

FONIX® 6500-CX Options

(with reference to options available for the earlier FONIX 6500 and 6500-C)

The options for the FONIX 6500-CX make it the most complete hearing aid analyzer in the world. Some options provide a whole sequence of tests that are done automatically. Others are primarily for convenience and speed. Still others provide special tests, unavailable elsewhere, for signal processing aids.

The options allow you to tailor your instrument to your needs and your pocketbook. Options can be added to existing units as the needs of the user change or as new options become available.

The FONIX 6500 options have become easier and easier to use as the software has been refined. Menus and instructions will appear on the video monitor as needed.

Following is a description of available options. They may be added to or revised from time to time. Custom options are possible on a time available basis. Contact the factory with your particular programming need.

Money-saving option packages are available.

Some options are only available on the FONIX 6500-CX or on units that have been upgraded to CX status.

ANSI* Option

This option has long provided a test sequence based on the ANSI S3.22-1987 standard. Recently we have introduced a test sequence based on the ANSI S3.22-1996 standard, a revision of the ANSI '87 test sequence. ANSI '96 can be ordered as a replacement for the ANSI '87 sequence or in addition to it. The ANSI S3.42-1992 test sequence is available on the FONIX 6500-CX, without additional charge, when either the ANSI '87 or ANSI '96 test sequence is ordered.

The ANSI Option provides a menu for easy access to each test sequence.

ANSI Option—S3.22-1996 (available only on CX units)

This test sequence is a revision of the ANSI '87 standard. Changes have been made to the standard in order to more effectively test hearing aids that use newer technology. The telecoil tests and AGC tests have the most pronounced differences.

The following tests are made and displayed:

- Output Sound Pressure Level 90 dB Graph
- Maximum Sound Pressure Level for 90 dB input (including the frequency)
- Average Full-On Gain
- Reference Test Gain
- Frequency Response
- Harmonic Distortion
- Frequency Range
- Equivalent Input Noise
- Battery Drain
- Variable frequency Input-Output Curves (AGC aids)
- Variable frequency Attack and Release times (AGC aids)
- Optional SPLITS Curve
- Optional Simulated Telephone Sensitivity Measurement

A telewand, used for measuring the simulated telephone sensitivity, is including with the ANSI '96.

*ANSI—American National Standards Institute

ANSI Option—S3.42–1992 (available only on CX units)

This is a family of noise curves using a very slight modification of our composite signal. Four different response curves will be shown on the screen. User chooses from the following ranges: 40-70, 50-80, or 60-90 dB.

The following measurements are made and displayed:

- NSPL–90 (Noise Sound Pressure Level with 90 dB input.)
- Full-On Noise Gain
- Actual Reference Gain
- Target Reference Gain
- Family of Frequency Responses Curves
- Noise I/O curve
- Test Specifications: For informational purposes only.

ANSI '92 tests are specifically for AGC and signal processing hearing aids, even though they are not yet required by the FDA.

ANSI Option—S3.22–1987*

- Saturation Sound Pressure Level 90 dB Graph
- Maximum Sound Pressure Level for 90 dB input (including the frequency)
- Average Full-On Gain
- Reference Test Gain
- Frequency Response
- Harmonic Distortion
- Frequency Range
- Equivalent Input Noise
- Battery Drain
- Input-Output (AGC aids)
- Attack and Release time (AGC) aids
- Optional Telecoil Test

Not all hearing aids are tested the same way. The operator uses an on-screen menu to choose the appropriate sequence for the type of aid under test: High Gain Linear, Mild-Moderate Gain Linear, AGC aid or Adaptive AGC Aid with or without Equivalent Input Noise Measurement. Special test frequencies are available. Since signal processing “adaptive release” type hearing aids require built-in delays during portions of the test sequences, that provision has been added to the option menu.

*Early 6500 units may have the ANSI '82 test sequence. Upgrades are available.

The FONIX 6020 Test Chamber shipped with all FONIX 6500-CX units contains the hardware for battery current drain measurements. A push of a button prior to the start of the ANSI sequences selects the appropriate battery voltage and size for silver, mercury or zinc air. The test chamber also provides a magnetic field to test the telecoil function of hearing aids. A separate external telecoil board is available as an optional accessory.

