

## *Immittance Audiometers AT235 and AT235h*

- Efficient Middle Ear Examinations



# Immittance *precision*

The AT235 is an automatic immittance audiometer ideal for diagnostic and screening evaluations. The primary design of the AT235 emphasizes ease of use without compromising testing flexibility. Test batteries of the AT235 include standard tympanometry, ipsilateral and contralateral acoustic reflex and reflex decay, Eustachian tube function test and air conduction audiometry.

Automated tympanometry may be combined with 2 programmable reflex test batteries. Further manual reflex testing is available for more tests or to confirm/modify automated reflex results. The AT235 allows more than 40 reflex tests per ear to be stored and printed. These capabilities provide the necessary tests for the majority of any clinic's needs. The addition of high frequency probe tones to optimize tympanometry testing of infants is available with the AT235h model.



**leading diagnostic solutions**



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## Normal Tympanometry

Interacoustics utilize two beneficial techniques to acquire tympanograms. The first is an 'endless airflow' technique which improves the instrument's ability to obtain a tympanogram on difficult to test patients or when a slight leak is present. This prevents the system from continually resetting to continue the test. The second feature is an intelligently controlled pump system with an adaptive speed control. This feature combines a very fast test speed with high resolution of the tympanogram peak which might otherwise be obtained only with a slower pump speed.

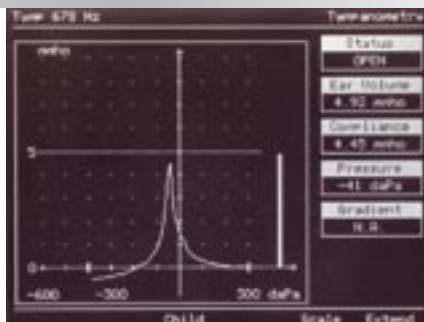
## High Frequency Tympanometry with the AT235h

The AT235h provides additional high-frequency probe tones for Y-component testing in addition to the traditional 226Hz tone. With the push of a single button, the AT235h will switch to a 678, 800 or 1000 Hz probe tone. A tympanogram that is recorded using a high frequency probe tone (e.g. 1000 Hz) is considered more suitable for screening neonates.

## A & B Reflex Programs

Two user programmable acoustic reflex sequences are available allowing the user to define a simple screening procedure for test A and a more in-depth evaluation as test B. These protocols may be programmed and/or selected by the push of a button. The parameters for test A & B come with a factory default setting but are easily changed to better suit alternative clinical test routines. The protocols allow intensity presentations at fixed levels, in auto threshold mode or a defined sequence to display reflex growth. The AT235 and AT235h allow mixing of ipsi and contra reflexes in the protocol as well as a variety of stimuli such as pure tones or noise bands. There are few limitations on storing and printing as more than 40 reflexes may be recorded per ear. All reflex testing may be done manually in addition to the automated routines.

*High frequency screening tympanometry records the IYI tympanogram.*



*A wrist strap for proper clinical measurements is included.*



## Decay – Contra and Ipsi

Acoustic reflex decay testing is available with ipsilateral stimulation as well as with contralateral stimulation. The AT235 comes with a standard single TDH39 transducer as well as an insert phone for stimulating the contralateral ear. Both are calibrated to the instrument from the factory.

## ETF Test

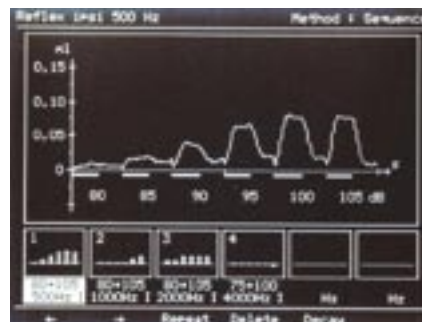
The AT235 performs a Eustachian Tube Function test for an intact eardrum. This test may be performed manually or automatically as it provides instructions as the test is in progress.

