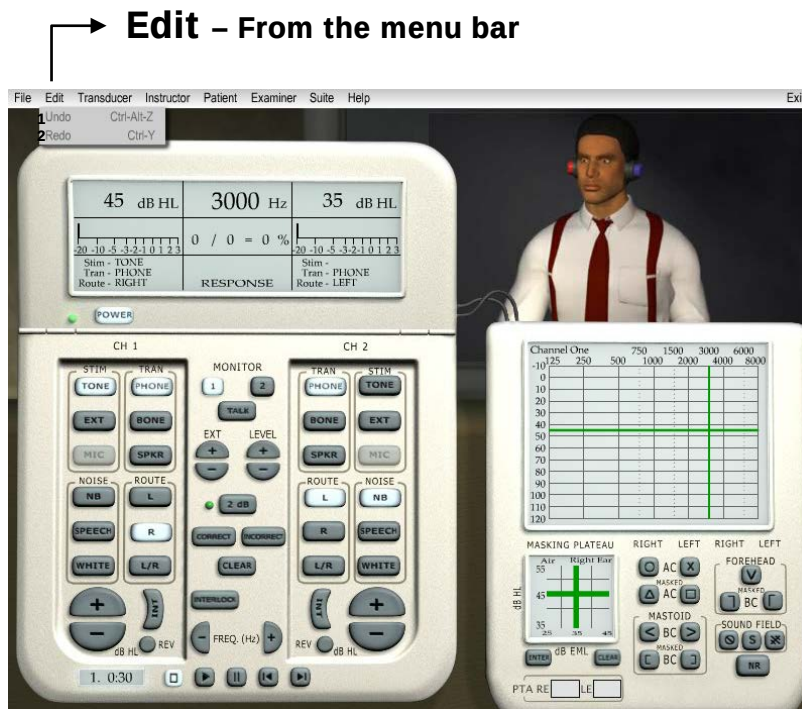
How to Navigate the Menu Bar



File – From the menu bar

1. **Load Profile:** Loads a new profile and clears the audiometer.
2. **Open Session:** Loads a previous profile and restores all corresponding session data.
3. **Save:** Saves all relevant data for the current session without prompting.
4. **Save as:** Saves all relevant data for the current session after prompting the user for the save location.
5. **Print:** Brings up a submenu:
 - Audiogram* – Prints the plotter and speech audiometry data.
 - Masking Plateaus* – Prints the masking plateaus and effective masking levels.
6. **Print Preview:** Brings up submenus
7. **Exit:** Quits the application.

NOTE: When a profile is loaded via Load Profile or Open Session, the Audiometer will temporarily suspend until finished loading.

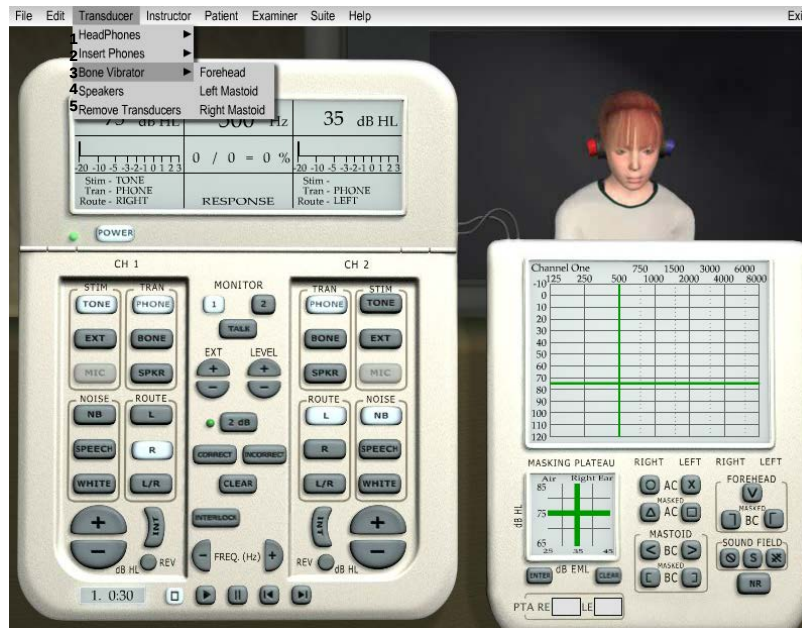


1. **Undo:** Reverses the last action.
2. **Redo:** Redoes the last undone action.

NOTE: *The following actions are affected:*

- 1) *placing or removing symbols from the plotter.*
- 2) *placing or removing dots from a masking plateau.*
- 3) *scoring of responses during speech audiometry*

→ **Transducer** - From the menu bar



1. **Headphones:** Brings up a submenu
 - Both ears* – Places one headphone on both ears. Removes the loudspeakers or bone vibrator if present.
 - Left ear only* – Places one headphone on the left ear. Only available if the bone vibrator is on the forehead or the right mastoid.
 - Right ear only* – Places one headphone on the right ear. Only available if the bone vibrator is on the forehead of the left mastoid.
2. **Insert Phones:** Brings up the same submenu as **Headphones**.
3. **Bone Vibrator:** Brings up a submenu:
 - Forehead* – Places the bone vibrator on the forehead. Removes the loudspeakers or any headphones if present.
 - Left mastoid* – Places the bone vibrator on the left mastoid. Removes the loudspeakers or any headphones if present.
 - Right Mastoid* – Places the bone vibrator on the right mastoid. Removes the loudspeakers or any headphones if present.
4. **Speakers:** Uses loudspeakers in the patient area
5. **Remove Transducers:** Removes any transducers currently in use on the patient.

NOTE: For speech audiometry, the patient must be configured with headphones on both ears or loudspeakers. When one of these options is selected, the application will suspend while it loads the corresponding patient videos.

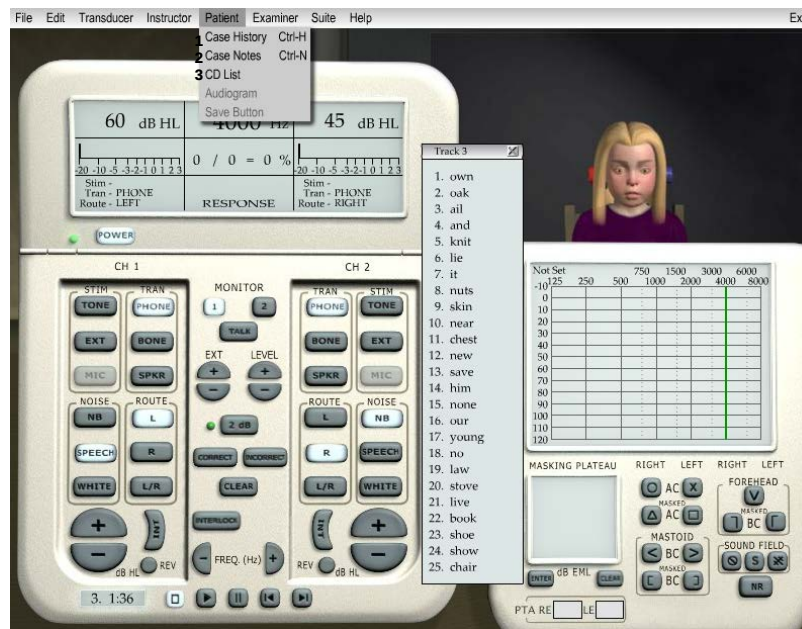
➔ **Instructor** – From the menu bar



1. **Audiogram:** Displays a separate audiogram plotter configured from the profile's thresholds.
2. **Speech Data:** Displays all relevant values for speech audiometry.
3. **Save Button:** Hides or reveals a save button which automatically places the correct symbol based on the last test.
4. **Response Light:** Disables or enables the display of a broad green light in the main window when the patient responds positively.

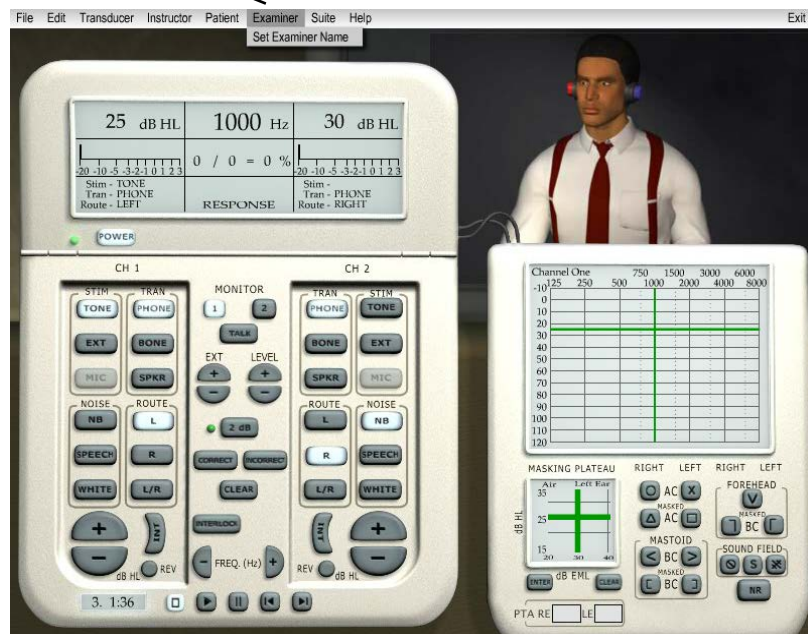
NOTE: These options are only available upon entering a valid password.

