

keTRIVENI AUDIOMETER MANUAL (Rev 1.20)

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Congratulations on your selection of an audiometer that was built for field or clinical use by field based and clinical based audiologists from around the world who have shared their ideas on the perfect low-cost audiometer.

PACKING LIST

- ✍ TAM 25 Audiometer.
- ✍ S.M.P.S Power supply with battery backup.
- ✍ TDH 49 Headphones.
- ✍ Oticon B71 Bone conductor.
- ✍ External microphone with lapel clip.
- ✍ Patient Response Switch.
- ✍ Installing and Using PC Software.
- ✍ Operating Manual.

SPECIFICATIONS

SPEECH/TONE SECTION

✍ Oscillator	Analog with digital control.
✍ Pure Tone Attenuator	in Steps of 5dB.
✍ Attenuator Range	-20 dB to 120 dB.
✍ Attenuator Linearity	Maximum Error at Any One Attenuator Setting is +/- 1 dB.
✍ Tone Interruption	Less than 100ms for rise & Decay of Tone.
✍ Frequency Range	(For Air Conduction) 250Hz, 500Hz, 750Hz, 1KHz, 1.5KHz, 2KHz, 3KHz, 4KHz, 6KHz, 8KHz (For Bone Conduction) 250Hz, 750Hz, 500Hz, 1KHz, 1.5KHz, 2KHz, 3KHz, 4KHz, 6KHz
✍ Frequency Accuracy	Within 3%.
✍ Hearing Level Accuracy	Within 2dB.
✍ Maximum dB settings For Air Conduction	250 Hz ----- 90 dB 500 Hz ----- 120 dB 750 Hz ----- 120 dB 1.0 kHz ----- 120 dB 1.5 kHz ----- 120 dB 2.0 kHz ----- 120 dB 3.0 kHz ----- 120 dB 4.0 kHz ----- 120 dB 6.0 kHz ----- 100 dB 8.0 kHz ----- 100 dB SPEECH ----- 100 dB
✍ Maximum dB settings For Bone Conduction	250 Hz ----- 50 dB 500 Hz ----- 60 dB 750 Hz ----- 60 dB

1.0 kHz ----- 60 dB
 1.5 kHz ----- 60 dB
 2.0 kHz ----- 60 dB
 3.0 kHz ----- 60 dB
 4.0 kHz ----- 60 dB
 6.0 kHz ----- 60 dB
 SPEECH ----- 60 dB

NOISE SECTION

✍ Noise	Wide, Narrow & Speech Band.
✍ Attenuator (Masking)	In Steps of 5 dB.
✍ Masking Range	0 dB to 100 dB.
✍ Attenuator Linearity	Maximum Error at Any One Attenuator Setting is +/- 1 dB.

OTHER SPECIFICATIONS

✍ Total Harmonic Distortion + Noise	Less Than 3% at maximum Intensity settings.
✍ Input Power	90V-270V/ 50/60 Hz A.C. 6V D.C. for battery operation.
✍ Size of Audiometer	18.5 cm x 13.0 cm x 5.5 cm.
✍ Weight	3.2 Kg Audiometer and Power supply. And battery.

AUDIOMETER POWER SUPPLY

- 1) Your audiometer may have come with a power supply with in built battery and S.M.P.S or just with an S.M.P.S.
- 2) First connect the silver colored jack from the power pack to the audiometer, at the point marked 'POWER INPUT'.
- 3) Then connect the mains cord to the audiometer power pack.
- 4) Connect the other end of the mains cord to the mains supply.
- 5) If you have a power supply with battery, skip this point. If you have the non battery power supply, then turn on the power supply by

- flipping the switch on the power supply to the 'ON' position. Your audiometer must turn on.
- 6) The following points are only for power pack with inbuilt battery.
 - 7) If you have a power supply with built in battery then flip the switch at the back of the power pack to the 'ON' position, it glows red indicating that power is present. Then flip the switch on the front of the power pack to the 'AUDIOMETER' position the audiometer will now turn on.
 - 8) To use the power pack on battery disconnect the mains or turn off the switch at the back of the power supply. The battery will now supply power to the audiometer.
 - 9) To charge the battery flip the switch at the back of the power pack to the 'ON' position, it glows red indicating that power is present. Then flip the switch on the front of the power pack to 'CHARGER' position. The battery will start charging.
 - 10) If the battery is charged for 8 hours it can power the audiometer for about 6 to 8 hours. When the battery becomes low the 'LOW BAT.' Indicator on the front panel will glow red indicating its time to recharge or use on mains.
 - 11) The audiometer will be off during the time duration the battery is charging.