## Children's Train

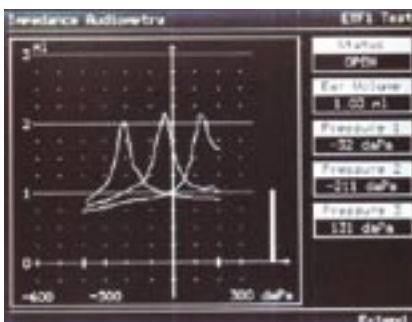
When you need to hold the attention of an active child, all you have to do is press the Child Train button to activate the visual distraction display of a moving train – complete with billows of smoke from the engine.



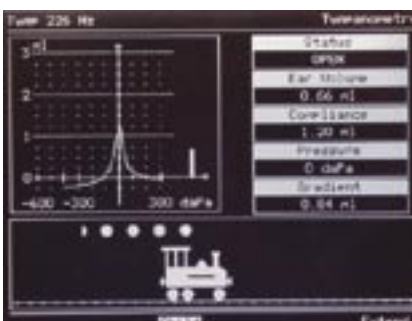
*Tympanogram and reflex test results displayed simultaneously.*



*A group of increasing stimuli for reflex testing, clearly displays reflex growth with increasing intensity.*



*Automated Eustachian Tube test is available.*



*A moving train may help to keep children quiet during testing.*



# *Immittance Audiometers AT235/AT235h*

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*Detachable probe.*

## **Probe Systems**

Interacoustics has a unique and efficient probe design that can be quickly converted from a diagnostic style to a screening pencil probe. The software automatically recognizes which probe end is currently in use and converts to the appropriate calibration values.

The diagnostic probe is held in place by a custom shoulder strap and is more appropriate for more extensive testing. Meanwhile, the screening probe is ideal for performing quick and basic tympanograms with a screening ipsilateral reflex.

*Audiometry is available through an independent headset with two phones (optional).*



## **Audiometry**

A basic air conduction pure tone audiometry function is a standard feature on the AT235 and AT235h.

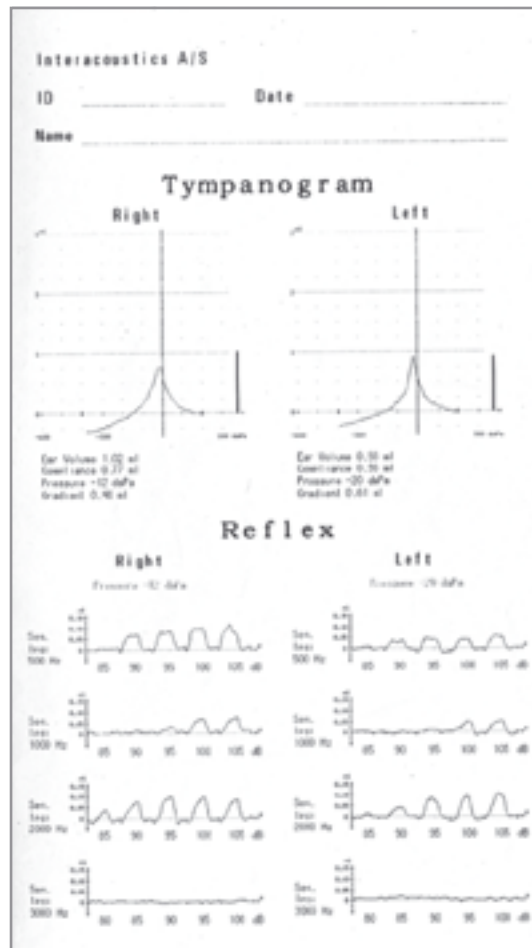
Basic pure tone audiograms may be generated manually or with an automatic HL function. All that is required is the purchase of an optional, independent headset. For patient safety, the maximum output may be limited.



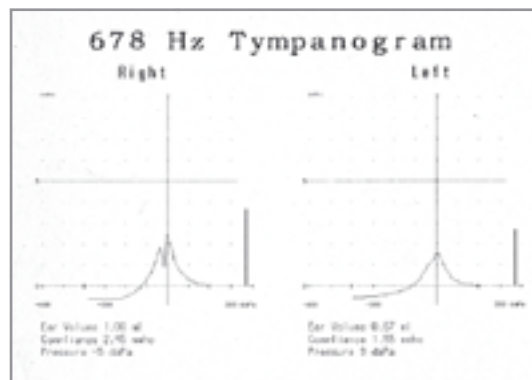
*Clinical measuring is also possible with the included shoulder strap.*

## Printing Options

A fast thermal printer is built into the instrument. If the data is downloaded to the Interacoustics IaBaseII software or NOAH, printouts may be generated through a PC.