→ **Patient** - From the menu bar



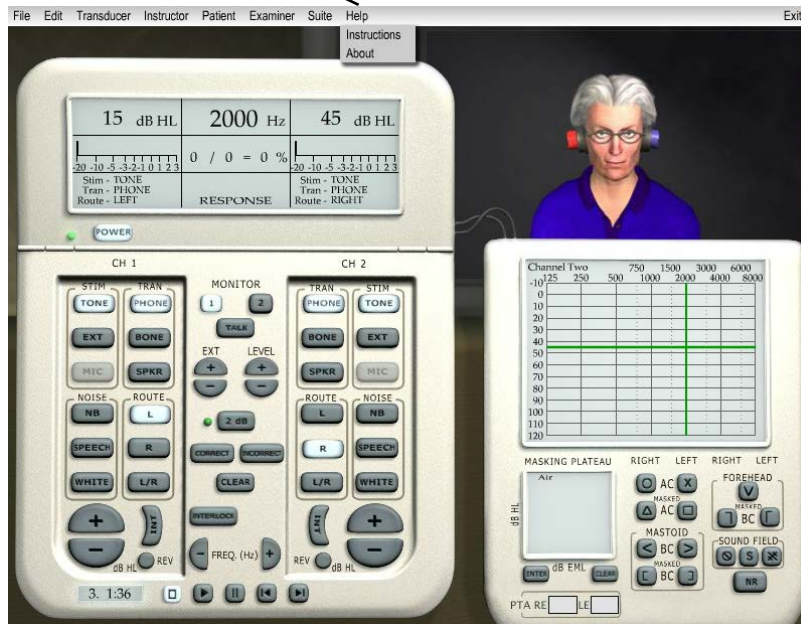
1. **Case History:** Displays the case history information for the current patient.
2. **Case Notes:** Opens the case notes window
3. **CD List:** Displays a list of the CD tracks and the words for each track.

➔ **Examiner** - From the menu bar



1. **Set Examiner Name:** Allows the student to set the information including name and email address that will be included with the submitted lab.

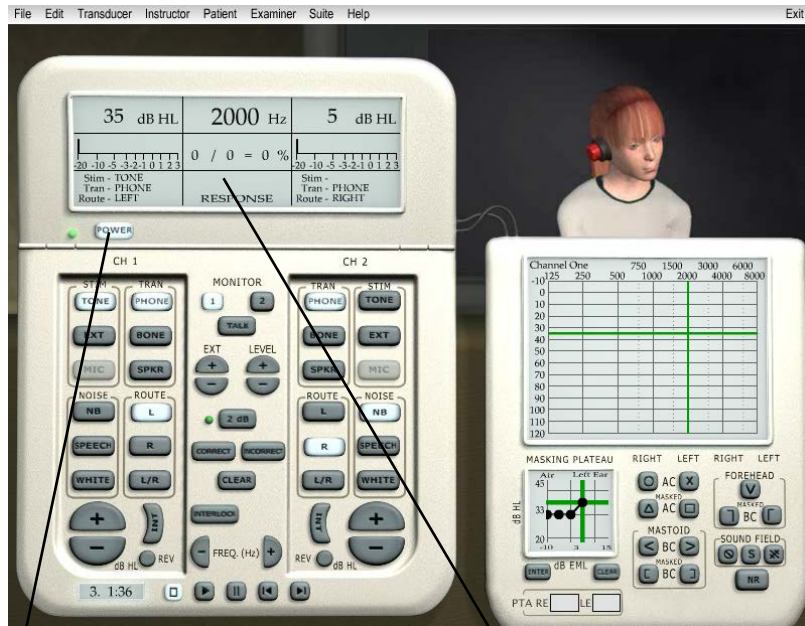
↖ **Help** - From the menu bar



1. Instructions: When you click on the “Instructions” option a window pane will appear which will prompt you to click on an area of the audiometer to learn more about what it does and how to use it. Active areas will change the mouse into the hand icon. Selection of an inactive area will restore these instructions. To end instruction mode, click the ‘X’ button above this box.

2. About: When you click on the “About” option a window pane will appear noting the production and credits.

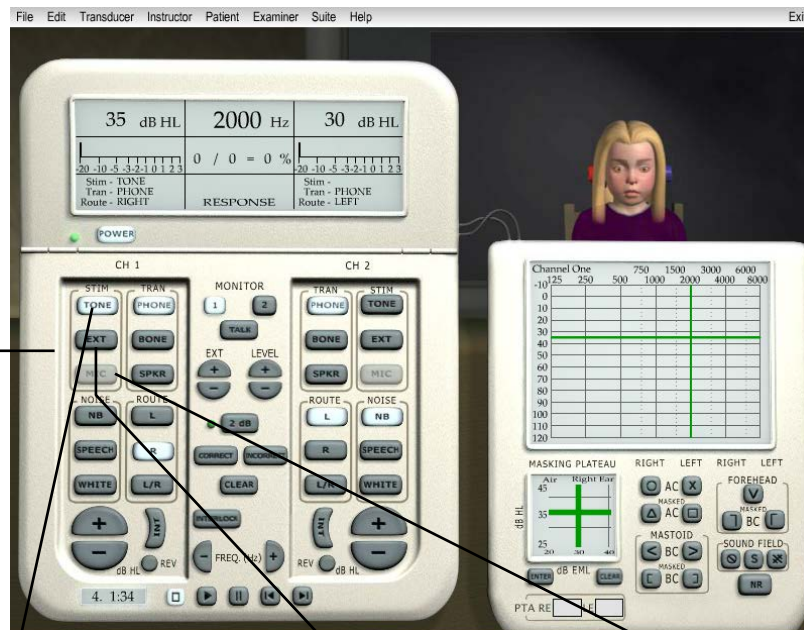
Pushbuttons on the Virtual Audiometer



POWER: When the “power” push button is depressed, the Virtual Audiometer turns on and automatically initializes and displays the default audiometer and audiogram screens. The user will need to select “Load Profile” or “Open Session” from the “File” menu to begin or continue an audiometric evaluation.

MAIN WINDOW: This area displays important information about the machine's current state. The left and right sections display information for channel 1 and channel 2 respectively. For both channels, the top area displays the calibration setting for the channel. The middle area displays the calibration setting for the channel. The bottom area displays the channels current configuration for "stimulus," "transducer," and "route." The center section displays more general information. The top area displays the scores recorded for the patient during speech audiometry. The bottom area displays a broad green light when a patient responds positively during a pure tone test. The light is only displayed if enabled via the "Instructor" menu.

→ **Stimulus** - Selection of a stimulus removes any noise selection for the channel.

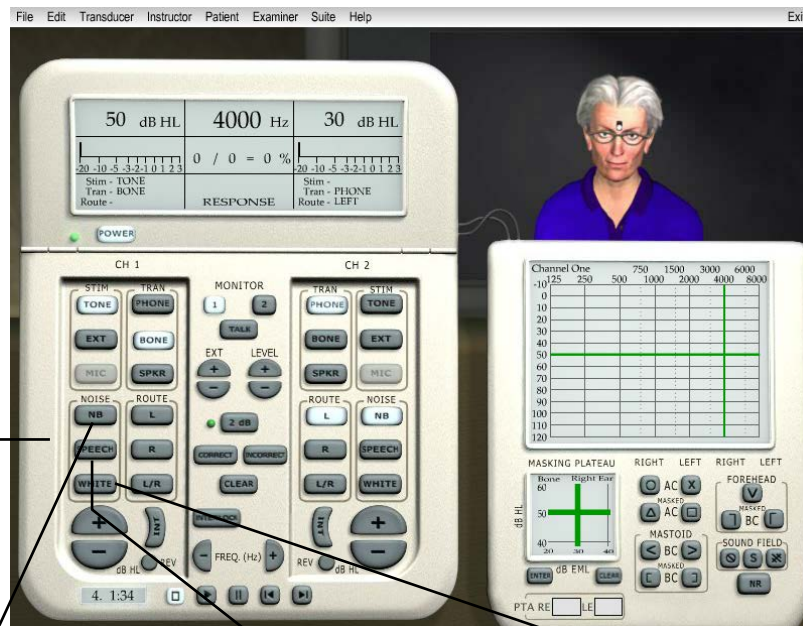


TONE: The “tone” pushbutton allows the selection of a pure tone for air or bone conduction testing using a selection of three transducer types: phone, bone, speaker. The plotter for the audiogram is displayed below the subject, and white and speech noise from the opposite channel are disabled.