FRONT PANEL KEYS AND THEIR OPERATION

- 1) INTENSITY (UP): - This key allows the user to increment the hearing level intensity in steps of 5 dB. The maximum HL intensity is 120 dB depending on the input and output conditions.
- 2) INTENSITY (DOWN): - This key enables the user to decrement the Hearing level intensity in steps of 5dB. The minimum HL intensity is - 20 dB depending on the input and output conditions.
- 3) MASK (UP): - This switch allows the user to increment the masking level intensity in steps of 5 dB. The maximum masking intensity is 100 dB.

- 4) MASK (DOWN): - This key allows the user to decrement the masking level intensity in steps of 5 dB. The minimum masking intensity is 00 dB.
- 5) FREQUENCY (UP): - This enables the user to increment the frequency of the pure tone (when it is selected). The maximum attainable frequency can be 8 KHz depending upon the output selected.
- 6) FREQUENCY (DOWN): - This enables the user to decrement the frequency of the pure tone (when it is selected). The minimum attainable frequency is 250 Hz.
- 7) INT: - This is the Interrupt switch, which when pressed, presents a Pure Tone, if tone has been selected as the input. In Speech mode, it interrupts the Speech.
- 8) SPEECH/TONE: - This key helps the user to select any one of the following inputs.
 - a) Tone
 - b) SpeechBy default, the selected input is Tone
- 9) +10 dB: - If Input is Pure Tone and this key is pressed along with the Int key, the presented Tone is incremented by 10 dB, when possible. When Input is Speech, pressing this key alone will increment the Speech by 10 dB, when possible.
- 10) LEFT/RIGHT/BONE: - This key helps the user to select any one of the following outputs.
 - a) A.C. Left
 - b) A.C. Right
 - c) Bone Left
 - d) Bone RightBy default, the selected output is A.C. Left
- 11) L/R: - This key helps the user to toggle quickly between left/right sides for the selected output. Thus if output is 'AIR' then the tone can be quickly switched between the left and right headphones by pressing this key.

- 12) MASK SELECT: - Pressing this key when pure tone is input will select between NARROW AND WIDE BAND masking. Pressing this key when speech is input will select between SPEECH & WIDE BAND masking.

BACK PANNEL CONNECTIONS

1. EXTERNAL MICROPHONE: - Socket for the supplied external microphone.
2. BONE: - Socket for the supplied Bone conductor.
3. RIGHT: - Socket for the right headphone.
4. LEFT: - Socket for the left headphone.
5. PATIENT SWITCH: - Socket for the supplied patient switch.
6. RS 232: - Connect the supplied computer cable to this connector. The Audiometer connects to the computer using the 9 pin serial interface.

Triveni TAM 25 Audiometer Software Manual Ver2.00

End-User License Agreement

1> Grant of License. This EULA grants you the right to use and install this software on a single computer. This Software Product is licensed, not sold.

2> Reverse Engineering, Recompilation, and Disassembly: - You may not reverse engineer, recompile, or disassemble the SOFTWARE PRODUCT, except to the extent that such activity is permitted by law.

3> Rental: - You may not rent, lease, or lend the SOFTWARE PRODUCT.

4> Customer Remedies: - Triveni's entire liability and your exclusive remedy shall not exceed the price paid for the software product.

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TRIVENI TAM 25 AUDIOMETER SOFTWARE FEATURES

- ? Using the Triveni Audiometer software the audiometer can be turned into a complete P.C based audiometer.
- ? Patient records can be easily maintained on P.C thus eliminating paper work.
- ? Old records can be reviewed and updated later.
- ? The intuitive user interface allows you to work much faster and efficiently.

