

MADSEN Midimate

602 & 622
Diagnostic Audiometers

Quick Guide

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Technical support

Please contact your supplier.

GN Otometrics A/S

9 Hoerskaetten

DK-2630 Taastrup Denmark

T: +45 45 75 55 55, F: +45 45 75 55 59

www.otometrics.com

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1 Introduction

1.1 Standards and safety precautions

Standards. The MIDIMATE 602/622 complies with the following standards for audiometers: EN 60645-1, -2; ANSI S3.6.

 The MIDIMATE 602/622 and this manual are CE-marked according to the Medical Devices Directive 93/42/EEC.

 The MIDIMATE 602/622 is marked with this symbol to indicate compliance with Type B requirements of EN 60601-1.

Safety. This operation manual contains information and warnings, which must be followed to ensure the safe performance of the MIDIMATE 602/622. Local government rules and regulations, if applicable, should also be followed at all times. Special note should be made of the following:

 The MIDIMATE 602/622 is marked with this symbol when it is important that the user refers to associated warnings given in this manual.

 Any personal computer connected to the MIDIMATE 602/622 must comply with the requirements of IEC 950, "Safety of information technology equipment, including electrical business equipment".

Service and repair. Service and repair of electromedical equipment should be carried out only by the equipment manufacturer or by authorized representatives. The manufacturer reserves the right to disclaim all responsibility for the operating safety, reliability and performance of equipment serviced or repaired by other parties.

Cleaning and disposal. Periodically clean the LCD screen. Use an anti-static non-solvent solution on a lint-free cloth. Use a soft brush to remove dust. Use a small amount of mild detergent on a damp cloth to clean the cabinet and front.

Earphones, the eartip of the masking insert phone and the bone vibrator should be cleaned regularly with a damp cloth.

Do not attempt to clean and re-use the disposable yellow foam insert tips for the optional E-A-RTONE 3A Masking Insert Phone. No special disposal requirements apply to these insert tips.

When the MIDIMATE 602/622 is taken out of use, it should be disposed of in compliance with local regulations for disposal of electrical equipment.

Caution! Do not use chemical cleaning agents containing ammonia or alcohol as they will damage the cabinet and display.

1.2 About this manual

This manual is intended for audiologists, audiological assistants and health care staff in related professions performing audiological tests on patients.

1.2.1 Not covered in this manual

Some MIDIMATE 602/622 functions are not covered in this manual. This includes changing a fuse, changing the supply voltage, some power-on options, calibration, some print setup, printout trouble-shooting, on-line operation to a personal computer (except patient ID), and tables of setup structures and procedures, as well as test setups and print options.

1.2.2 Abbreviations and terms

Display texts and front panel controls are shown in the `Courier` font.

The following abbreviations are used in the MIDIMATE 602/622 display:

ABLB =	Alternate Binaural Loudness Balance
Bin. S+M =	Binaural Stimulus plus Masking
C =	Continuous
Ext =	External (Tape 1/Tape 2)
F.F =	Free-Field
HLL =	Hearing Level Lock
L =	Left
NBN =	Narrow Band Noise
P =	Pulsing
PTS =	Patient Signal
R =	Right
SISI (A) =	Short Increment Sensitivity Index (Air)
SN =	Speech Noise
W =	Warble
WN =	White Noise

The five numbered keys below the display are referred to as **Softkey 1** to **5** because, unlike the other keys, the *software* determines their functions. The current function of each **Softkey** is shown above it in the display (with a few exceptions, such as when you press **Softkey 3** in test mode the `Options Menu` is displayed. In cases where the displayed **Softkey** function shows a choice, the current selection is underlined, as in On/`Off`.

2 Installing the MIDIMATE 602/622

2.1 Rear panel

2.1.1 Connecting transducers and other devices

Before you switch on the electric power, connect the following, as required, to the Rear Panel (or elsewhere, where described):

- **Data Interface** (MIDIMATE 622 only). 25-pin RS-232C serial connection for optional operation together with one of the following:
 1. An external printer via cable part no. 8-71-420;
 2. The ZODIAC 901 via cable part no. 8-71-340;

Note!

For communication with ZODIAC 901, the Baud rate must be set to 9600.

3. A personal computer, via cable part no. 8-71-340. Must comply with IEC 950 requirements, "Safety of information technology equipment, including electrical business equipment". See "Data Interface Operation Manual" (7-26-121).
- **Pt-Sign.** For the Patient Response Handswitch.
 - **Phone L** (Left = blue), **R** (Right = red). Calibrated for use with the TDH 39 headphones supplied as standard with the MIDIMATE 602/622 fitted on an ME 70 noise-excluding Headset or on a TC 89E Headband.
 - **Bone.** For the B-71 Bone Conductor (§4.2).



Warning!

Do not remove or tamper with the bone conductor cable while it is connected to the MIDIMATE 602/622. Either disconnect the cable from the Rear Panel or switch off and disconnect the electric power supply first.