Example of printout from the AT235/AT235h.



Example of printout from the AT235h.

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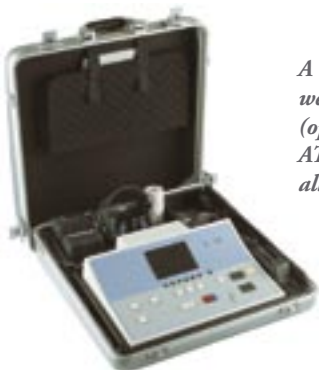
## **Data Storage with Windows® Based Software**

Transferring data to a PC is possible by two different applications. IaBaseII is the Interacoustics data base platform that enables data collection from multiple instrument sources into one patient file. Hearing aid information may also be included.

NOAH hearing aid fitting software will also integrate the test data when used with the Interacoustics NOAH impedance module software.



*Various included and optional parts.*



*A convenient light-weight carrying case (optional) will hold the AT235 or AT235h and all its accessories.*

# General Technical Specifications

## Standards:

Safety: EN 60601-1, Class I, Type B.  
EMC: EN 60601-1-2.  
Impedance: EN 61027/ANSI S3.39, Type 2.  
Audiometer: EN 60645-1/ANSI S.3.39, Type 4 Tone.

## Medical CE-mark:

Interacoustics A/S meets the requirements of the Annex II of the Medical Device Directive 93/42/EEC. Approval of the quality system is made by TÜV – identification no. 0123.

## Tympanometry:

### Probe tone:

*Frequency:* 226Hz. *AT235h also:* 678Hz, 800Hz, 1000Hz for traditional IYI-curve tympanometry.  
*Level:* 85 dB SPL.  
*Gain Control:* AGC.

### Air pressure:

*Control:* Automatic.  
*Range:* Default +200 to -400daPa (max. +300 to -600daPa).  
*Safety limitation:* -800 daPa and +600 daPa.  
*Pressure change rate:* Selectable in the set-up between 50, 150 and >250 daPa/s or automatic.  
*Compliance:*  
*Range:* 0.1 to 6.0 ml (numerical: 0.1 to 8.0 ml).

### Function:

Automatic, where pump speed, start and stop pressure can be user-programmed in the set-up.

### Eustachian Tube Function:

Williams test for normal ear drums.

## Acoustic Reflex Functions:

### Test Types:

*Automatic Reflex:*  
Two independent user selectable protocols.  
Series of fixed intensities available.  
Automated intensity search functions available for threshold search and reflex growth indication.  
Free mixing of Ipsi and Contra.  
*Manual Reflex:*  
Manual control of all stimuli.  
May also be used to redo part of automated test results.  
*Reflex Decay:*  
Manual control, with stimulus duration of 10 sec.  
Ipsi or contralateral stimulation.

### Contra Earphone:

TDH39 or insert receiver CIR22.

### Attenuator:

1dB or 5dB steps.

### Memory:

Internal memory for two ears.  
Each ear: 6 Ipsi and 6 Contra recordings. Each may have up to 6 stimuli. Also, there is memory for additional manual reflex recordings. (Total max. 78 reflexes per ear).

### Audiometer Functions:

#### Patient Response:

Connection for patient response switch.

#### Outputs:

Contra TDH39 headset may be used for audiometry.  
Double TDH39 Headset for audiometry (optional).

## Test types:

Manual Audiometry.  
Automatic Audiometry according to ISO 8253-1 (Patient controlled Hughson-Westlake).

## Various:

### RS232:

Input/output for computer communication. One mode allows an external PC to both monitor and control the instrument. The control actions can be followed on the display and operation panel.  
Online communication, where the measurement data are sent to an external PC can be selected.

### Keyboard:

Connection for external keyboard, standard PC type.

