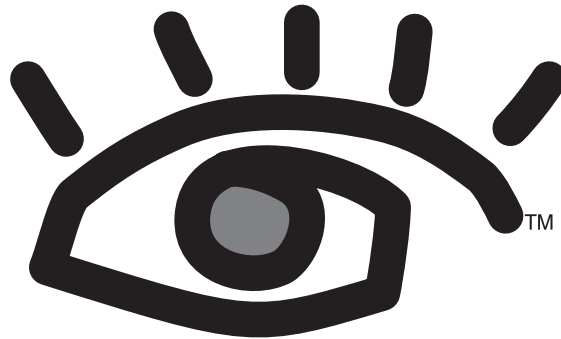


*Answers,
Not Just Data_{SM}*



Iasys[®]

Audio
Analyzer & Setup Tool

User's Guide

- Crossover Points and Levels
- Limiter Settings
- Delay Times
- System Polarity
- Frequency Response
- Coherence
- Programmable Sweep/Sine/Noise
- Spectrum Analysis

*Portable, Self-contained, Intuitive,
Fast results, Documentation,
Rugged, Made in USA*

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Rev : 1.15



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Section One **Welcome**
 New class of audio analysis1-2
 About this guide1-3

Section Two **Iasys Overview**
 What Iasys Does2-1
 How It Works 2-3
 General Iasys test procedure 2-5
 Getting Help 2-6

Section Three **Getting Started**
 A tour of the Front Panel3-1
 A tour of the Back Panel 3-3
 Making Measurements; procedures, guidelines, advice 3-5
 Electrical Measurements 3-6

Section Four **Automatic Tests**
 Crossover Frequency Point4-1
 Crossover Gain Levels 4-3
 Delay Measurement and Setting 4-5
 Checking Acoustic Polarity 4-7
 Limiter Setting and Verification 4-9
 Coherence/Phase Alignment 4-11
 Equalizable Spectra 4-15

Section Five **Manual Tests**
 Pink Noise5-1
 Sine Waves5-1
 Sweep Sine Tests 5-3

Section Six **Special Functions**
 Printing6-1
 Setting Time, and Date 6-3
 Setting Metric versus English distances 6-3
 Memory Management 6-5

Section Seven **Troubleshooting**
 Gain levels and error messages7-1
 Hookup error messages 7-2

Section Eight **Specifications**
 Hardware specifications8-1
 Parallel and Serial Pinouts 8-2

Section Nine **Warranty and Service Information**

Appendices

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More Than Just Any Test Instrument

The **lasys** audio analyzer is the result of a extremely dedicated group of people at AudioControl Industrial with a dream of what a useful but easy to use test instrument could be. We have almost fifteen man years invested so far.

It is not the result of our work alone. Substantial credit for the **lasys** goes to the many audio pioneers over the years who have laid down the principles embodied within it's fuzzy logic. In many ways, our job has been to build the artificial intelligence that hides the technology so you do not have to worry about it. Particular credit goes to the late Richard Heyser whose work was not only groundbreaking but lucidly described so others could understand.

lasys started with an examination of what a real time spectrum analyzer could do and what it could not. As you probably know, we build a lot of spectrum analyzers, so we are very familiar with them. We drew up our wish list and the result of that wish list is **lasys**. It helps anybody, like us, better set the common tools (crossover, delays, limiters, equalizers) that we have been using for years.

So from the design team of Dwight, Bob, Dennis, Mark, Robin and myself, we send you onto an adventure of better sounding, faster setup, and longer lasting sound systems. You not only get our best work but a little bit of us with each unit.

Sincerely

Tom Walker
President

A New Class of System Setup Tool

Iasys is a new class of audio measurement and analysis tool. It is extremely sophisticated yet very easy to use. Within the elegant box are all the parts and knowledge in the form of patent pending hardware and software that you need. The front panel operates as the simplest level of the operating manual in the sense there are buttons clearly marked for each function. But being simple to use is only one of the many attractions of **Iasys** (pronounced like “I assist”).

Answers Not Just Data

“Answers Not Just Data” is more a mantra than a slogan for **Iasys**. Run an automatic test and **Iasys** gives *specific answers* for the setting of crossover points, adjusting crossover levels, adjusting delay times, and setting limiters. There are no waterfall graphs to interpret. There are no complicated graphs that one person might interpret one way while another person sees something different. The answers from **Iasys** get you to where you want to go faster.

It is All Here

Iasys is self-contained with its own operating system, software, and computer built in. In its rugged metal case, it is ready to go without any other apparatus. Completely designed and built in the USA by AudioControl Industrial, **Iasys** is not vulnerable to unexpected or unwelcome changes in either hardware or software triggered by some unrelated computer company. This is a reliable, stable instrument that will support you for many years to come.