Four battery pills used in the ANSI Option are standard with the 6500-CX: #13, #675, #312, #10A, #AA, #5, and #41 are optional. Twelve inch cords are standard. Twenty four inch are available.

VA-CORFIG Option Veterans Administration Correction Factors for Insertion Gain

This option works in connection with both the ANSI '87 and ANSI '96 test sequences. In 1987 the Veterans Administration developed correction factors for the frequency response obtained with a 2cc coupler in order to predict insertion gain response. We have incorporated these correction factors into an option, the VA-CORFIG. When this option is activated, it is possible to run the regular ANSI Option, see the results, and then, with the push of a button, see the frequency response as it is modified by the correction factors. The regular ANSI results and the corrected results can easily be printed on the same hard copy.

Corrections are made at frequencies from 200 Hz to 5000 Hz.

These measurements are required for any ITE aids sold on contract to the Veteran's Administration.

Multi-Curve Option (Pure Tone and Composite)

The Multi-Curve Option permits the display of as many as four curves on the same graph. The displayed curves are identified with different colors on the color monitor. Symbols and descriptive information, such as test signal type and amplitude level, are also used to identify curves on black & white printouts. Nine reference curves are available, making a total of thirteen curves that can be held in memory until the unit is turned off.

The Multi-Curve option is very flexible. Curves can be deselected and then re-selected, copied from one position to another or cleared individually. One curve can be subtracted from another. Dual scaling is also available.

Coil Option

(Standard with the 6020 Sound Chamber)

This function permits the user to test an aid or auditory trainer in telecoil mode at all available pure tone frequencies, either individually or by running a response curve. Tests may also be performed in flat weighted composite mode (RMS measurement). Measurements are made at 10 mA per meter, or with software version 4.60 you can use the telewand with the telecoil feature. The magnetic field strength produced by the telewand is designed to mimic a telephone. The current used and the shape meet ANSI S3.22-1996 requirements

FONIX 6500-CXs are shipped with the 6020 sound chamber, which has a built-in telecoil. An optional separate telecoil board is also available.

For those who wish to test telecoils at different field strengths from the standard 10 mA per meter, we suggest the Telecoil/Earphone Adapter, an optional accessory. Please see a separate data sheet describing this adapter.

RBX Option

(Standard as of mid-December, 1988)

This option tests the Attack and Release times of AGC aids and measures battery drain in several ways. The Attack and Release time measurements are made at 2 kHz with the signal amplitude changing from 55 to 80 dB SPL, as specified in the ANSI '87 standard. Battery drain tests are done at any level, in real time, using pure tones (at any frequency) or the composite signal. You may also run a sweep of battery drain versus frequency, or even an input-output graph of battery drain versus the input source level (with the I/O Option). The last two functions are especially important for testing high-power, push-pull type instruments, whose battery drain changes under varying use conditions. Estimated battery life is displayed, also in real time, as a function of the measured drain and the battery type.

Gain Option

(Pure Tone Only)

Note: One of the standard features of the 6500 is the GAIN measurement in the composite mode. Therefore, the GAIN Option is for pure tones only.

Gain is the measure that describes the amount of amplification provided by an aid. The Gain Option automatically subtracts the input signal from the measured output of the hearing aid and displays the

difference. A response curve of gain values can be printed when desired. The Gain Option can be used with the Averaging Option to display Average Gain.

Input-Output Option

(Pure Tone and Speech Weighted Composite)

The Input-Output (I/O) Option automatically measures the dynamic characteristics of AGC and ASP hearing aids. It reads the aid's output SPL or GAIN as the level of the input signal is varied from 50 to 90 dB SPL. The scan can use the composite tone, or any pure tone from 200 to 8000 Hz. To accommodate any circuit attack time, the delay time between stimulus onset and measurement can be set between 0.1 and 3.0 seconds. Results are displayed and printed in both graphical and numerical form.

0-60 Option

(Pure Tone and Composite—Flat & Speech Weighted)

This option provides the operator with instant access to a 60 dB SPL signal, or "signal off", making it easy to perform equivalent input noise measurements and other measurements that use 60 dB. When in composite mode, the "60 dB" refers to the RMS source SPL.

Note: A 60-90 Option can be ordered in place of the 0-60 Option.

I.D. Option

With the I.D. Option, Frye Electronics will program the 6500 to print your own identification on the headings printed before the start of the ANSI Option, and before all single curves. You may specify up to 27 characters, including spaces, to identify your business, office, or institution.