Installation Issues

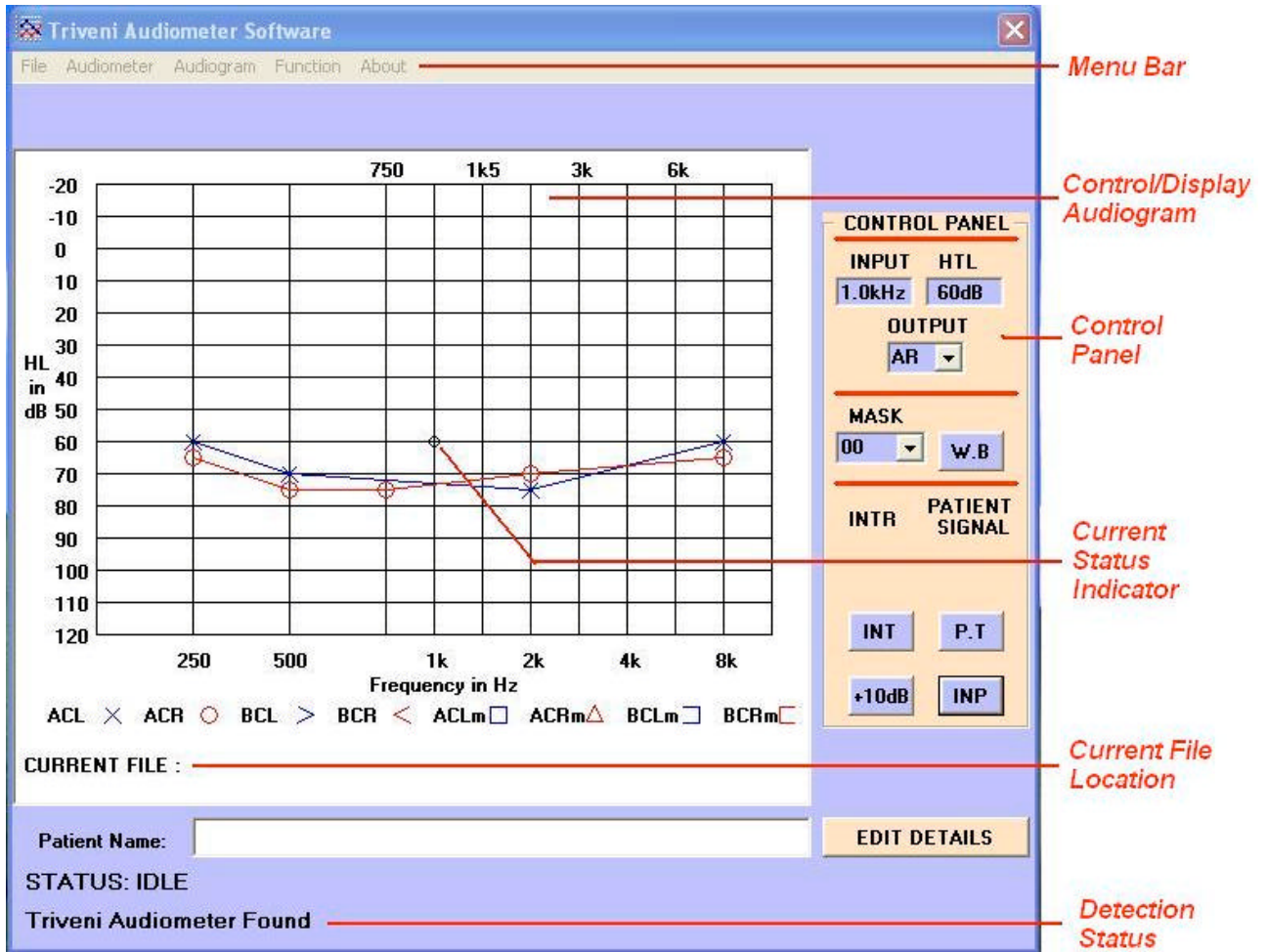
1> To install the product, insert the CD that came along with Audiometer into your CD-ROM drive and then run the setup.exe program from the 'Run' option after clicking the 'Start' button.

2> Type 'x:\setup' where 'x' is the letter assigned to your CD-ROM drive. When Setup asks you for the directory where you would like to install the software, it is recommended that you keep the default directory. Setup then proceeds to install the software asking you to install the remaining disks as needed.

NOTE--> FOR WINDOWS NT USERS

Service Pack 3 or higher is needed for installation of the software on NT based machines. The Service Pack can be downloaded from the Microsoft web site.

USER INTERFACE



Starting the software

- 1>** The software is designed to run optimally on a screen resolution of 800x600. If your screen resolution is lower please change it to the required resolution.
- 2>** Connect the audiometer to any spare 'Com' Port with the cable provided. (Com 1 to Com 4 is currently supported).
- 3>** Turn on the audiometer.
- 4>** To start the program click: - Start > Programs > TAM-Control2 > TAM-Control2 Audiometer.
- 5>** When the software starts the audiometer should be automatically detected. 'Detection Status' will confirm audiometer detection.