EXT: The “external” pushbutton allows the use of recorded speech materials played using the included compact disc player controls. Note that the user must first calibrate the audiometer to 0 VU using the 1kHz calibration tone contained on the first track of the included compact disc. For this machine, the patient must be configured to loudspeakers or both headphones via the “Transducer” menu to match this channel setting. An entry area for recording speech audiometry values is displayed below the subject, and narrow band noise from the opposite channel is disabled.

POWER: When the “power” push button is depressed, the Virtual Tympanometer turns on and presents the user with several indicators of the state of the middle ear. The user will need to select “Load Profile” or “Open Session” from the “File” menu to begin and create a tympanogram or perform other tests.

➔ **Noise** - Selection of a noise removes any stimulus selection for the channel.



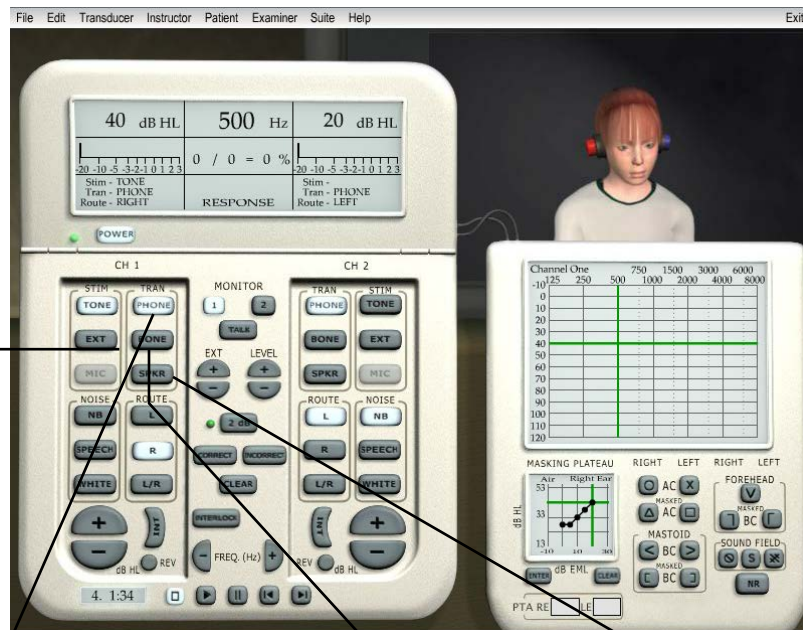
NB: The “NB” pushbutton selects narrow band noise. This bandpass filtered noise centered at each test frequency is changed.

SPEECH: The “speech” pushbutton selects speech spectrum noise. This is a white noise that has been filtered to simulate the average spectrum of conversational speech.

WHITE: The “white” pushbutton selects white noise. White noise is a broad-band noise containing acoustic energy at all frequencies between 125 Hz and 12 kHz. average spectrum of conversational speech.

NOTE: For the purposes of this machine, the same noise is used for both speech and white. The stimulus selection for the opposite channel affects which noise selections are available.

→ **Transducer output:** The transducer output selection may be changed at any time.

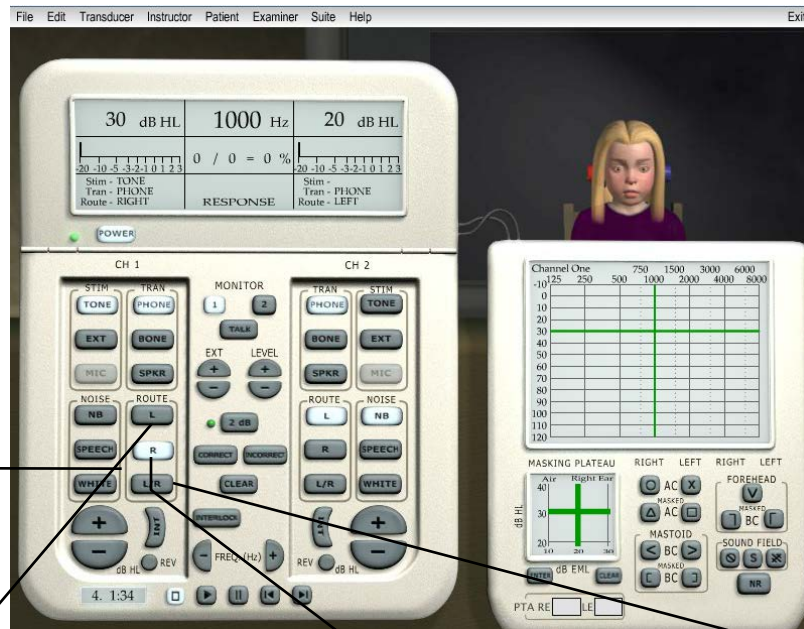


PHONE: The “phone” pushbutton allows the routing of the headphones for each available stimulus. The patient must be configured with one or both headphones via the “Transducer” menu to match the channel setting.

BONE: The “bone” pushbutton allows the routing of the bone vibrator for each available stimulus. The patient must be configured with the bone vibrator via the “Transducer” menu to match the channel setting.

SPKR: The “speaker” pushbutton allows the routing of the loudspeakers for each available stimulus. The patient must be configured with loudspeakers via the “Transducer” menu to match the channel setting.

→ **Route** - Routing output selection is unavailable if the channel's transducer output selection is set to bone.

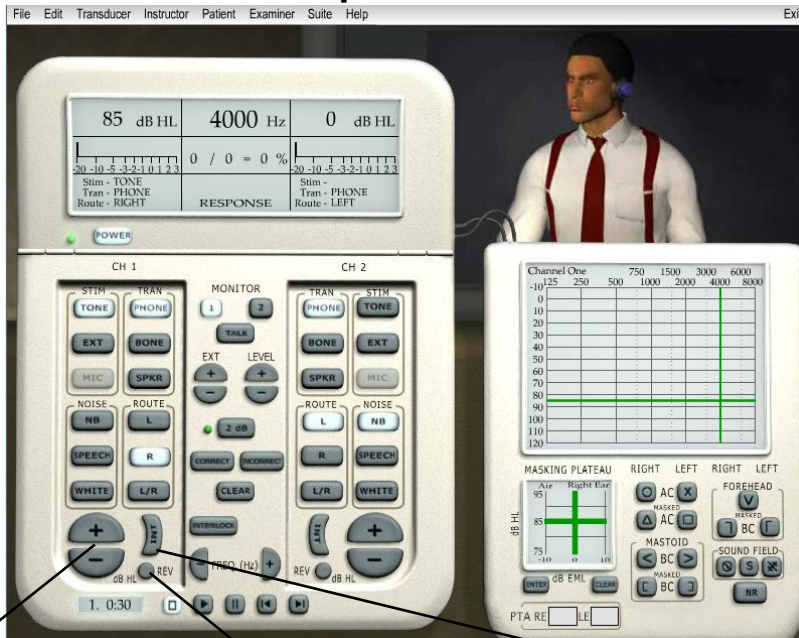


L: The “left” pushbutton causes the signal for the selected stimulus to be routed to only the left headphone or left loudspeaker depending on the output transducer selected for the channel. If the patient is configured with only one headphone, the signal will only be received if the headphone is on the left ear.

R: The “right” pushbutton causes the signal for the selected stimulus to be routed to only the right headphone or right loudspeaker depending on the output transducer selected for the channel. If the patient is configured with only one headphone, the signal will only be received if the headphone is on the right ear.

L/R: The “left/right” pushbutton causes the signal for the selected stimulus to be routed to both headphones or both loudspeakers depending on the output transducer selected for the channel. If the patient is configured with only one headphone, the signal will only be received by that headphone.

Interrupt and Reverse

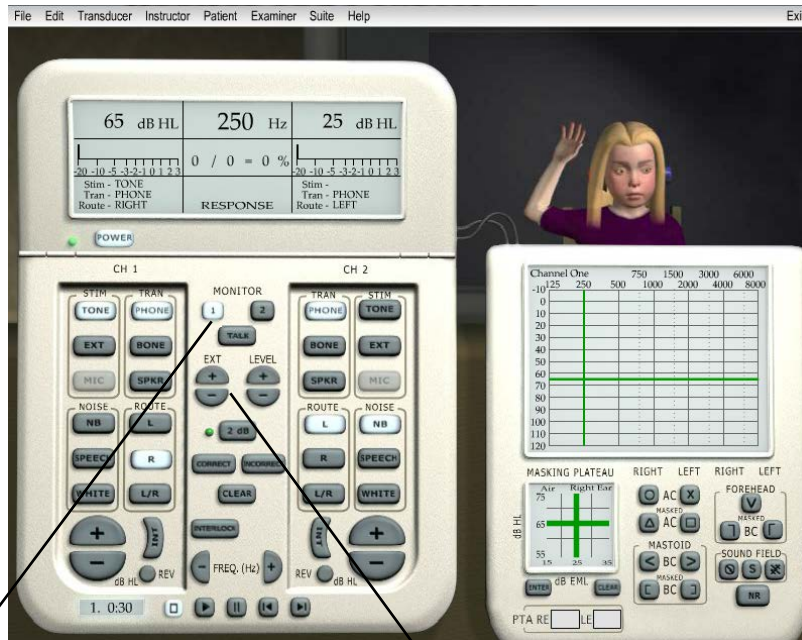


Attenuators: The Virtual Audiometer contains two independent intensity pushbutton controls for test signal and masking intensity levels through a range of -10 dB to the maximum allowable dB for the channel's current configuration. The plus (+) and minus(-) pushbuttons increase or decrease the intensity in 5 dB increments or 2 dB increments if the 2 dB pushbutton is depressed.