- **Insert.** For the optional Insert Phone for masking (§4.2.2).
- **FF, L and R.** (Free Field, Left and Right) For optional free-field loudspeakers via external amplifiers. Max 3 V RMS from 500 Ω .
- **Monitor.** For optional monitor headset with boom microphone 8-75-340 or optional monitor adaptor 8-71-140 with monitor loudspeaker (such as 8-75-330) and talkover/live voice microphone (such as 8-72-240).
- **TB-Mic.** For optional patient talkback microphone.
- **Tape 1, Tape 2.** For pre-recorded speech from an optional stereo CD player or tape-recorder. Sensitivity 0.1 V to 3.0 V RMS into 47 k Ω .

2.1.2 Connecting the electric power supply

Before switching on the MIDIMATE 602/622, read the following:

 **Warning!** Before you connect the power cable, make sure that the voltage from the electrical outlet matches the voltage shown on the **Voltage Selector** located beside the **Power** switch.

If necessary, use a small screwdriver to unscrew the two screws at the back of the top panel. Tilt the top panel forwards and remove it. Set the correct voltage and remount the top panel.

 **Warning!** Operating at the wrong voltage may blow the fuses.

 **Warning!** Do not change the voltage selection while the power is connected.

Caution!
Always use an electrical power supply with protective earth, which complies with IEC requirements, such as (a) the power cable supplied, (b) an electrical power supply tested to IEC requirements, (c) a power cable fitted with a 3-pin plug, (d) an extension cable with earth connection, and (e) an extension cable which does not increase the resistance of the earth connection.

Caution!
As this may generate a click, do not switch on the MIDIMATE 602 while the headphones are being worn.

Caution!
Do not leave the optional dust cover on the MIDIMATE 602 with the power switched on.

To switch on press the on/off switch on the right side of the cabinet. The green **Power** LED on the front panel lights when the power is on.

3 Setting Up Test Parameters

Use the MIDIMATE 602/622 to test patients with one of five pre-programmed `User Tests` (§3.1), or with a manual setup by menu (§3.2). MIDIMATE 622 may be set up to store and display for viewing and/or print out thresholds as described in §8.2.

3.1 Preprogrammed user tests

MIDIMATE 602/622 is delivered with `Tests 1` to `3` pre-programmed with typical setups for `Tone/Air` (§4.1), `Tone/Bone` (§4.2) and `Speech` testing with recorded speech (§5.2). To change the setup of these tests and pre-program `Tests 4` and `5` see Chapter 7.

To select one of the other `User Tests`, do as follows:

1. Press **Menu** until `Select User Test` is displayed.
2. Press the **Softkey** corresponding to the required `User Test`.
3. If required, hold down the selected **Softkey** to interrupt the automatic setup sequence. When the sequence is completed the MIDIMATE 602/622 is ready for testing.

3.2 Manual setup by menu

To set up the test parameters manually, do as follows. To backstep in this procedure, press **Menu** instead of a **Softkey**.

1. Press **Menu** to display the `Select Function` screen. The upper line shows the current function and the lower line shows the options you can select by pressing the **Softkeys**.
2. Press **Softkey 1, 2** or **3** to select the `Function` (`Tone`, `Speech` or `Special`) with its corresponding `Output` screen.
3. Press **Softkey 1, 2** or **3** to select the `Output` (`Air`, `Bone` or `F.F.`) and display the `Stimulus Side` screen.
4. Press **Softkey 1, 2** or **3** to select the `Stimulus Side` (`Left`, `Right` or `L+R`) and display the corresponding `Masking` screen, or `Input` screen in the case of `Speech`.
5. If you selected `Speech` in step 0, press **Softkey 1** or **2** to select the required `Input` (`Tape (CD)` or `Micr.`) with its corresponding `Masking` screen.
6. Press **Softkey 1, 2, 3** or **4** to select the type of `Masking` (`No Mask`, `Air`, `Ipsi` or `Bin. S+M`) and to see a list of the selections made (including a reference number for the selected setup).
7. After a few moments the default settings for the selected test are shown. If required, change any of these settings by toggling the corresponding **Softkey**.

8. To set the **Tone Switch** so that it gives a minimum of 1.5 s stimulus when it is pressed, press **Softkey 3** to display the Options Menu and toggle **Softkey 1** until 1.5s On is displayed. Wait 5 sec or press **Menu** to return to test mode.
9. To change the level resolution, press **Softkey 3** to display the Options Menu and toggle **Softkey 1** until 1 dB or 5 dB is displayed. Wait 5 sec or press **Menu** to return to test mode.