JIS Option

Japanese Instrument Standard (recently updated to the 2000 Standard)

This option automatically performs all the tests specified in the Japanese Standard for hearing aids. Included are three special couplers: the MZ-1, MZ-2, and MZ-3, and correction factors programmed into the instrument.

The menu driven program is flexible so that each aid can be tested in an appropriate manner. Provision is made for that portion of the standard that calls for regular 2cc coupler measurements.

The following tests are included in this program:

- Output Sound Pressure Level with an input of 90 dB (curve)
- Maximum Sound Pressure Level
- Frequency Response Curve
- Full on Gain Curve
- Response Curve Gain
- Reference Test Gain
- Total Harmonic Distortion
- Equivalent Input Noise
- Input/Output
- Attack & Release

RS232 Option

The RS232 Option consists of firmware programmed into the FONIX 6500-CX, documentation on both 5 1/4 and 3 1/2" inch disks, and a cable needed to connect the FONIX 6500-CX to a computer. The RS232 makes it possible to run CHAP (Computer Hearing Aid Program), run DSL/FONIX LINK, run WINCHAP, or write a custom program to either operate the analyzer and/or accept data from it. Documentation on the RS232 disks provides sample programs and information on programming the FONIX 6500-CX, the FP40/FP40-D and the Hearing Evaluators. This same information can be downloaded from our web site—www.frye.com. A separate data sheet on the RS232 options is available with more details.

In-Situ Option

When the In-Situ Option is ordered, the CIC Option is not available. The In-Situ Option predicts how a hearing aid will perform when it is “in position” on the user’s ear. The option takes into account average values for the real-ear factors not accounted for by 2cc coupler measurements: the position of the hearing aid microphone, the impedance of the occluded ear canal, and the effect of occluding the ear canal with an earmold. Three special couplers are included with the option: MZ-1, MZ-2, and MZ-3. One part of the In-Situ Option, using these couplers and correction factors, is the equivalent of the real ear simulator specified in the IEC 117 standard and part of the IEC 118-0 standard. (This test is required as part of the evaluation process in some European countries.)

This option gives the equivalent of occluded ear measurements made on a KEMAR manikin and an Ear Simulator (Zwislocki coupler) at a fraction of the cost of these items. It does not make provision for venting effects.

Averaging Option (Pure Tone Only)

The Averaging Option measures and averages the output of an aid at three frequencies. You can use the high frequency set: 1000, 1600, 2500 Hz; or the IEC (HAIC) frequencies: 500, 1000, 2000 Hz. Several sets of Special Purpose Average frequencies are available, as well. Any input signal from 50 dB to 100 dB (5 dB steps) can be used. The data can be printed when desired.

The Averaging Option continually tests at the three frequencies so that the operator can turn the volume control on the aid and watch the change in average output on the video monitor.

This option can also be used with the GAIN Option to display average gain.

IEC* I 18-7 Option—Amended (Pure Tone Only)

This option allows the operator to test according to the IEC Performance Standard published in 1982 and amended in 1994.

Tests include:

- OSPL (Output Sound Pressure Level) Curve
- Full-on Gain
- Response Curve
- Nominal Reference Test Gain (updated to conform to the 1994 amendment**)
- Harmonic Distortion Measurement Equivalent
- Input Noise
- Battery Current Measurement

Artifacts in testing “adaptive release” hearing aids can be avoided by selecting built-in delay times in the setup menu.

* IEC—International Electrotechnical Commission

** To update your machine, you will need to contact your Frye Electronics representative or the factory to order the CPU for the 6500-CX or the 94CPU for the FP40/FP40-D.

Star Option

The Star Option provides three different sets of tests for signal processing aids. With the introduction of software version 4.50, it is possible to purchase a fourth test for the Star Option—the new Profiler.

1. Enhanced Attack and Release

This test allows you to measure attack and release at any of 18 pure tone frequencies, or with the composite signal. In addition, aid output can be displayed in your choice of time frames: 50 mS, 100 mS, or 200 mS per division on a special graph.

These attack/release tests allow you to distinguish between a well-designed ASP circuit and one that is poor or questionable.

