

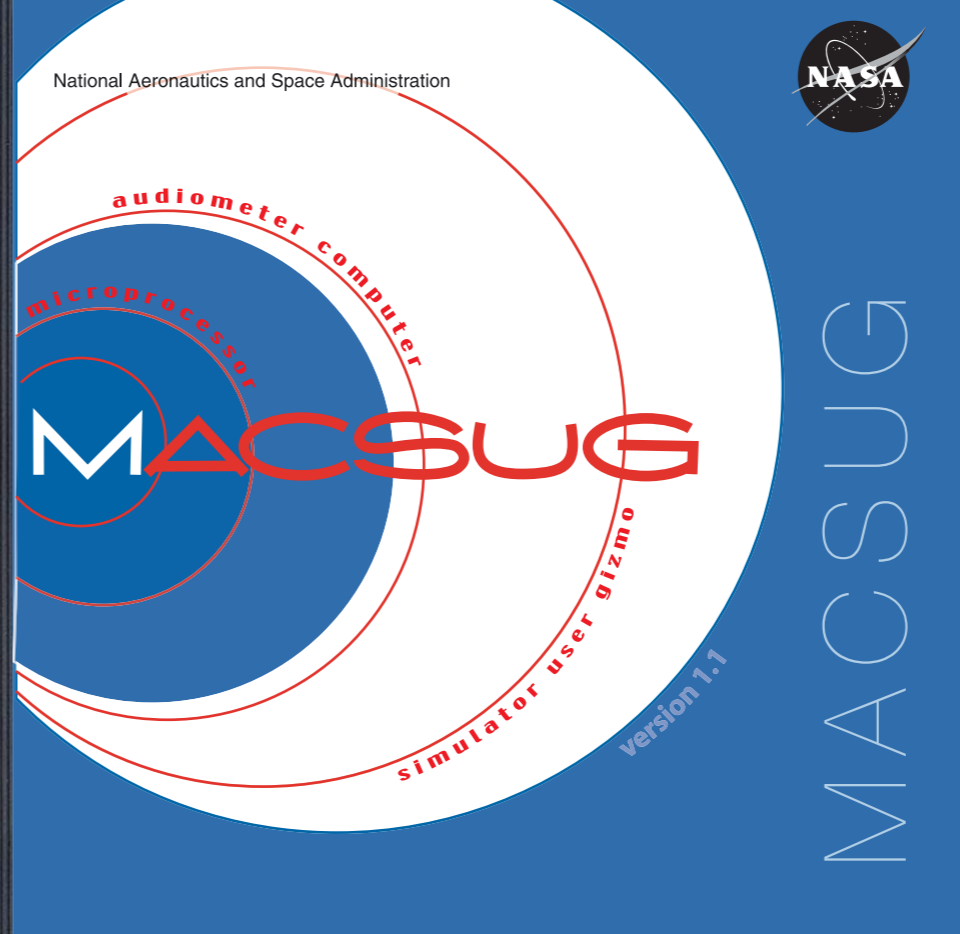
The NASA Glenn Research Center Acoustical Testing Laboratory has produced this Manual Audiometer Computer Simulator User Gizmo **MACSUG** training software as an educational resource for simulating and illustrating techniques and principles of manual audiometry and audiogram review.

**MACSUG** visually displays the process of manual pure-tone, air conduction audiometric testing, when used in a teaching environment where the user (individual or instructor with students) enters input that simulates the response of the patient. A computer using **MACSUG** software can be used to demonstrate basic manual audiometry techniques in a format consistent with microprocessor audiometers used in industrial hearing conservation programs. These concepts may be easily displayed to large groups in a classroom setting using a computer projector system or even the computer's monitor.

**MACSUG** may also be used to teach audiogram review and OSHA recordability determination for industrial hearing conservation programs, including calculation of shifts, STS metrics (with and without age corrections) and average hearing level. **MACSUG** has been developed as an educational tool for classroom use by an instructor, but it may also be used by individuals who wish to practice or review their understanding of pure-tone audiometric testing and audiogram review principles.

**MACSUG** is intended to be a generic teaching tool and is not intended to mimic or endorse any commercial product. **MACSUG** does not include features related to clinical audiology education. **MACSUG** is not intended for clinical use.

For more information and free downloadable **MACSUG** software, please visit the NASA Glenn Research Center Acoustical Testing Laboratory website at <http://acousticaltest.grc.nasa.gov>



## About **MACSUG**

### Credits:

Software Engineering:  
Paul J. Passe  
Analex Corporation  
NASA Glenn Research Center

Design:  
Nicholas Hawes  
Cleveland Institute of Art

Prepress production:  
NASA Glenn Research Center  
LTID / Imaging Technology Center and  
Publishing Services

**MACSUG** is a collaborative project of the NASA Glenn Research Center Acoustical Testing Laboratory and the NASA Johnson Space Center Audiology and Hearing Conservation Clinic.

It is recommended that **MACSUG** be run on a PC running Windows®95, Windows®98, Windows ME®, Windows®2000, or Windows XP®.

This software product may not be incorporated in whole or part into any product, website, or media that is redistributed or resold.