4 Pure Tone Testing

4.1 Air Conduction thresholds

4.1.1 Preparing for the test

Before you test the Air Conduction thresholds of a patient, make the following preparations:

1. Connect the patient response handswitch, the headphones, the optional monitor headset (or the optional monitor adaptor with talkover microphone and monitor loudspeaker), and the optional patient talkback microphone.
2. Switch on the electric power supply.
3. Select User Test 1 or change the setup as described in Chapter 0, and make sure that the setup begins with *Tone, Air*.
4. If you use an optional monitor headset or loudspeaker, it will normally give an audible response each time the patient activates the patient response handswitch. To disable or re-enable this function, press **Softkey 3** in test mode to display the *Options Menu*, and then toggle **Softkey 5**. The display shows *PTS-Off* when you can disable the function by pressing **Softkey 5**, and vice versa. The display returns automatically to the current test values after a few moments.
5. Check the monitored level of audible response from the patient response handswitch if it is enabled, and, if necessary, use a screwdriver to adjust the **Pt. Vol.** level on the rear panel until this level is comfortable.

4.1.2 Testing the patient

To test the patient, do as follows:

1. Place the patient, facing away from the MIDIMATE 602/622, preferably in a sound-cabin.
2. Instruct the patient in how to use the patient response handswitch. When the patient presses the handswitch, the **Response** light on the front panel lights, and there is a signal in the optional monitor headset or monitor loudspeaker.
3. If required, instruct the patient in how to use the optional talkback microphone.
4. To check the monitored level of the patient's talkback press the **Talkback** key in the right-hand **Level** section of the front panel, and change it, if required, by turning any of the rotary wheels while you hold down the key. The **Response** indicator shows the percentage used.
5. To check the monitored level of the stimulus press the **Monitor** key in the right-hand **Level** section of the front panel, and, if required, change it by turning any of the rotary wheels while you hold down the key. The **Stimulus** indicator shows the percentage used.

6. Fit the headphones on the patient, with the red phone on the right ear.
7. If required, test the level of the operator's monitor or talkover microphone on the patient. If needed, adjust by pressing and holding down the **Microphone** key in the left-hand **Level** section of the front panel, or the **Talk Over** key and turning any of the rotary wheels. The **Stimulus** indicator shows the percentage used.
8. Toggle **Shift L/R** to select the ear with the better hearing to be tested first. The ear selected for testing is shown on the display above **Softkey 3**.
9. Turn the **Frequency** wheel to set the stimulus frequency shown on the display above **Softkey 1**. Testing normally starts at 1000 Hz.
10. Toggle **Softkey 2** to **P** if pulsed tone is required.
11. To present the stimulus tone to the patient's test ear, press the **Tone Switch**, which is the large key below the **Hearing Level** wheel. The **Stimulus** indicator lights to confirm that the tone is presented and displays the intensity as long as the **Tone Switch** is held down.
12. Turn the **Hearing Level** wheel to change the stimulus intensity until the patient's threshold is found for the current frequency (displayed above **Softkey 1**), and read its value from the display above **Softkey 3**.
13. If **Store** is set up, press **Softkey 3** twice to store this value (MIDIMATE 622 only).
14. Repeat the test at the next frequency. Testing is usually done at increasing frequencies until the highest frequency is reached, and then to test at the frequencies below 1000 Hz in descending order.
15. Repeat the test for the poorer ear.

4.1.3 Testing patients with large threshold differences

If the difference between the thresholds in the two ears is greater than 40 to 60 dB, do as follows:

1. Press **Menu** to display the **Select Function** menu.
2. Press **Softkey 2** to select **Air**, which presents Narrow Band Noise (masking) to the better (contralateral) ear.
3. Use **Softkey 4** to toggle masking On.
4. Turn the **Masking Level** wheel to set the masking level shown on the display above **Softkey 5**.
5. Cooperate with the patient to determine the threshold for Narrow Band Noise for the contralateral ear.
6. Set Masking to a level 15 dB above this threshold.
7. Continue to apply masking to the better ear. Present a tone to the poorer ear at the hearing level that was previously determined to be the tone threshold without masking.

If the patient can still hear the tone, this is the valid threshold. If the patient cannot hear the tone, this is because the threshold determined without masking has been invalidated by contralateral bone conduction to the better ear. How to obtain the valid threshold is described in §4.1.4.

4.1.4 Correcting a threshold invalidated by contralateral bone conduction

In cases where the tone threshold determined for the poorer ear has been invalidated by contralateral bone conduction, do as follows:

1. Press **Softkey 3** to display the Options Menu.
2. Toggle **Softkey 2**, 1 dB/5 dB, to change the level resolution for both hearing level and masking to 5 dB.
3. Increase the hearing level of the tone in 5 dB steps and present the tone. Do so until the patient can hear it.
4. Increase the masking level by 5 dB and repeat step 2.
5. Repeat step 3 until an increase in masking level does not change the tone threshold.

The tone threshold determined under these conditions is the correct one.