2. Adaptive Attack and Release

This set of tests lets you measure the attack and release times of signal processing aids that show a distinctly different release phase for long and short stimulus durations. Among the circuits requiring this test are: Etymotic's K-Amp®, Telex's Adaptive Compression®, and Phonak's Super Compression®. A well-designed circuit will eliminate "pumping and breathing" of background noise.

3. Digital Speech-in-Noise

This test provides a way to accurately test aids which are designed to distinguish speech from noise. Short, randomly-spaced bursts of composite noise mixed with a continuous signal or no signal provide a means of testing units that require more "speech-like" input signals to produce accurate results. This test gives you the option of using the ANSI '92 signal or an ICRA signal derived from a long-term speech spectrum. You can also use a bias tone to test a unit's filtering ability.

4. Enhanced DSP

This measures the "group delay"—the amount of time it takes a digital hearing aid to take an analog sound, turn it into digital data, process the data and turn it back into a sound wave for the ear to hear. This can be very important for monaural and open canal fittings.

It also tests the "signal phase." This is a measurement of the "pushing" and "pulling" of the amplified sound of a hearing aid. Find out if a binaural set of hearing aids is working together as a team, or if one is "pushing" while the other is "pulling." See the brochure on Enhanced DSP for more information.

Profiler

The Profiler is a series of ten diagnostic tests chosen for their potential to identify hearing aids that are in need of repair or replacement. The Profiler is also useful for establishing a baseline performance for signal processing aids. The entire series takes under 45 seconds to run.

Tests include:

- OSPL 90 Curve (Output sound pressure level at 90 dB)
- Maximum Output
- Harmonic Distortion
- Battery Drain
- Equivalent Input Noise
- Soft Speech Response Curve
- Moderate Speech Response Curve
- Loud Speech Response Curve
- Curve 2 Gain
- Reserve Gain Curve

Quik-Probe™ II Option

For Real Ear Measurements

The Quik-Probe II Option allows you to make measurements in the ear with unparalleled speed, using the real time composite signal. For testing the fit of a hearing aid, the Quik-Probe II Option provides you with both insertion gain and Sound Pressure Level (SPL) methods. Included with the SPL feature are signals designed specifically to accurately test digital aids. The Quik-Probe II also includes a Target 2cc coupler mode so that you can order aids from the manufacturer based on "in-situ" targets converted to 2cc coupler curves.

Quik-Probe II includes a unique Remote Control Module so that you can operate the Option from a hand-held device, as well as from the front panel of the instrument. You may even separate your real ear test location by as much as fifty feet from the instrumentation module.

This option features a smooth and accurate probe microphone, reference microphone, foot switch, speaker and a "Quik-Store" multi-curve feature that lets you store as many as nine reference curves in addition to unaided, aided, insertion gain, and target gain curves.

CIC Option

(Available for CX versions only)

(Does not conform to ANSI standards)

When the CIC Option is ordered, the In-Situ Option is not available. This new option provides realistic tests of Completely in the Canal hearing aids. Since a CIC aid to a great extent fills the ear canal, the coupler used should be significantly smaller in volume than the standard 2cc coupler. However, a smaller coupler by itself is not enough of a change. Correction factors are also necessary because the small coupler itself does not reflect the impedance of the eardrum (tympanic membrane), which becomes more frequency dependent as the cavity is filled. Therefore, the CIC option applies specially tailored correction factors to all measurements.

The CIC Option can be used for any single test, and it also provides a complete sequence of tests, following the pattern of the ANSI S3.22-1987 Option. This CIC Option is completely separate from the ANSI Option. It does not reflect any published standard, but we believe that it provides information that is much more realistic than that obtained with a 2cc coupler test.

OES Option

**Occluded Ear Simulator Option—
(Pure Tone and Composite)**

This Option consists of three special couplers: the MZ-1, MZ-2, and MZ-3, and programming corrections so that measurements of unvented hearing aids will be equivalent, or nearly equivalent to those obtained with a real ear simulator, as described in the IEC 711 standard. In many countries outside the U.S. these measurements are necessary at some stage in the evaluation process. The measurements are part of the IEC 118-0 standard battery of tests.

The OES option is much less expensive than an ear simulator. The MZ-1, MZ-2, and MZ-3 couplers allow for testing of all types of aids. The rugged design of these couplers means many years of trouble-free use.

Indian Option

(6500, 6500-C only)

A series of tests conforming to the Indian Standard.



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