REV: When the "reverse" pushbutton is depressed, the function of the interrupt pushbutton is reversed. In this state, presentation of the selected stimulus to the selected transducer for the channel is constant except when the interrupt pushbutton is depressed.

INT: The "interrupt" pushbutton causes the presentation of the selected stimulus to the selected transducer for the channel. Presentation of the signal continues for as long as the interrupt pushbutton is held down and immediately ends when the interrupt pushbutton is release.

Monitor and Calibrators

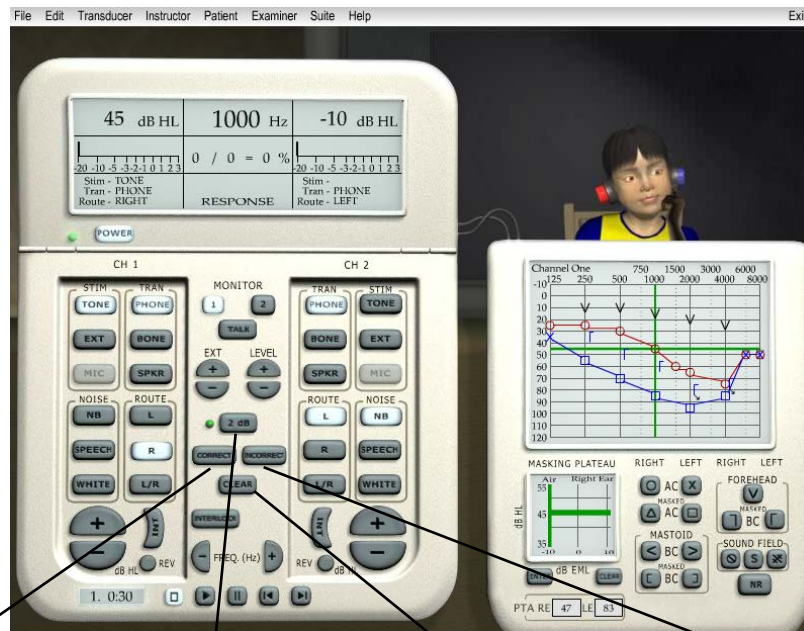


MONITOR: The “monitor” pushbuttons allow the stimuli to be heard by the tester. There is no volume control on the virtual audiometer itself. Consequently, the volume level must be set using the computer’s volume control. Channels (1) and (2) may be selected and heard separately or simultaneously.

EXT: The external plus (+) and minus (-) pushbuttons permit the external input stimulus to be calibrated to zero VU on the Virtual Audiometer.

NOTE - MIC - The microphone (+) and minus (-) pushbuttons are not activated at this time.

Scoring Speech - The speech score is displayed in the center of the audiometer main window as (number correct/number answered) and as a percentage.



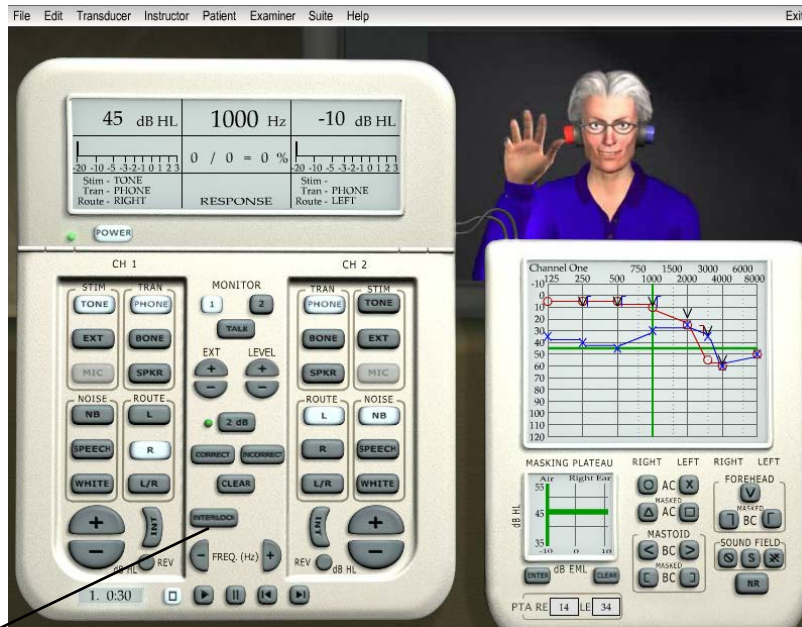
CORRECT: The "correct" pushbutton increment both sides of the score and updates the percentage.

INCREMENT: When the 2dB pushbutton is depressed, the "increment" on the attenuator dials change from a 5 dB step to a 2 dB step. The "increment" is reset to a 5dB step when the 2dB button is raised. Affects both channels.

CLEAR: The "clear" pushbutton resets both sides of the score to zero and clears the percentage.

INCORRECT: The "incorrect" pushbutton increments only the right side of the score and updates the percentage.

Interlock and Save Buttons



Interlock: Depressing the “interlock” button locks the channel 1 & 2 interrupt and reverse buttons together.

Save: Depressing the “save” button after presentation of at least one tone automatically stores correct audiometric symbols on the audiogram (this button is only visible if the instructor has set a specific profile to accommodate it).

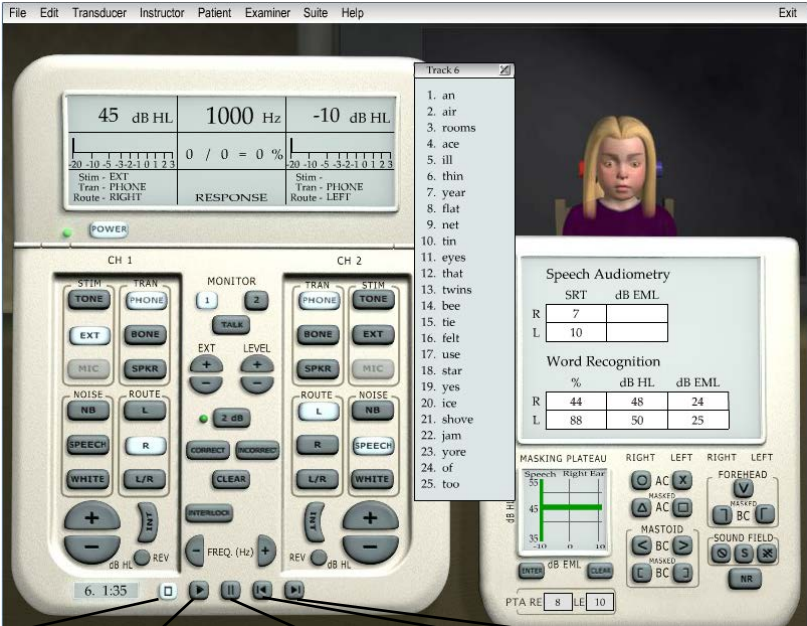
CD PLAYER

The virtual audiometer incorporates a built-in compact disc player. The 6 available tracks are:

- 1) 1 kHz Calibration Tone
- 2) Spondaic Word List
- 3-6) Mono-syllabic half-lists 1-5 (25 words each)

The 1 kHz Calibration Tone is used to calibrate the audiometer to 0VU prior to playing tracks 2-6. In the event that the audiometer is not calibrated to 0VU, the presentation level of the words contained in tracks 2-6 will be inaccurate.

The five pushbutton controls for the CD player function in the traditional fashion. From left to right, they are:



The screenshot shows the Virtual Audiometer Suite 2013 interface. The main window displays the CD player controls, including a digital display showing 45 dB HL, 1000 Hz, and -10 dB HL. Below the display are two channels (CH 1 and CH 2) with various buttons for stimulus (STIM), transducer (TRAN), monitor, and response. A list of words for Track 6 is displayed on the right side of the interface. The words are: 1. an, 2. air, 3. rooms, 4. ace, 5. ill, 6. thin, 7. year, 8. flat, 9. net, 10. tin, 11. eyes, 12. that, 13. twins, 14. bee, 15. tie, 16. felt, 17. use, 18. star, 19. yes, 20. ice, 21. shove, 22. jam, 23. yore, 24. of, 25. too. Below the word list is a 'Speech Audiometry' section with tables for SRT and dB EML, and a 'Word Recognition' section with tables for % and dB HL. The bottom of the interface shows a 'MASKING PLATEAU' section with a graph and buttons for 'RIGHT', 'LEFT', 'RIGHT', and 'LEFT'.