4.1.5 Locking the masking level to the hearing level

You can lock the masking level to the hearing level so that any change in the hearing level results in a corresponding change in the masking level. Do as follows:

1. In test mode press **Softkey 3** to display the Options Menu.
2. Toggle **Softkey 4** to activate hearing level lock. If the display shows HLL-On, the hearing level lock will be activated when you press **Softkey 4**.
3. To change the interval between the Masking and Hearing levels, turn the **Masking** wheel.

4.1.6 Testing above 110 dB HL

To override the MIDIMATE 602/622 110 dB (approx.) hearing level limit, which is built in for safety purposes, toggle the **Ext. Range HL** key so that the **Ext. Range HL** lamp lights up. You can then test patients at maximum hearing levels up to 25 dB greater, depending on the transducer in use.

4.1.7 Setting a minimum tone presentation time

Press **Softkey 3** to display the Options Menu, and then **Softkey 1**, 1.5s On/Off, to enable or disable an automatic timer which sustains the effect of pressing the **Tone Switch** for a minimum of 1.5 s.

4.2 Bone Conduction thresholds

Masking is always necessary when Bone Conduction thresholds are tested because of the reduced level of contralateral attenuation.

4.2.1 Masking with TDH39 headphones

The procedure for testing the patient's Bone Conduction thresholds differs from that for Air Conduction as follows:

1. Connect the B-71 Bone Conductor into the **Bone** socket on the rear panel.
2. Select `User Test2` (as described in Chapter 0) to see the set-up for Bone Conduction, unless the default settings have been changed.
3. Make sure that there are no interfering ambient sounds, especially at low frequencies, — if necessary place the patient in a sound cabin.
4. Fit the headphones so that the red (right) phone is applied to the poorer ear for masking, and the other phone is applied to the patient's temple region, leaving the ear to be tested uncovered.
5. Use **L/R Shift** to select the masking output required
6. Use **Softkey 4** to toggle `Air Off`.
7. Use a tone hearing level about 10 to 20 dB above threshold, and check with the patient to find the most sensitive part of the mastoid to place the Bone Conductor. Make sure that there is no contact between the headband, which secures the Bone Conductor, and the headset or headband supporting the TDH39 headphones which could conduct vibrations from one to the other. Leave it in this position until the test is finished.
8. Determine the threshold without masking.
9. Use **Softkey 4** to toggle `Air On`.
10. Test the threshold again with masking.
11. If the threshold has changed, determine the true threshold by testing in the same way as in §4.1.4.
12. Switch the Bone Conductor and headphone to the opposite ears. Test the poorer ear with masking applied to the better ear.
13. If the bone conduction thresholds for the two ears prove to be very different, use a masking insert phone (optional accessory) instead of the TDH39 headphones.

4.2.2 When to use a masking insert phone

The optional masking insert phone (8-75-250) has a much lower level of bone conduction caused by vibration than the TDH39 headphones. Use the masking insert phone instead of the TDH39 headphones for masking when you test the Bone Conduction threshold of patients with much more hearing loss in one ear than in the

other. This is to avoid “false” contralateral masking caused by the high masking level required in the weaker ear.

The test procedure is similar to that described in §4.2.1.

4.3 Free-Field thresholds

Free-field pure-tone testing, with loudspeakers instead of headphones, is used primarily when the patient for instance is a child who dislikes wearing headphones. However, the measured thresholds will be influenced by:

- The distance from the loudspeakers to the patient;
- The acoustic absorption of the walls of the test room;
- Ambient noise.

Loudspeakers (such as 8-02-450) and a two-channel power amplifier such as PA 210 (8-02-240) for free-field testing are optional accessories.

To set up a free-field tone test, do as follows:

1. Connect the amplifier’s left and right inputs to **FF, L** and **R** on the rear panel.
2. Connect the loudspeakers to the amplifier’s outputs.
3. Press **Menu** to display the `Select Function` menu.
4. From the `Select Function` menu press **Softkey 1** to select the `(Tone) Output ?` menu.
5. From the `(Tone) Output ?` menu press **Softkey 3** to select `F.F.`
6. From the `(Tone, F.F) Side ?` menu press **Softkey 1** to select `Left`.
7. From the `(Tone, F.F, Left) Masking ?` menu press **Softkey 3** to select `FF`.

To minimize the influence of standing waves on the measured threshold, the test tone is frequency modulated to a depth of $\pm 5\%$ by a warble tone. If required, you can disable this by toggling **Softkey 2** so that `C/P/W` is displayed instead of `C/P/W`.

To use the narrow band noise provided for masking as an alternative test source instead of tone, do as above but with the following differences:

8. Press **Softkey 2** to select `Right` instead of `Left` in step 5.
9. Toggle **Softkey 4** to display `F.F On/Off`.
10. Turn the **Hearing Level** wheel counterclockwise to reduce the tone to minimum.
11. Use the **Masking Level** wheel to see the threshold (displayed above **Softkey 5**) for each center frequency.