Controlling your audiometer

- 1>** The 'Control/Display Audiogram' is your primary control and display tool. (See user interface)
- 2>** The 'Current Status' indicator displays the current frequency and intensity to be generated by the audiometer. This same information is numerically displayed in the INPUT and HTL text fields in the 'CONTROL PANEL'.
- 3>** To select a different frequency and intensity click on that particular point on the audiogram and the "Current Status' indicator will move to that point. For example to generate a tone of 6 kHz at 30dB click on the audiogram at the intersection point of 6 kHz and 30dB.
- 4>** To present a tone click the 'INT' button in the 'CONTROL PANEL'. You can also right click on the audiogram and select the 'Int Lock' option to lock/release the interrupt.
- 5>** After the threshold has been determined right click on the audiogram and click on the 'Save Data' option to plot the audiogram. The 'Save Data' option allows you to save the data as a regular symbol or as a no response symbol.
- 6>** After audiometry is complete the audiogram can be saved to disk using the File > Save option.
- 7>** The Patient's Name Field displays the name of the current patient, if it had been previously saved. In case of a new patient it is blank.
- 8>** The relevant patient information can be entered/changed by clicking on the 'EDIT DETAILS' button.

Control Panel

INPUT SELECT button: - Allows you to select between Tone / Speech inputs.

1> When speech input is selected the intensity can be varied from -20dB to 100dB and the 'Current Status' indicator always remains at 1kHz.

MASK dropdown box: - This selection allows you to apply 0 - 100dB of wide band masking to the opposite ear.

W.B / N.B: - Pushing these key toggles between wide band masking noise and narrow band masking noise when the input is tone. If input is speech then it toggles between wide band noise and speech band noise.

OUTPUT dropdown box: - This selection allows you to set the output. Example AR, AL, BR, BL.

INT button: -

1> If input is 'Tone' pressing this key will present to tone to the subject.

2> If input is 'Speech' pressing this key will interrupt the speech, which is being presented to the subject.

P.T button: - Pressing this button will result in a pulsing tone being presented to the subject. The tone will be on for 1 second and off for 1 second.

+10dB button: - This button is used to increment the HL level by 10 dB provided the headroom exists.

Menu Options

'File' Menu: -

- 1> New:** - Clears existing data if any, on the audiogram so that new audiometry can be carried out.
- 2> Open:** - Allows you to open a previously saved record.
- 3> Save:** - Allows you to save current audiogram on disk.
- 4> Exit:** - Quits the program.

'Audiometer' Menu: -

- 1> Comm. Ports:** - If the audiometer is detected automatically this option is disabled. But if the audiometer could not be automatically detected then this option is used to manually select the comm. port to which the audiometer is connected.

'Audiogram' Menu: -

- 1> Select:** - After doing a complete audiometry i.e. AC and BC you can use this option to selectively view data on the audiogram. Example if AC-L and BC-L are selected (checked) then only these outputs will appear on the audiogram. The data for other outputs is still present but it's not visible.
- 2> Copy To Clipboard:** - This option allows you to copy the audiogram to clipboard. From the clipboard you can paste the audiogram to an application of your choice. Example to copy the audiogram to MS Word click on 'Copy To Clipboard' option in the TAM-Control software (Audiogram > Copy To Clipboard) and then open MS Word and click the menu Edit > Paste. The audiogram will now appear in the document.
- 3> Print:** - The option opens a form where you can select if you want to print only the Audiogram or the Audiogram along with patient details. The selected information is displayed in Microsoft Word Automatically. For this feature to work Microsoft Word must be installed on your computer.

'Function' Menu: -

- 1> Int Lock:** - This option allows you to 'lock' or 'release' the interrupt.
- 2> Pulse:** - Same as pulse key. If selected test is 'Normal' or 'Warble' this menu option allows you to present a pulsing tone to the subject.

3> Save Data: - After the threshold has been determined this option is used to save the data and plot the audiogram. The symbol can be saved as a regular symbol or as a no response symbol.

'About' Menu: -

This option displays the software and hardware version numbers.

EDIT DETAILS BUTTON: -

Clicking on this button opens a form, which contains the patient's details.

1> If the patient is a new patient then fill in the required information about the patient.

2> If the patient's details have already been entered before edit it as required.

3> Then click on the OK Button.