STOP: Stops play and resets the current track to the beginning.

PLAY: Starts play from the current track's position.

PAUSE: Stops play but leaves the track in its current position.

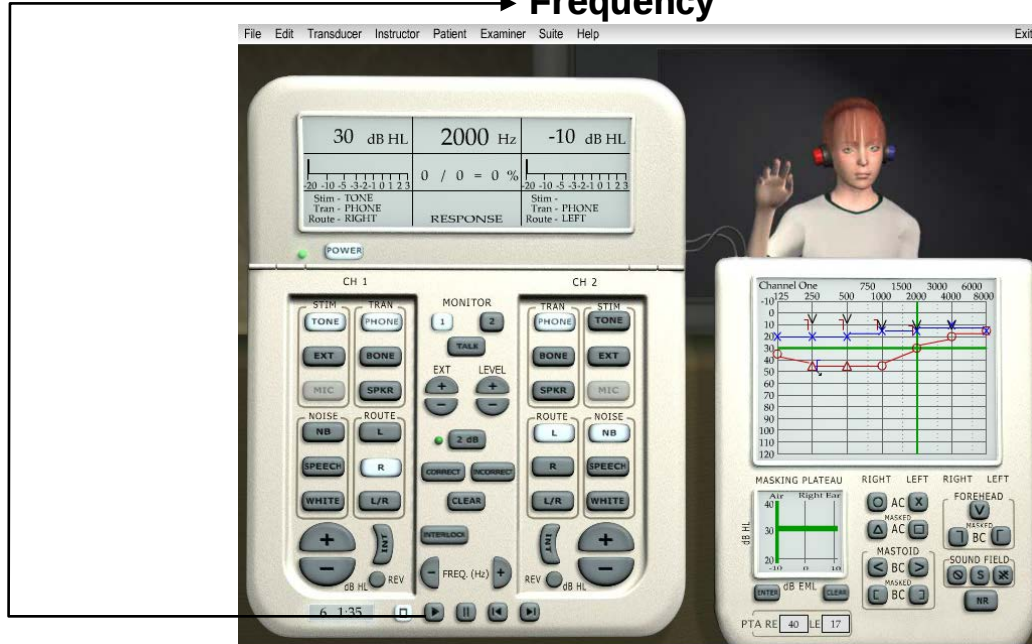
PREVIOUS: Switches to the beginning of the previous track.

NEXT: Switches to the beginning of the next track.

A list of available tracks for the CD and the different words contained in tracks 2-6 can be displayed via the “Student” menu. This list may be moved anywhere on the face of the virtual audiometer.

To present the materials contained on the compact disc, the channel’s stimulus selection must be set to external and either the channel’s “interrupt” or “reverse” pushbutton must be depressed. (If both are depressed, the signal is cancelled.)

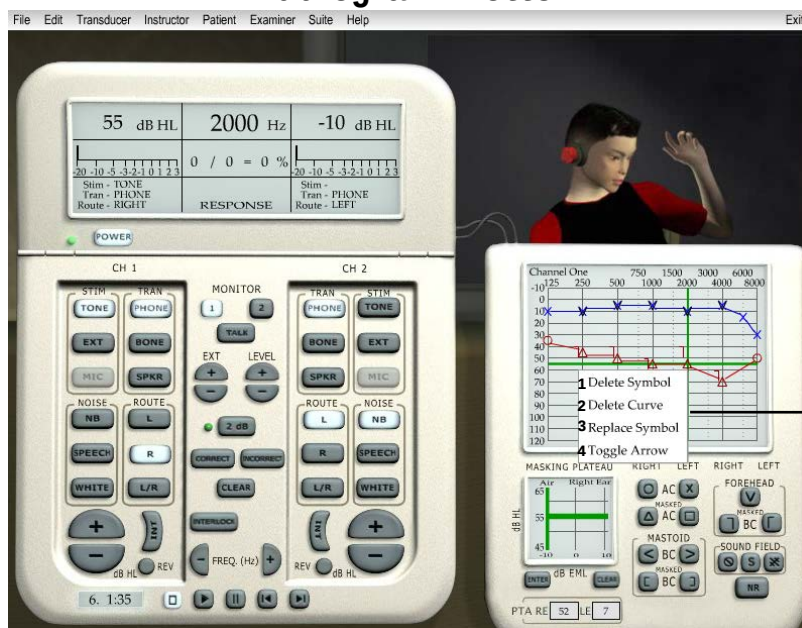
→ Frequency



The frequency plus (+) and minus (-) pushbuttons respectively increase or decrease the test frequency level. Both pushbuttons will cause the frequency test level to wrap around at the maximum and minimum levels. 250, 500, 750, 1000, 1500, 2000, 3000, and 4000 Hz are available for both air and bone conduction testing.

125, 6000, and 8000 Hz are available exclusively for air conduction testing. If either channel's transducer output selection is set to bone, these test frequency levels are disabled.

Audiogram Plotter



The audiogram plotter displays the results of pure tone testing. When the appropriate threshold for the current test has been established, select the appropriate symbol pushbutton to place the symbol on the plotter at the current frequency and decibel levels (as indicated by the vertical and horizontal green bars on the plotter). Each symbol represents a standard audiometric marker when plotting the audiogram. The “forehead” group consists of the unmasked symbol, and the masked right and left bone conduction symbols. The “sound field” symbols represent right and left sound field speakers. They are referenced to the patient’s right and left and not necessarily the position in the room itself.

Symbols can be later modified by left clicking on them with the mouse to bring up a submenu with several different options:

1. DELETE SYMBOL:

Removes the selected symbol from the audiogram plotter

2. DELETE CURVE:

Removes the selected symbol and all corresponding symbols from the audiogram plotter. Corresponding symbols are those that match the same test ear and test type. For example, circle and triangle are both used for air conduction testing of the right ear.

3. REPLACE SYMBOL:

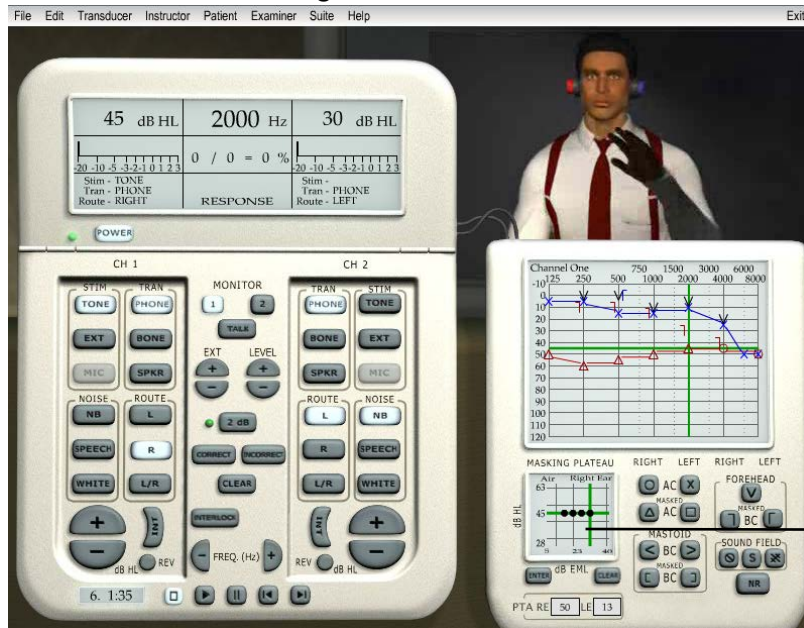
Removes the selected symbol from the audiogram plotter and places a blinking marker at the removed symbol's location. The next symbol pushbutton to be selected will place the symbol at the location of the marker. To remove the marker without placing a new symbol, left click on the marker.

4. TOGGLE ARROW:

Toggles the “nr” arrow on or off for the selected symbol. When two or more different symbols are placed in the same position, the mouse left click over this group will first bring up a menu that allows the user to select which symbol to modify.

The plotter also displays other useful information about the audiometer's current configuration. The current channel is displayed in the upper-left corner. Frequency values are displayed across the top with a vertical green bar indicating the current frequency level. Decibel values are displayed along the left side with horizontal green bar indicating the current decibel level for the current channel.