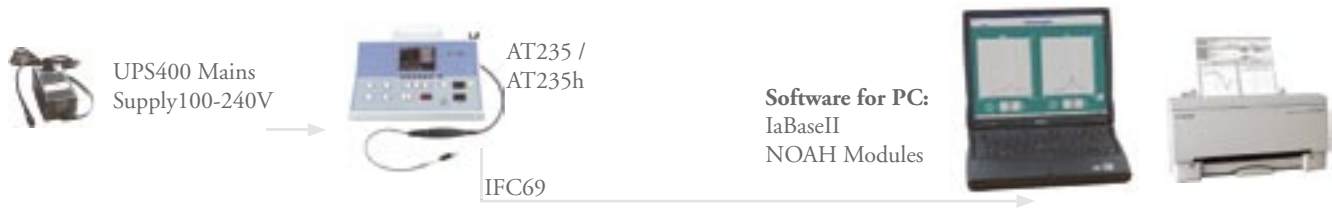
### Printer

Built in fast thermal printer with paper width: 112 mm.

### Accuracy:

*Stimulation Frequencies:*  $\pm 1\%$ .  
*Probe tone frequency:*  $\pm 1\text{Hz}$ .  
*Probe tone level:* 85 dB SPL.  
 $\pm 1.5$  dB measured in an IEC126 acoustic coupler. AGC for ear canal compensation.  
*Pressure measurement:* 5% or 10 daPa, whichever is greater.  
*Compliance measurement:*  $\pm 5\%$  or 0.1 ml, whichever is greater.

# Interconnections



## General Technical Specifications - continued

**Examples of Compatible Windows Software:** LaBaseII Database Program.

IA-NOAH-Imp Module for interfacing to NOAH.

**Frequencies and Intensity Ranges:**

For safety / comfort reasons an optional limitation of maximum intensity is available.

**Power supply:** UPS400 (Included) 100-240V.

**Warm up time:** 10 minutes at room temperature (20°C).

**Consumption:** 15VA, max. 45VA.

**Construction:** Plastic cabinet.

**Dimensions:** LxWxH 36x26x10 cm / 14x10x4 inches.

**Weight:** 2.8 kg / 6 lbs.

**Air Freight Packing:** 48x31x37 / 19x22.2x14.6 inches.

**Gross weight:** 6.5 kg / 12.4 lbs.

Frequency	Reflex						Audiometry			
	Contralateral				Ipsilateral		TDH39		EAR-Tone 3A	
	TDH39		Insert/CIR22		Min	Max	Min	Max	Min	Max
	Min	Max	Min	Max						
Hz	dBHL		dBHL		dBHL		dBHL		dBHL	
125	-10	90	-	-	-	-	-10	90	-10	90
250	-10	110	0	100	-	-	-10	110	-10	105
500	-10	120	0	105	10	105	-10	120	-10	110
750	-10	120	-	-	-	-	-10	120	-10	115
1000	-10	120	0	110	10	110	-10	120	-10	120
1500	-10	120	-	-	-	-	-10	120	-10	120
2000	-10	120	0	105	10	105	-10	120	-10	120
3000	-10	120	0	100	10	100	-10	120	-10	120
4000	-10	120	0	95	10	100	-10	120	-10	115
6000	-10	120	-	-	-	-	-10	120	-10	100
8000	-10	110	-	-	-	-	-10	110	-10	95
WB noise	-10	120	0	100	10	105	-	-	-	-
LP noise	-10	120	0	100	10	105	-	-	-	-
HP noise	-10	120	0	100	10	105	-	-	-	-

### Included Parts:

- ATP-AT235u Universal Probe System with shoulder strap and wrist strap
- TDH39 Single Contralateral Headset
- CIR22 Contralateral Insert Phone
- CAT40 Calibration Unit 0.2-0.5-2.0-5.0 ml
- UPS400 External Switch Mode Power Supply
- Power Cable (110/220V, please specify)
- BET50 Box of 65 assorted Eartips
- TPR26 3 Rolls of Recording Paper

- IA NOAH Imp Software Module
- RS232 Cable
- PCR-AT235 Dust Cover
- Operation/Multilingual CE manuals

### Optional Parts:

- TDH39 Audiometric Headset
- EAR-Tone3A Insert Phones for Audiometry
- ACC25 Carrying Case
- APS2 Patient Signal
- CAT227 Calibration Unit 0.2-0.5-1-2-3-4-5 ml
- IES-2 Impedance Ear Simulator

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