5 Testing with Speech

5.1 Live speech testing

5.1.1 Setting up the test

To set up a test of a patient's live voice threshold, do as follows:

1. Connect either the monitor headset with boom microphone or a monitor loudspeaker and talkover/live voice microphone via the monitor adaptor to **Monitor** on the rear panel. If you use the monitor loudspeaker and talkover/live voice microphone, you should speak the words into the microphone with a fixed distance of about 20 cm between your mouth and the microphone.
2. Place the patient in a sound cabin to make sure that the live voice is heard only via the MIDIMATE 602/622. If no sound cabin is available fit the patient with an ME 70 noise-excluding headset to prevent threshold levels which are nearly normal from being influenced by directly transmitted live voice.
3. Press **Menu** to display the `Select Function` menu.
4. Press **Softkey 2** to select `Speech` and display the `Output` menu.
5. Press **Softkey 1** to select `Air` and display the `Stimulus` menu.
6. Press **Softkey 1** to select `Left` and display the `Input` menu.
7. Press **Softkey 2** to select `Micr.` and display the `Masking Output/Input` menu.
8. Press **Softkey 1** to select `No Mask` unless there is a risk of a response from the ear not being tested. This may be the case either because of widely differing thresholds, or because the test is to be made at a level well above threshold. For masking, press **Softkey 2** to use white noise (WN), or **Softkey 3** to use speech noise (SN), which is white noise filtered so that speech frequencies predominate.
9. Press and hold the **Microphone** pushkey on the **Level** panel and turn any of the three rotary wheels while you read aloud from a word list. Use a word list, where the words have been expressly prepared for threshold measurements in order to obtain a peak deflection of 0 dB on the **Stimulus** VU indicator. (0 dB corresponds to normal threshold.) Make sure that the level, the pace and the distance from the microphone of the live voice used for setting up is the same as for the actual test.

5.1.2 Testing the speech reception threshold

The patient's speech reception threshold is defined as the sound pressure level for which the patient can repeat correctly 50% of the words in a spoken list. Each of the words used for this test is of two syllables stressed equally (spondees). To test the patient, do as follows:

1. Instruct the patient carefully in how to repeat each word he hears.

2. If possible, select the better ear to test first by toggling **L/R Shift**.
3. Read from the list while you turn the **Hearing Level** wheel to find the lowest level at which the patient can still repeat each word correctly.
4. Turn the **Hearing Level** wheel counterclockwise to reduce the L.Micr level shown above **Softkey 3** by 5 dB.
5. Continue the test to determine the percentage of words, which the patient repeats correctly at this level.
6. Repeat steps 3 and 4 until the percentage of at least 20 words, which the patient repeats correctly, falls below 50%. Make a note of both the level and the corresponding percentage in each case. Normally the first few words are sufficient to establish the patient's score, and the remaining words serve to confirm it.
7. Determine the patient's hearing loss, by interpolation if necessary, from the level corresponding to a 50% score.
8. Toggle **L/R Shift** and repeat steps 2 to 6 for the other ear.

If necessary, repeat the procedure with progressively increasing levels.

5.1.3 Testing speech discrimination

To test a patient's speech discrimination, do as follows:

1. Prepare for the test as described in §5.1.1. Each of the words used for discrimination testing must be phonetically balanced. Because of the relatively high levels used in discrimination testing, masking is usually recommended to prevent an unwanted response from the ear not being tested.
2. Record the score of correctly repeated words for a test conducted at a level of 40 dB above the patient's speech threshold. At this level a patient with normal hearing would score 100%. Patients with hearing loss resulting in reduced discrimination may score as little as 40% to 50%, and for certain kinds of hearing loss their score may be reduced at increased hearing levels.
3. Repeat the test at other levels to determine if the score varies with level.
4. Toggle **L/R Shift** and repeat the test on the other ear.

5.2 Testing with recorded speech

The setup for testing the patient using pre-recorded word lists is similar to the procedure described in §5.1.1, with the following differences:

1. Connect the output of a tape recorder or CD player to **Tape 1**, and in the case of a two-channel or stereo signal to **Tape 2** as well.
2. Placing the patient in a sound cabin is not necessary, as there is no direct path for the sound.

3. If you are using recorded speech for testing, a high-quality talk back microphone, amplifier and headset are required. If they are not used, there may be discrimination loss because it will be difficult to hear the patient repeat the words. The microphone should be uni-directional and should be placed close to the patient.
4. The recorded speech material used for the test must have a stated relation with a recorded calibration signal.
5. Select User Test 3 (§3.1) instead of step 0, unless the default setting has been changed, or press **Softkey 1**, Tape (CD), instead of **Softkey 2** in step 0.
6. Instead of doing as in step 0, start the tape recorder or CD player. Keep pressing the **Tape 1** pushkey on the **Level** panel and turn any of the three rotary wheels in order to obtain a peak deflection of 0 dB on the **Stimulus** VU indicator.