4> Click on the Cancel Button if you don't want to save the new changes made to the patient's details.

5 > Click on the Save Option from the file menu in order to save the patient's details.

CALIBRATION

- ✍ Digital calibration (Can be calibrated from front panel) No moving parts inside the audiometer (Enhanced stability of calibration)
- ✍ Can be calibrated to accommodate THD39/49 or HD-01 headphones
- ✍ Calibrated to accommodate B71 bone conductor.
- ✍ Compliant with ANSI S3.6 1989 standard (If used with standard accessories)

CALIBRATION FOR THE TAM-25 AUDIOMETER

Caution: - Calibration must be carried out only by a trained technician.

The calibration instructions show how to setup the audiometer for calibration. They do not explain the setup or the equipment needed for calibration. It is assumed that the user is familiar with calibration techniques and equipments.

About the TAM-25 Audiometer:-

The TAM-25 audiometer can be calibrated separately for LEFT, RIGHT and BONE outputs. This make the audiometer very versatile in that it does need matched pair of headphones. The TAM-25 can easily accommodate unmatched pair with difference of up to 10dB at any given frequency.

Calibrating for LEFT ear output:-

- 1> Connect the Headphones to the LEFT & RIGHT socket at the back of the audiometer.
- 2> Now set the audiometer to display 250Hz, 90dB, AL.
- 3> Now press the INTERRUPT key.
- 4> With the INTERRUPT key pressed, press the FREQUENCY UP & FREQUENCY DOWN keys simultaneously.
- 5> The exact order of the FREQUENCY UP & FREQUENCY DOWN key is not important. To enter CALIBRATION MODE all three keys (INTERRUPT, FREQUENCY UP, and FREQUENCY DOWN) must be held down simultaneously with the INTERRUPT key being the first always.
- 6> You will now see F:A:M displayed on the LCD screen. The screen will look something like this F:A:M ff aa mm (where ff, aa & mm are 2 digit hexadecimal numbers)
- 7> These numbers are the digital representation of the voltages that are output by the circuits inside the audiometer. They do not convey direct information about the frequency or the intensity.
- 8> Now to change the frequency press the FREQUENCY UP to increase or FREQUENCY DOWN to decrease the frequency of the selected output. Please note the frequency setting is stored common to all outputs (i.e. LEFT, RIGHT & BONE) so change made is reflected across all outputs. A change made to the frequency setting is also reflected by the changing 'ff' numbers.

- 9> Now to change the intensity by less than 5dB press the HTL UP to increase or HTL DOWN to decrease the intensity of the selected output. Please note the intensity setting is separately stored for LEFT, RIGHT & BONE outputs. A change made to the intensity setting is also reflected by the changing 'aa' numbers. For LEFT & RIGHT outputs the 'aa' value must be between 20 & 7f. For BONE the 'aa' value must be between 20 & af.
- 10> To change the intensity by a margin of 5dB press the MASKING UP to increase or MASKING DOWN to decrease the intensity in 5dB steps. A change made using the masking keys to the intensity setting is also reflected by the changing 'mm' numbers.
- 11> Now that you have calibrated at 250Hz its time to save all that hard work! Press the +10dB button to save the calibrated value.
- 12> Now press the INTERRUPT key.
- 13> With the INTERRUPT key pressed, press the FREQUENCY UP & FREQUENCY DOWN keys simultaneously. Again the order of the FREQUENCY UP & FREQUENCY DOWN key is not important just that they all must be held down simultaneously with the INTERRUPT key being the first always. (This is the same way you entered this mode)
- 14> Now to calibrated for any other frequency select that frequency & set the intensity to 90dB and repeat above steps.