MACSUG was developed for use by:

- Course Directors of CAOHC-approved courses
- Professors of university-level audiology courses
- Hearing conservationists who explain audiometric test procedures in OSHA-required employee training programs
- Hearing conservationists, audiologists, and physicians who provide patient education

MACSUG computer screen images can be projected in a classroom setting to illustrate:

- details of the manual audiometry process
- real-time STS, age-correction, and average hearing level calculations
- interdependence of variables in the audiometric equation (current and baseline ages, use of age corrections, baseline and current audiome on process)
- audiometric case studies for class discussion

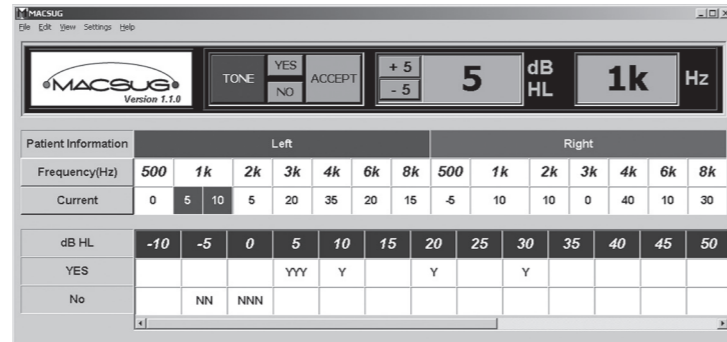
MACSUG can be used with multiple computers in audiometry lab and practicum sessions.

MACSUG can be used as a self-study and homework aid to:

- review and practice manual audiometry techniques
- learn and understand STS and age correction calculations
- view and evaluate instructor-supplied audiogram or case files

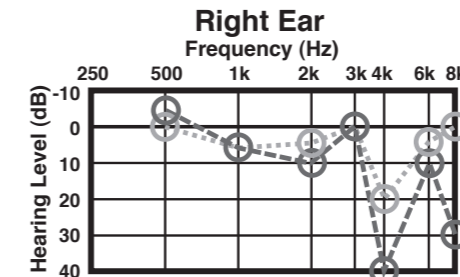
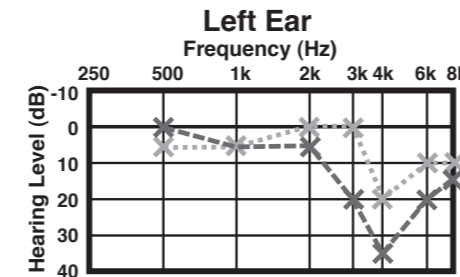
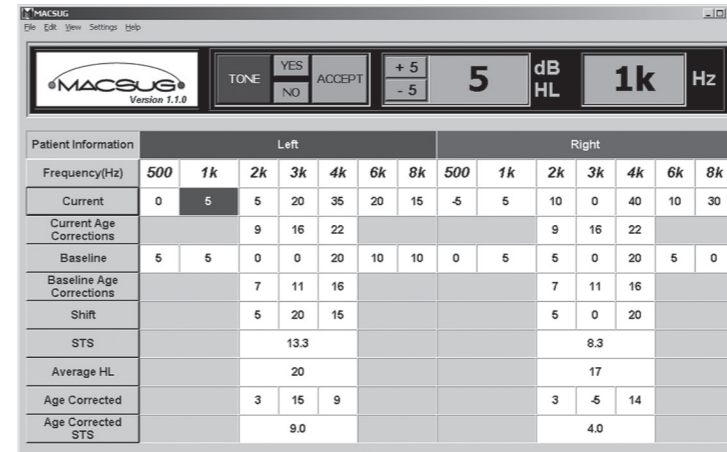
MACSUG can be used as a desk-top calculator and graphic display to convey concepts such as STS in a patient counseling environment

The MACSUG screen displays the process of manual audiometric testing. A tally helps track patient responses to aid in hearing threshold determination.



MACSUG is available as a free downloadable application at:  
<http://acousticaltest.grc.nasa.gov>

In audiogram review mode, MACSUG displays calculated parameters that compare the "current" and "baseline" audiograms, which may also be viewed on a graph.



MACSUG Features

- Simulates screen displays of a typical microprocessor audiometer, including key functions used to determine hearing thresholds in manual air conduction audiometry.
- Tally tracks "yes" and "no" patient responses to audiometric tone presentations as an aid in hearing threshold determination. Tally may be hidden for more challenging practice.
- Pop-up instructional messages highlight conditions that warrant attention.
- Audiogram includes 8000 Hz, as recommended by NIOSH for hearing conservation audiometry.
- Audiograms are treated as "separate ear" files, in accordance with OSHA-required "separate ear baseline revision" procedures.
- Plotting function displays current and/or baseline audiograms.
- Screen may be saved as an image file for later use in PowerPoint slides, handouts, homework assignments, tests, and other printed materials.
- Sample audiograms and cases are provided. New audiograms and complete cases can easily be created and saved for later use.
- Multiple methods are provided for easily modifying audiograms while viewing resulting changes in calculated parameters.
- Browser windows provide flexibility in file management. Audiogram and case files can be stored anywhere on the user's computer for later retrieval.
- Selectable prompts and instructional features accommodate both instructor-led and self-study modes as well as varying levels of mastery.
- Display colors for MACSUG screen features may be easily customized.
- MACSUG displays air conduction data only, not other audiometric data (e.g., bone conduction or speech audiometry).