The procedures for threshold and discrimination testing with recorded speech are similar to those described in §5.1.2 and §5.1.3.

5.3 Testing with Free-Field speech

For Free-field speech testing use loudspeakers (such as 8-02-450) and a two-channel power amplifier such as PA 210 (8-02-240) instead of headphones to present the speech to the patient. The measured thresholds will be influenced by:

- The distance from the loudspeakers to the patient;
- The acoustic absorption of the walls of the test room;
- Ambient noise.

Free-field speech testing is especially useful for fitting hearing aids, particularly those designed to compensate for perceptive-type hearing loss and discrimination loss. With masking applied, it is also useful for testing children who dislike wearing headphones.

To set up a free-field tone test, do as follows:

1. Press **Menu** to select the Select Function display.
2. Press **Softkey 2** to select Speech.
3. Press **Softkey 3** to select F . F .
4. Press **Softkey 1** to select Left.
5. Press **Softkey 1** to select Tape (CD).
6. Press **Softkey 1** to select No Mask. If masking is required, you can select WN (**Softkey 2**), SN (**Softkey 3**) or Ext (**Softkey 4**).
7. Adjust the level of the stimulus as described in step 0 in §5.2.

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8. If you have selected Ext masking, set the masking reference level. To do so turn any of the rotary wheels while you hold down the **Tape 2** key on the front panel until a deflection of 0 dB is shown on the **Stimulus** VU indicator.
9. When you have completed testing of the left ear, toggle **L/R Shift** to switch the signals to the left and right loudspeakers before you test the right ear.

6 Special Tests

To go to the `Select special Test` menu, press **Menu** until the `Select Function` menu is displayed and then press **Softkey 3, Special**.

6.1 The SISI test

The SISI test (Short Increment Sensitivity Index) shows whether a patient can detect small variations in intensity lasting 200 ms. The SISI test is not a recruitment test. A patient who scores 60% or better for frequencies above 1000 Hz or in some cases down to 250 Hz may have cochlear problems. Patients with normal hearing, middle ear diseases or nerve hearing loss will score up to 20% at all frequencies.

To make the SISI test, do as follows:

1. Connect the patient response handswitch, the headphones, the optional monitor headset (or the optional monitor adaptor with talkover microphone and monitor loudspeaker), and the optional patient talkback microphone.
2. Switch on the electric power supply.
3. Place the patient, facing away from the MIDIMATE 602/622, in a sound-cabin, if available.
4. Press **Menu** once or twice to display the `Select Function` menu.
5. Press **Softkey 3, Special**.
6. Select `SISI (A) L` from the `Select special Test` menu by pressing **Softkey 1**.
7. Select `Left` by pressing **Softkey 1** or `Right` by pressing **Softkey 2**.
8. Instruct the patient to activate the patient response handswitch every time a short increment in level is heard.
9. To demonstrate the test to the patient, turn the **Hearing Level** wheel until the stimulus tone (shown above **Softkey 3**) is 40 dB or more.
10. If the display does not show `1-5dB`, (the 5 dB default increment), toggle **Softkey 2** until it does.
11. Press the **Tone Switch** to begin the demonstration.
12. Make sure that the patient has understood the instructions: the **Response** indicator lights up when the increments in stimulus tone are displayed above **Softkey 3**. The increments are not audible in the monitor headset.
13. Stop the demonstration by turning the **Hearing Level** or **Frequency** wheel.
14. Reduce the stimulus tone to 20 dB.

15. Turn the **Frequency** wheel to select the desired test frequency.
16. Toggle **Softkey 2** to display $\underline{1}$ -5dB and reduce the increment to 1 dB.
17. Press **Tone Switch** to start the test.
18. Press **Softkey 5**, Stop, to reset or continue the test.

During the test, the running total of Presentations is displayed on the screen. When 20 presentations have been made at 5 second intervals, the test is completed automatically. The patient's Score is shown both as a total and as a percentage. To check whether the patient really responds to increments, pause the test by pressing **Softkey 5**, and then after a few moments either resume by pressing **Softkey 5** again, or reset the test by pressing **Softkey 1**.

6.2 Fowler's test

Fowler's test (the Alternate Binaural Loudness Balance test) is practical when there is a difference in hearing loss of more than 20 dB between the ears. With this test you can measure recruitment in one ear by determining any change in the ear-to-ear difference when the test is repeated at different hearing levels. To perform the test, do as follows:

1. Prepare for testing as in steps 1 to 4 of §6.1.
2. Select Fowler from the Select special Test menu by pressing **Softkey 2**.
3. Select the level for the test ear and present the tone to each of the patient's ears in turn, twice for each ear. Adjust the level until the patient feels the same sensation of loudness in both ears.
4. Select one ear as a fixed reference and the other as the variable. Use the **Hearing Level** wheel for the left ear and the **Masking Level** wheel for the right ear to set each of the initial stimulus tone levels to 10 dB above the actual threshold of the corresponding ear.
5. Turn the **Frequency** wheel to select the desired test frequency.
6. Press the **Tone Switch** to start the test, which has a fixed duration of a couple of seconds.
7. After the test, adjust the hearing level in the variable ear to suit the patient's reaction to the test.
8. Repeat the test as many times as necessary until the patient feels the same sensation of loudness in both ears.
9. Record the final levels.
10. Repeat steps 3 to 8 at other reference levels and other frequencies as required.
11. Press **Menu** to exit the test.