Built on a Solid Base

We have been building real time spectrum analyzers since the late 1970's. You probably already own one. The SA-3050 family of analyzers is the world's most popular in use daily from major worldwide concerts to movie soundtracks to White House press conferences. All of our experience with audio analyzers is built into the new and groundbreaking **Iasys**. Please explore the possibilities of **Iasys** by reading on in this user's guide.



About This Guide

Most of this guide is divided into two page modules. On the left page of each module there is a summary of the subject followed by detailed information on how to perform the test or function which is the subject of that module. On the right page, usually, you see a set of hookup diagrams and illustrations of that test or function. The text often continues below the drawings.

The two page format is what you find when you look up most topics. Not only is this format efficient and clear, it means that each subject stands pretty much alone. You can use the table of contents to find a subject and then learn what you need from the two page instructions and diagrams. In some modules, you will see references to more information elsewhere in the guide. That said, we still harbor fond hopes that you will read most of this manual since we have filled it full of hints on how to get the most out of the amazing Iasys audio analyzer.

Module Format

Each two page module is organized with the following sections in this order (unless we thought better of it and used some fuzzy logic):

- summary of the purpose of that module;
- for the subject of the module, what **Iasys** does for you automatically;
- instructions on performing a test or function;
- hints, cautions, or additional information that helps;
- drawings of the display screen with the information you should see;
- picture of the front panel section with the relevant buttons; and
- diagrams of a common system hookup.

User Guide Organization

This guide proceeds from the general to the specific:

- For Overview** Begin with “**Iasys Overview**” for information specific to **Iasys**. Included here is a description of the features (which are unlike any test instrument you have used before), some basic theory of operation, test procedure protocols, and information about getting help
- “Getting Started” covers the **Iasys** front and back panel plus some advice on making acoustic measurements and loudspeaker analysis in specific.
- For Testing** “Automatic Tests” refers to the tests for crossovers, limiters, delays, etc, including polarity and coherence that **Iasys** runs literally at the push of a button.
- “Manual Tests” includes sine, noise, and swept sine tests which are user controlled.
- Support** “Special Functions” contains how to print results, changing time, date, english versus metric, and memory management.
- “Troubleshooting” is self-explanatory as are the sections on “Specifications” and “Warranty and Service Information”.

A brief summary of the topic appears here.

Automatic Tests

Crossover Frequency Recommendation

After making initial tests on the characteristics of the speakers being measured, Iasys recommends the correct crossover frequency point. This crossover point recommendation takes into consideration the acoustical space during the test.

Iasys will automatically

- measure the background noise during the first part of the test
- set the microphone pre-amps to the correct level
- ramp up the test signal to 18 dB above the background, a minimum of 88 dB, or another pre-set level
- scan the driver under test before conducting a detailed analysis

Performing a crossover frequency test
This test is completed on individual drivers (or sets of drivers) based upon the design of the system. For example, with a three-way system, test the lowest driver or group, then the mid-range, and finally the high frequency components.

To perform a crossover frequency test:

- 1 Connect Iasys output to the amplifier powering the driver (or set of drivers) for the lowest frequency. If there are any electronics between Iasys and the amplifier, they should be bypassed or their effect will be measured as well.
- 2 Place the microphone within the listening area and on-axis for best results
- 3 Connect the microphone to Input 1 of the Iasys audio analyzer.
- 4 Press the CROSSOVER button on Iasys
- 5 Select a memory (A,B,C,D) to store the results for this speaker or speaker set. There is data already present in the memory if a diamond (◊) is above the letter.
- 6 If you wish to select a different bank of memories, press RECALL and use the wheel to scroll through the memories. To erase a memory, push ENTER for the special functions menu.
- 7 Press TEST and everything else is automatic. Use QUIT to interrupt the test.
- 8 Now repeat the above steps for a different driver using a different memory (A,B,C,D).

Some things to consider

- ✓ The microphone position. The microphone should be in the coverage pattern and on-axis of the speaker tested. It is very important not to move the microphone position during the tests.
- ✓ Testing with a passive or active crossover. Iasys can test with a crossover active and then measures the energy output of the combination of

References

- Section 2 page 1 for Iasys test procedure
- Section 3 page 5 for info on making measurements
- Section 6 page 5 for information on memories and their management
- Section 6 page 7 for custom setting of test levels

Section 4 page 1
8/15/98

Illustrations and diagrams appear here.