Masking Plateau Window

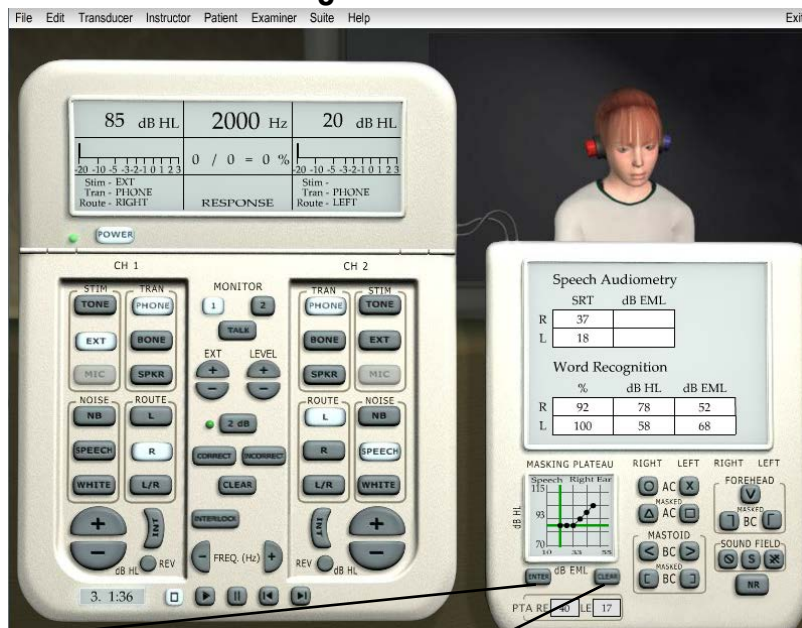


The “masking plateau window” displays the masking function established during clinical masking.

During clinical masking, dots can be placed on the masking plateau window by selecting the “enter” pushbutton below the window, the dot is placed at the intersection of the dB HL of the test channel and the dB EML of the masking channel. If a second dot is placed on the same vertical, the first dot is removed. To remove a dot without replacing, the dot can be left-clicked with the mouse.

Other useful information is displayed in the “masking plateau window” as an aid during clinical masking. A horizontal green bar indicates the current dB HL of the test channel. A vertical green bar indicates the current dB EML of the masking channel. The top right corner indicates the current test ear. The top left corner indicates which type of test the audiometer is configured for. Dots can be placed down the grid only during air and bone conduction test if the test ear has been established.

Masking Plateau Buttons

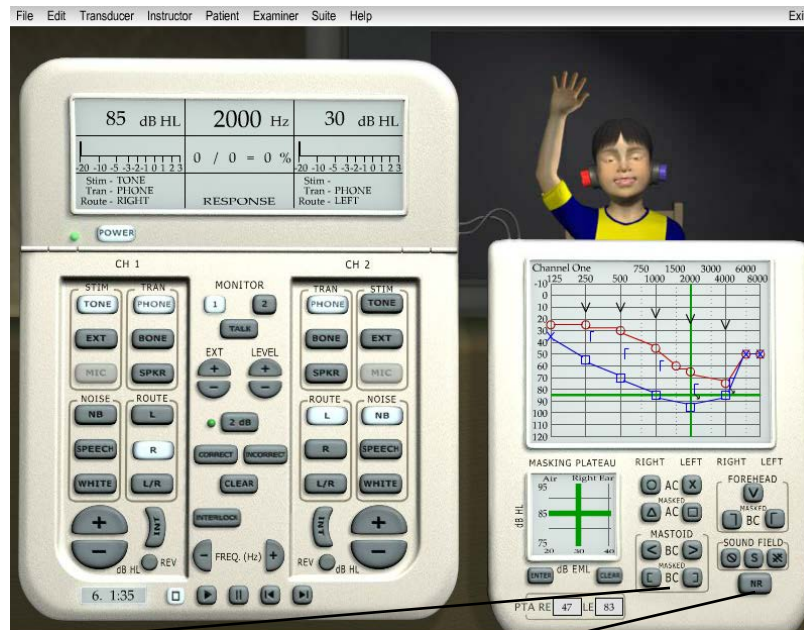


ENTER: The “enter” pushbutton causes a dot to be placed on the masking plateau window at the intersection of the dB HL of the test channel and the dB EML of the masking channel. If a second dot is placed on the same vertical, the first dot is removed. Dots can be placed on the grid only during air and bone conduction testing if the test ear has been established.

CLEAR: The “clear” pushbutton removes all the dots displayed on the masking plateau window. Only the current masking plateau is cleared. Other masking plateaus are unaffected.

Audiogram Symbols Buttons

The symbol pushbuttons are used to place symbols on the audiogram plotter as a record of the patient's thresholds obtained during testing. All of the symbol buttons behave the same except the “nr” pushbutton.



SYMBOLS: To place a symbol on the audiogram plotter, select the appropriate symbol pushbutton for the current test. If a second corresponding symbol is placed on the same vertical, the first symbol is replaced. Corresponding symbols are those that match the same test ear and test type. For example, circle and triangle are both used for air conduction testing of the right ear.

NR: The “nr” pushbutton toggles the nr arrow on or off for the last symbol that was placed. The “nr” arrow for prior symbols can be toggled by left clicking on the symbol.

Purpose of the Tympanometer

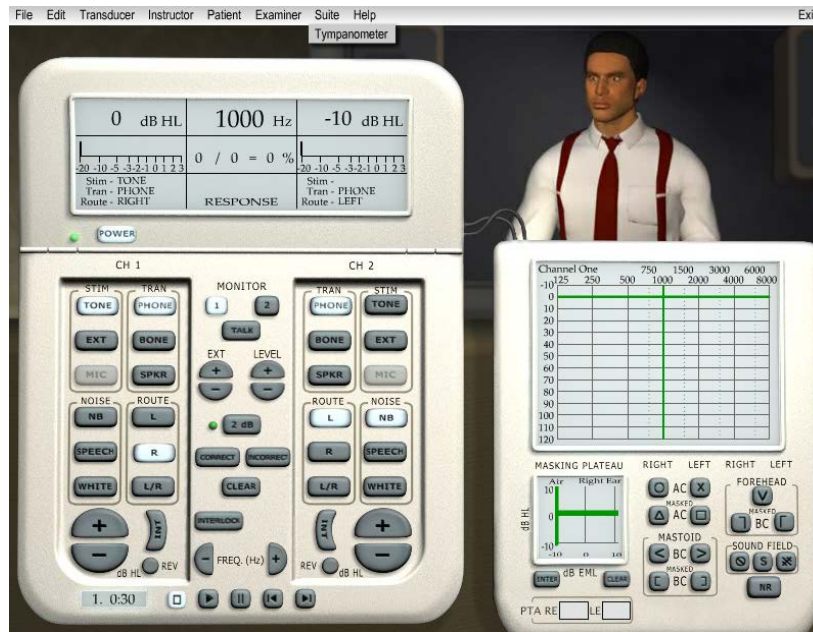
The Virtual Tympanometer provides students with a realistic environment in which to perform four separate tests of middle ear function. They are: tympanometry, acoustic reflex and acoustic decay thresholds, as well as a test of Eustachian tube function. Students will learn the basic functions of the Virtual Tympanometer as they relate to these four procedures in the following section.



Opening the Virtual Tympanometer

OPTION 1: Click on the Tympanometer icon in the Virtual Audiometric Suite that you've already installed on your computer.

OPTION 2: If the Virtual Audiometer is already running you can simply click on the suite tab in the menu bar and select Tympanometer and your profile will be transferred to that program. NOTE: While your work in the Virtual Audiometer won't be disturbed when a profile is switched to the Virtual Tympanometer it is still a good idea to save your work before switching.