6.3 Stenger's test

If, for instance, a patient falsely claims that his hearing is impaired in one ear, this can be established by performing Stenger's test. This test determines the air conduction threshold in the ear of the patient. Since Stenger's test involves simultaneous tone stimulus of both **Left** and **Right** ears, make sure that the patient is wearing the headphones correctly, with the red phone on the right ear. To conduct the test, do as follows:

1. Press **Menu** until the **Select Function** menu is displayed.
2. Press **Softkey 3, Special**.
3. Select **Stenger** from the **Select special Test** menu by pressing **Softkey 3**.
4. Turn the **Frequency** wheel to select the desired test frequency.
5. Set the hearing level to 10 dB above threshold in the good ear and 10 dB below threshold in the allegedly impaired ear. Use the **Masking Level** wheel for the **Right** ear.
6. Present the stimulus by pressing the **Tone Switch**.
7. A response from the patient indicates a negative Stenger result: the ear is impaired.
8. If the patient does not respond because he wrongly believes that the tone was presented only to the allegedly impaired ear, a positive Stenger result is obtained: the ear is not impaired.
9. Exit the test by pressing **Menu**.

6.4 The Rainville test

The Rainville test is used to determine the ipsilateral bone conduction threshold without testing the other ear. It is a test of masked bone conduction in which thresholds are established by air conduction with and without masking via bone conduction. To perform the test, do as follows:

1. Connect the patient response handswitch, the headphones, the B-71 Bone Conductor, the optional monitor headset (or the optional monitor adaptor with talk-over microphone and monitor loudspeaker), and the optional patient talkback microphone.
2. Switch on the electric power supply.
3. Place the patient, facing away from the MIDIMATE 602/622, in a sound-cabin, if available.
4. Place the right headphone on the ear to be tested, and the Bone Conductor on the mastoid bone behind this ear.

5. Instruct the patient in how to use the patient response handswitch.
6. Press **Menu** until the `Select Function` menu is displayed.
7. Press **Softkey 3**, `Special`.
8. Select `Rainv.` from the `Select special Test` menu by pressing **Softkey 4**.
9. Turn the **Frequency** wheel to select the desired test frequency.
10. If required, toggle **Softkey 2** from `C/P/W` to `C/P/W` to select a pulsed tone stimulus.
11. Turn the **Hearing Level** wheel to select an `R:Tone` level about 5 dB above threshold.
12. Press the **Tone Switch** to apply the tone stimulus in the headphone.
13. Gradually increase the level of NBN in the Bone Conductor by turning the **Masking Level** wheel until the patient no longer responds when the stimulus is applied.
14. Evaluate the bone threshold at the current frequency by subtracting 3 dB from the masking level.
15. Exit the test by pressing **Menu**.

7 Programming a User Test

7.1 Accessing user test programming mode

To access User Test programming, do as follows:

1. Switch off the MIDIMATE 602/622.
2. Press **Softkey 3** while you switch on the power until the User Progr. Parameters menu is displayed.
3. Press **Softkey 3**, Progr. to select the Enable User Programming menu.
4. Press **Softkey 1**, Yes, or **Softkey 2**, No, as required.
5. Press **Menu** to quit the User Progr. Parameters menu and execute the normal start-up procedure ending in User Test 1.

7.2 Programming a user test

A user test will store choices such as Output and Stimulus Side, the test frequency and the hearing and masking levels, and also options such as HLL and PTS. To program or change a user test, do as follows:

1. Activate user test programming as described in §7.1.
2. Press **Menu** once or twice to quit User Test 1 and display the Select Function menu or select an existing User Test to be changed.
3. Set up or change the selected User Test as for manual setup by menu (§3.2).
4. To check that user test programming actually is activated, or to save the current user test, press **Softkey 3** to display the Options Menu. This menu should show Progr. above **Softkey 3**.
5. Wait 5 sec or press **Menu** to return to the test mode, or press **Softkey 3**, Progr., to display the Programming User Test! menu.
6. Press **Softkey 5**, Quit, to change or check the test setup, or **Softkey 1**, Continue, to assign a number to the User Test.
7. Press **Softkey 1, 2, 3, 4** or **5** to save the user test as Test1, Test2, Test3, Test4 or Test5 respectively, and exit from user test programming to test mode with the setup of the user test you have just stored.