Calibrating for RIGHT ear output:-

- 15> Connect the Headphones to the LEFT & RIGHT socket at the back of the audiometer.
- 16> Now set the audiometer to display 250Hz, 90dB, AR.
- 17> Now press the INTERRUPT key.
- 18> With the INTERRUPT key pressed, press the FREQUENCY UP & FREQUENCY DOWN keys simultaneously.
- 19> The exact order of the FREQUENCY UP & FREQUENCY DOWN key is not important. To enter CALIBRATION MODE all three keys (INTERRUPT, FREQUENCY UP, and FREQUENCY DOWN) must be held down simultaneously with the INTERRUPT key being the first always.
- 20> You will now see F:A:M displayed on the LCD screen. The screen will look something like this F:A:M ff aa mm (where ff, aa & mm are 2 digit hexadecimal numbers)
- 21> These numbers are the digital representation of the voltages that are output by the circuits inside the audiometer. They do not convey direct information about the frequency or the intensity.
- 22> Now to change the intensity by less than 5dB press the HTL UP to increase or HTL DOWN to decrease the intensity of the selected output. Please note the intensity setting is separately stored for LEFT, RIGHT & BONE outputs. A change made to the intensity setting is also reflected by the changing 'aa' numbers. For LEFT & RIGHT outputs the 'aa' value must be between 20 & 7f. For BONE the 'aa' value must be between 20 & af.
- 23> To change the intensity by a margin of 5dB press the MASKING UP to increase or MASKING DOWN to decrease the intensity in 5dB steps. A change made using the masking keys to the intensity setting is also reflected by the changing 'mm' numbers.

- 24> Now that you have calibrated at 250Hz its time to save all that hard work! Press the +10dB button to save the calibrated value.
- 25> Now press the INTERRUPT key.
- 26> With the INTERRUPT key pressed, press the FREQUENCY UP & FREQUENCY DOWN keys simultaneously. Again the order of the FREQUENCY UP & FREQUENCY DOWN key is not important just that they all must be held down simultaneously with the INTERRUPT key being the first always. (This is the same way you entered this mode)
- 27> Now to calibrated for any other frequency select that frequency & set the intensity to 90dB and repeat above steps.

Calibrating for BONE output:-

- 28> Connect the Bone vibrator to the BONE socket at the back of the audiometer.
- 29> Now set the audiometer to display 250Hz, 25dB, BL.
- 30> Now press the INTERRUPT key.
- 31> With the INTERRUPT key pressed, press the FREQUENCY UP & FREQUENCY DOWN keys simultaneously.
- 32> The exact order of the FREQUENCY UP & FREQUENCY DOWN key is not important. To enter CALIBRATION MODE all three keys (INTERRUPT, FREQUENCY UP, and FREQUENCY DOWN) must be held down simultaneously with the INTERRUPT key being the first always.
- 33> You will now see F:A:M displayed on the LCD screen. The screen will look something like this F:A:M ff aa mm (where ff, aa & mm are 2 digit hexadecimal numbers)
- 34> These numbers are the digital representation of the voltages that are output by the circuits inside the audiometer. They do not convey direct information about the frequency or the intensity.
- 35> Now to change the intensity by less than 5dB press the HTL UP to increase or HTL DOWN to decrease the intensity of the selected output. Please note the intensity setting is separately stored for LEFT, RIGHT & BONE outputs. A change made to the intensity setting is also reflected by the changing 'aa' numbers. For LEFT & RIGHT outputs the 'aa' value must be between 20 & 7f. For BONE the 'aa' value must be between 20 & af.
- 36> To change the intensity by a margin of 5dB press the MASKING UP to increase or MASKING DOWN to decrease the intensity in 5dB steps. A change made using the masking keys to the intensity setting is also reflected by the changing 'mm' numbers.
- 37> Now that you have calibrated at 250Hz its time to save all that hard work! Press the +10dB button to save the calibrated value.
- 38> Now press the INTERRUPT key.
- 39> With the INTERRUPT key pressed, press the FREQUENCY UP & FREQUENCY DOWN keys simultaneously. Again the order of the FREQUENCY UP & FREQUENCY DOWN key is not important just that they all must be held down simultaneously with the INTERRUPT key being the first always. (This is the same way you entered this mode)
- 40> Now to calibrated for any other frequency select that frequency & set the intensity to 45dB and repeat above steps. Calibration for 250Hz Bone is carried out at 25dB while for all other frequencies is carried out at 45dB.

Tips:-

- 1> Calibration values are saved to permanent memory only when you quit the calibration mode. Thus always quit the calibration mode using the procedure described above to retain calibration after power off.
- 2> Since changes to frequency are reflected across all outputs. Start calibration with LEFT ear and calibrate the frequency here, then move on to calibrate the RIGHT & BONE outputs and calibrate these outputs without changing the frequency settings.

Calibrating for Speech:

- 1> For calibrating the Speech input please open the audiometer only. Then turn the preset P1 (MIC) located in the center of the PCB near the ELAYS (black color). Turn this counter-clockwise to increase gain and clockwise to decrease the gain.

Note: Calibrating for NB & WN is not possible at this time. If needed – supply correction factors.