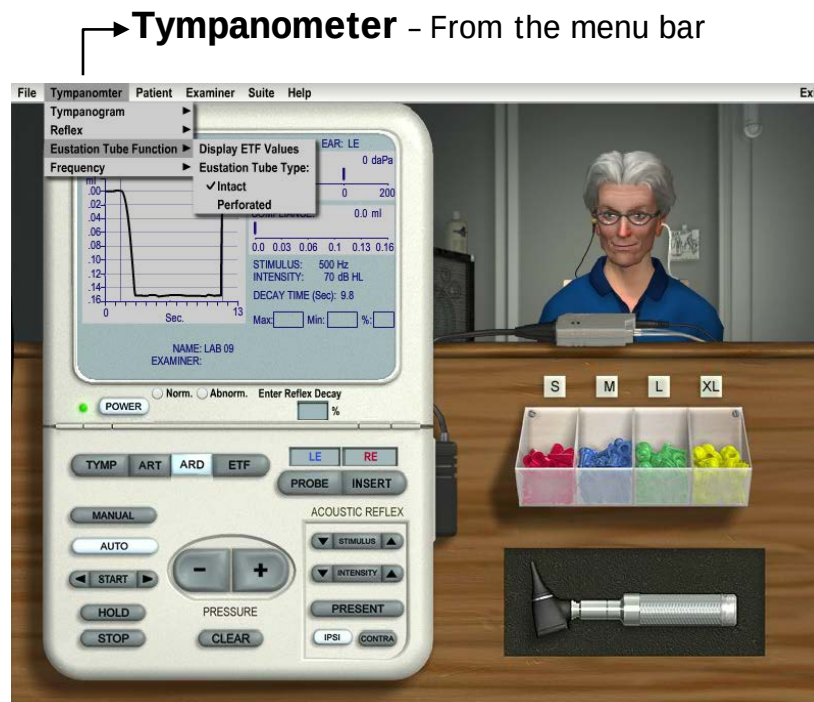


How to Navigate the Menu Bar

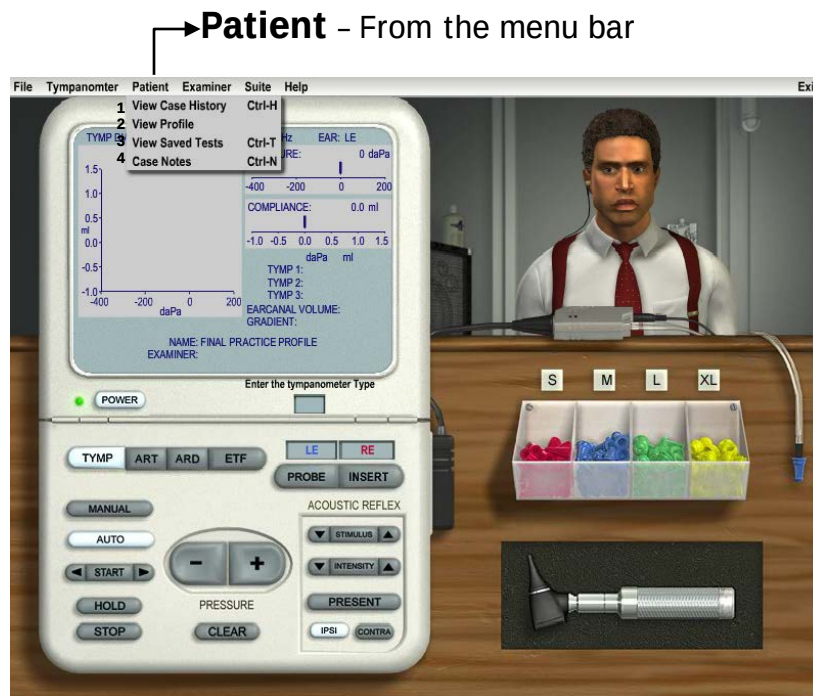


File - From the menu bar

1. **Load Profile:** Loads a new profile and clears the audiometer.
2. **Open Session:** Loads a previous profile and restores all corresponding session data.
3. **Save:** Saves all relevant data for the current session without prompting.
4. **Save as:** Saves all relevant data for the current session after prompting the user for the save location.
5. **Print:** Opens window "select graphs to print"
6. **Exit:** Quits the application.

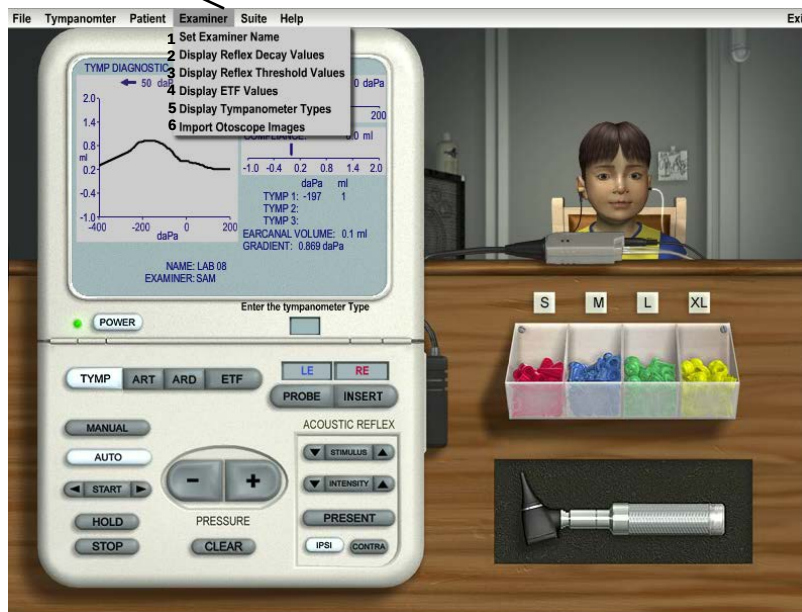


1. **Tympanometer:** Brings up the submenu “Pressure Range”
Normal – Sets the tympanogram abscissa to -400 to 200 daPa
Wide – Sets the tympanogram abscissa to -600 to 400 daPa
2. **Reflex:** Brings up a submenu
Display Reflex Decay Values – Opens a window displaying all ARD values at with normal or abnormal indicators
Display Reflex Threshold Values – Opens a window displaying all ART values at 500, 1000, 2000 and 4000 Hz, the ear being tested and if the test was performed ipsilaterally or contralaterally.
3. **Eustachian Tube Function:** Brings up a submenu:
Display ETF Values – Opens a window displaying a
Eustachian Tube Function – Used to indicate Eustachian tube type (Intact or Perforated)
4. **Frequency:** Used to select a probe test frequency of either 226 Hz or 678 Hz



1. **View Case History:** Displays the case history information for the current patient.
2. **View Profile:** Displays a visual overview of recorded tests for the patient.
3. **View Saved Tests:** Displays a list of all tests performed on the patient. This window also allows the user to select which tests will be submitted for final grading by the instructor.
4. **Case Notes:** Opens the case notes window.

← **Examiner** - From the menu bar



1. **Set Examiner Name:** Allows the student to set the information including name and email address that will be included with the submitted lab.
2. **Display Reflex Decay Values:** Displays a table showing data recorded in the “Enter Reflex Decay” window at the bottom of the main window of the Virtual Tympanometer at either 226 Hz or 678 Hz along with the option to indicate a normal or abnormal result.
3. **Display Reflex Threshold Values:** Displays a table showing data recorded in the “Enter AR Threshold” window at the bottom of the main window on the Virtual Tympanometer at either 226 Hz or 678 Hz.
4. **Display ETF Values:** Displays a table showing an overview of data collected for each ear during EFT testing along with the option to indicate a normal or abnormal result.
5. **Display Tympanometer Types:** Displays a table showing an overview of data recorded in the “Enter the tympanometer Type” at the bottom of the main window on the Virtual Tympanometer.
6. **Import Otoscope Images:** Opens a browsing window that allows the user to select a previously saved otoscope image to import into the Virtual Tympanometer.

OTOSCOPY AND EAR PIECES

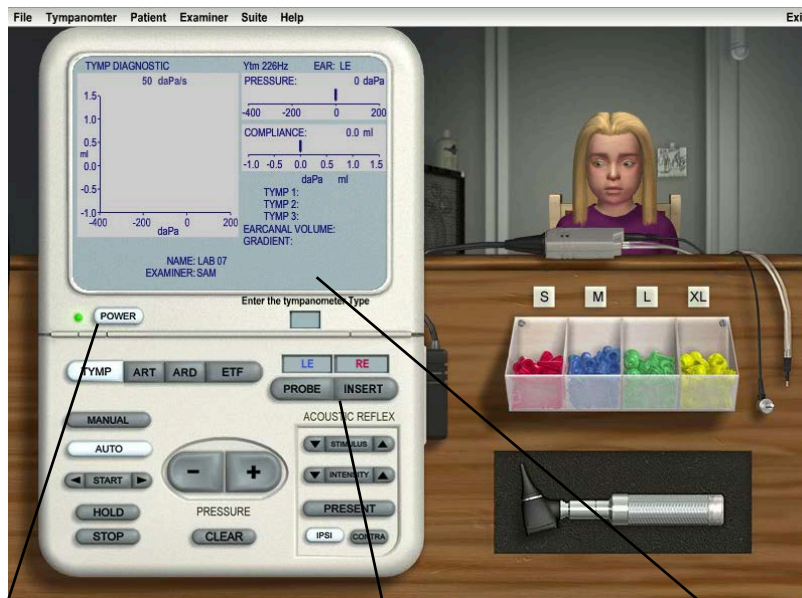


OTOSCOPE: Before performing any testing in either the Virtual Audiometer or Virtual Tympanometer, an otoscopy must be performed to determine if there are any visible pathologies that would prevent a test from functioning properly. The image above shows a view of the tympanic membrane through the otoscope.

FOAM TIPS: Foam tips should be fitted to both the earphone and the tympanometer probe before testing and are found in four different sizes. If tip is the incorrect size the ear pieces will either fall out or the text "probe leak" will appear on the main window indicating a poor seal.

EAR PIECES: Shown on the left is the earphone and on the right the tympanometer probe.