8 Data Interface

8.1 Entering patient ID

You can enter an identification number for the patient when the MIDIMATE 602/622 is on-line to a computer database. Do as follows:

1. Toggle the **Menu** key on the front panel to display the `Select Function` screen.
2. Press **Softkey 5** to display the `Patient` screen.
3. If required, press **Softkey 1** to reset the number displayed to zero.
4. To change the number displayed press **Softkey 2**. The number is automatically increased by 1.
5. To change the existing number use the **Frequency** wheel to select the digit to be changed and change the value with the **Hearing Level** wheel. An asterisk (*) marks the selected digit. You can enter spaces and dashes (-) as well as the numerals 0 to 9.
6. Press **Menu** to exit the patient ID function.

8.2 Printing audiograms (MIDIMATE 622 only)

You can store air and bone conduction and free-field threshold data for both ears and print it out on a standard printer, a ZODIAC 901 or an external printer connected to the ZODIAC 901 as described in §2.1.1. To set it up see the description in §8.3.

8.2.1 Storing test results

To store the results of a current test for subsequent printing out, do as follows:

1. In test mode press **Softkey 3** to display the `Options Menu`.
2. Press **Softkey 3**, `Store`, briefly. If printout has not been set up as in §8.3, the `Store` option will not be shown.

8.2.2 Printing an audiogram

To print out stored thresholds as an audiogram, do as follows:

1. In test mode select the `Printer Menu` by holding down **Softkey 3** while `Store` is shown above it.
2. Press **Softkey 4**, `Plot`.

The display shows `Printing . . .` during printout. In MIDIMATE 622, versions 3.0 and 3.1, the **Ext. Range HL** lamp flashes during printout.

8.2.3 Viewing stored test results

To view the stored thresholds, do as follows:

1. If required, reselect the test mode with the same function and output as the thresholds to be viewed by pressing **Menu** and then using the `Select Function` sequence.
2. Press **Softkey 3**, `View`.
3. If required, toggle **L/R Shift** to select the appropriate ear.
4. Turn the **Frequency** or **Hearing Level** knob to change the frequency of the displayed threshold.

8.2.4 Printing separate Air and Bone Conduction audiograms

MIDIMATE 622 prints out both Air and Bone Conduction thresholds on the same audiogram (if there is one). To obtain separate audiograms, do as follows:

1. Test the patient with the first transducer type to be used.
2. Print out the stored thresholds that were registered.
3. Clear the stored data by pressing **Softkey 5**, `Clr-All`, in the `Printer Menu`.
4. Test the patient with the second transducer type.
5. Print out the stored thresholds that were registered with the second transducer type.

With **Softkey 1**, `Clr-L`, and **Softkey 2**, `Clr-R`, stored left and right thresholds can be retained or cleared independently of each other.

8.3 Setting up printout

To set up printout on the MIDIMATE 622, do as follows:

1. Switch off the MIDIMATE 622.
2. Press **Softkey 3** while you switch on the power.
3. Release **Softkey 3** when the `User Progr. Parameters` menu is displayed.
4. Press **Softkey 5**, `Printer`, to display the `Printer Options`. This menu gives access to five sub-menus.
5. Press **Softkey 1**, `Select`, to display the `Select Printer` menu.

6. Press **Softkey 1**, *Disable*, if MIDIMATE is to be used online to a PC instead of a printer. Press **Softkey 2**, *Zodiac*, to print out via a ZODIAC 901. (This will work only at 9600 baud.) Press **Softkey 3** or **4** to print out via a standard printer. **Softkey 3**, *Std.H*, is for hardware control with busy high on the DSR line, and **Softkey 4**, *Std.L*, is for busy low.
7. Press **Softkey 2**, *Format*, to display the *Select Format* menu.
8. Press **Softkey 1** or **2** to select A4 format. **1** places the left and right audiograms on the left and right of the printout respectively. **2** places them in reverse order. Press **Softkey 3** to format printout for 110mm paper.
9. Press **Softkey 3**, *Header*, to display the *Header* menu.
10. Press **Softkey 1**, *Yes*, to include a header on each printout containing patient data and the time and date. To skip this and speed up printout, press **Softkey 2**, *No*.
11. Press **Softkey 4**, *Ths.Log*, to display the *Threshold Logging* menu.
12. Press **Softkey 1**, *Yes*, to print out each threshold in a tabular format immediately after storing. If this is not required, press **Softkey 2**, *No*.
13. Press **Softkey 5**, *Avg.*, to access the *Average Values* menu.
14. Press **Softkey 1**, *Yes*, to include weighted average values on the printout together with the actual weighting values used. Press **Softkey 2**, *No*, to omit these but include masking values instead (if applicable).
15. Press **Menu** twice to return the MIDIMATE 622 to normal operation.