Pushbuttons and Displays on the Virtual Tympanometer

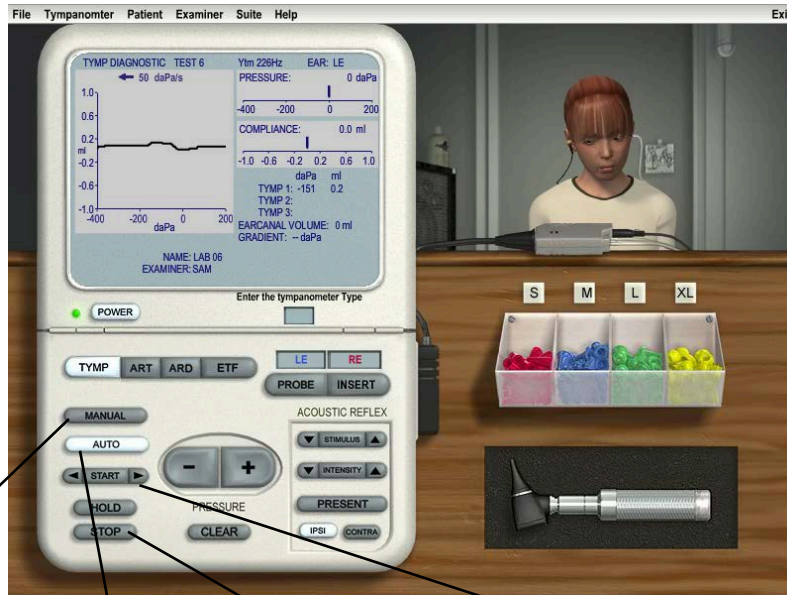


POWER: When the “power” push button is depressed, the Virtual Tympanometer turns on and presents the user with several indicators of the state of the middle ear. The user will need to select “Load Profile” or “Open Session” from the “File” menu to begin and create a tympanogram or perform other tests.

PROBE/INSERT INDICATOR: Indicates the ear in which the probe and insert phone is located and is essential for accurate data collection.

MAIN WINDOW: This area displays important information about the machine’s current state which in the image above is the main tympanometry window. To change the main window click on one of the four buttons to the right of the red circle.

continued



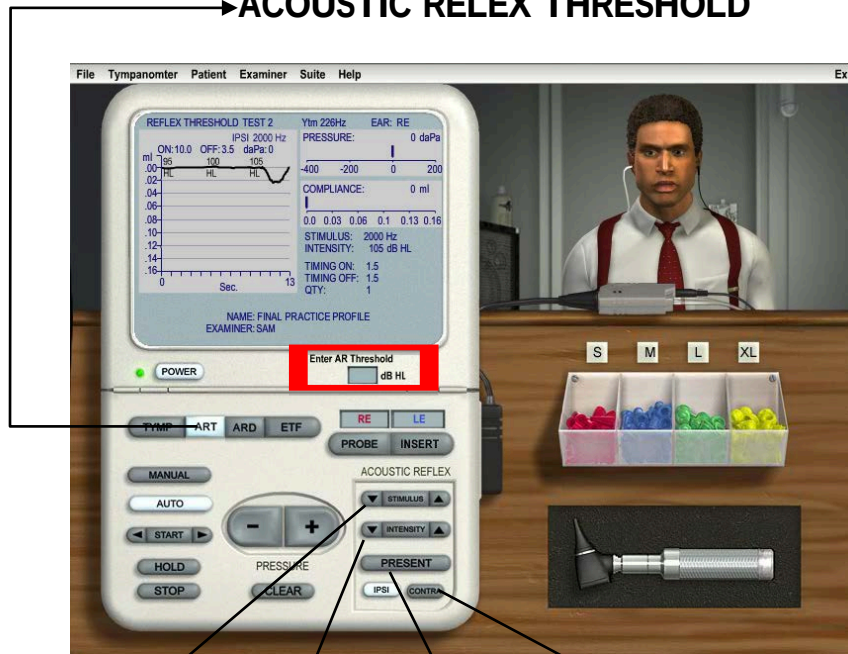
MANUAL : Manually increase or decrease the pressure in the probe tip starting at either -400 or 200 daPa. This method requires the user to use the +/- pressure buttons to perform the test.

AUTO: Automatically changes the pressure on the tympanic membrane and records the results on the tympanogram.

HOLD/STOP: The HOLD button can be used to pause a test which can then be restarted by pressing the START button. The STOP button ends a test and cannot be restarted.

START : When the AUTO button is activated pushing the START button begins the pressure sweep in the ear when the probe is located. The arrows to the left and right of this button can be used to indicate if the test begins in the positive to negative region.

→ ACOUSTIC RELEX THRESHOLD



STIMULUS:
Used to adjust the test frequency of the presented tone to 500 Hz, 1000 Hz, 2000 Hz, or 4000 Hz.

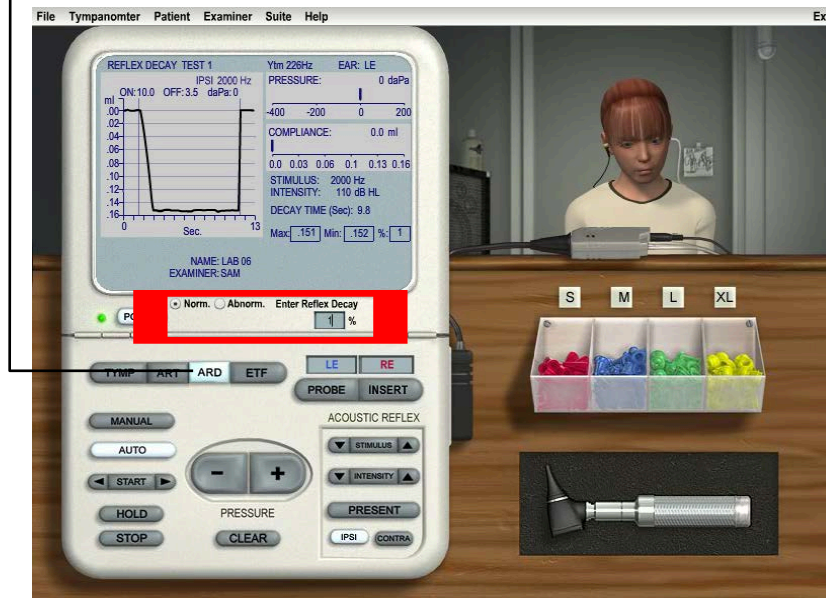
INTENSITY: Used to adjust the starting intensity of the presented tone to between 0 dB HL and 110 dB HL.

PRESENT: Presents the specified tone to the patient and increases the intensity of the tone in 5 dB increments until a contraction of the stapedius muscle is recorded.

IPSI / CONTRA:
Determines if selected tone is presented ipsilaterally or contralaterally in relation to the probe tip.

NOTE: After the acoustic reflex threshold has been determined use the indicated field to record the result.

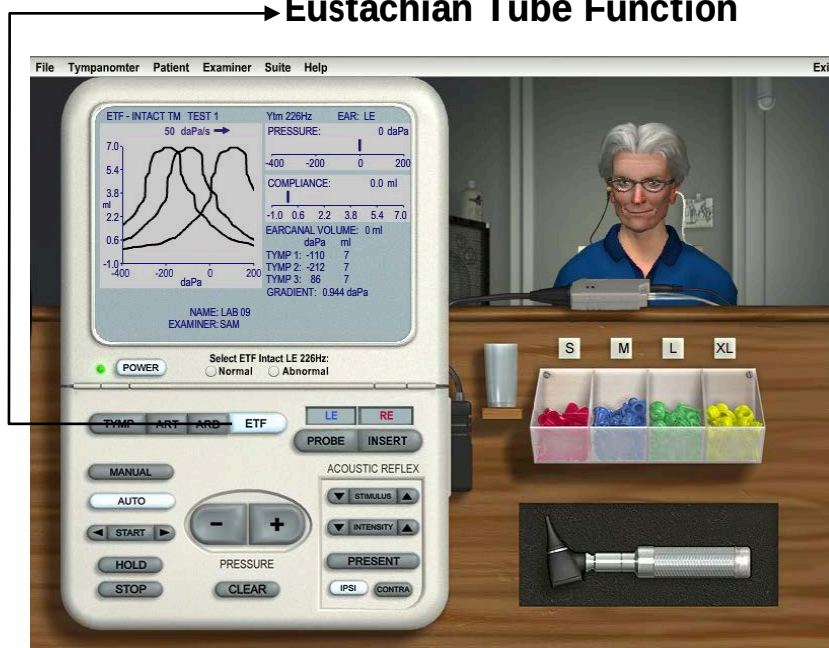
→ ACOUSTIC RELEX DECAY



Procedures for performing an Acoustic Reflex Decay test are very similar to those of the Acoustic Reflex Threshold and utilize the same push buttons on the Virtual Tympanometer. The user can select the desired stimulus and intensity of the test tone and if it will be presented ipsilaterally or contralaterally in relation to the probe tip. After the minimum and maximum values are found they can be entered in the respective boxes in the main window. A calculated percentage can then be recorded in the field indicated below the main window along with a diagnosis of either a normal or abnormal reflex decay.

It is important to note that values recorded in the main window will not be saved if a new test is performed. They should be saved in the field beneath the main window.

→ Eustachian Tube Function



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