Measuring Delay Times and Distances

Bank	23	Polarity
A:	161.75	+
B:	162.51	feet +
C:	163.35	-
D:	162.93	msec +

Some things to consider

- ✓ Accuracy of delay settings: since any digital processor has inherent internal lags due to processing, the readout on the delay you are using may be either "total delay" or "net delay", that is including the internal delay or not. One way to test this with Iasys is an electronic hookup of the output of Iasys to the delay and the output of the delay to the input of Iasys. Use a setting like 100 msec and see what you measure. More than likely the Iasys measurement will be longer due to internal processing time within the delay. Iasys is measuring true total delay.
- ✓ Distortion and coherence: Iasys uses noise correlation to measure distance. That is, Iasys knows the signal it is sending and looks for the time difference of the arrival of that signal at the microphone. This test relies upon the signal at the microphone being of reasonable quality. For best results, minimize background noise and sources of signal degradation like close reflections of high amplitude. If there is a problem, Iasys will display an error message.
- ✓ Temperature and humidity: Iasys measures the actual time of the acoustic delay and then calculates the distance based upon 1129 feet per second. Since the speed of sound changes with temperature and humidity, use the time measurement of Iasys to set the time of the delay rather than distance.

Section 4 page 6
8/15/98

Detailed instructions and other information appear here.

References to related modules elsewhere appear here.

User's Guide Format

When you see the symbol, turn to the next page for more information on this topic.

Conventions

The name of a button appears in ALL CAPITAL letters. The title of a display screen, the top line of the display, is always in "quotation" marks.

You will find these symbol used throughout this guide:

! Pay special attention to paragraphs with this symbol. Disregarding them may produce undesirable results (producing a rip in the space time continuum).

1 Numbers in square boxes are steps in a procedure.

2 Numbers in round boxes are keyed to the same numbers in the drawing on the right hand page

✓ Tips and notes appear in paragraphs with this symbol.

This symbol appears on the right page when the topic continues in the next module.

This button to start a procedure

What Iasys Does

Using a patented process, **Iasys** gathers and processes acoustical information and delivers answers. Answers that can be addressed with the tools available to all audio professionals. **Iasys** does not require the knowledge of acoustics, electronics, or physics previously needed to decipher frequency and time domain analyzers. A wealth of experience and knowledge is tapped when the TEST button is pressed.

Iasys is a fuzzy logic based audio analyzer. Through statistical analysis of amplitude, frequency and time, **Iasys** "learns" its environment and arrives at the best possible gain, sensitivity, bandwidth and time constraints for any test. The automatic setup process eliminates test variances due to different operators. All test results and formats relate directly to real audio devices, such as loudspeakers, amplifiers, crossovers, limiters, delays and equalizers, and their actual performance parameters. **Iasys** provides the user with the answers necessary to complete, optimize, and verify any installation. This insures maximum performance and reliability based on reality, not on subjectivity, opinion, or differing interpretations of data.

Self- contained

Iasys is a stand-alone analyzer that does not have to depend on a computer or laptop to operate. No lockups, sound cards, mice, or operating system updates. Just answers.

Portable

Only 4" tall, 10" wide, 14" deep in a rugged metal chassis and tough carrying case, **Iasys** is easy to carry from job to job. Rugged and reliable.

Intuitive

The push of a few buttons, and you will be running tests and getting answers. No sub-menus, no training programs and no Ph.D. in acoustics. Just answers.

Fast Results

Give **Iasys** a few minutes and you will have answers on an easy to read, bright display.

Documentation

Iasys has 32 banks of nonvolatile memory and the capability to output directly to a printer or through a serial port to a computer.

Iasys Automatic Tests

CROSSOVER — After analysis of the acoustic energy of a set of components in a particular environment, **Iasys** will recommend where the crossover frequency should be set to maximize each component. Once the crossover frequency is set, **Iasys** will assist in setting the levels of each bandpass.

DELAY and POLARITY — **Iasys** will analyze and display the acoustic distance from the speaker to the microphone and relative distance between



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CROSSOVER SETTINGS:

Between Crossover
Memories: Freq:

A-B 150 Hz
B-C 1.5 kHz

Set Crossovers; press
TEST for Balance test

Crossover Point

Output Level Balance

Mem 23

A	B	C
150	1.5	

Output Level: -10dB

Crossover Level

Delay Test Records

Bank 23		Polarity
A:	161.75	+
B:	163.51 feet	+
C:	163.35	-
D:	162.93	+
	feet	msec

Distances and Polarities

Limiter TEST Records

Bank 23	A	B	C
dBu	-4	-6	-3
Volts	41	32	30
SPL	100	103	102
Freq	99	304	2.0k

Limiter Recommendation

2 to 4 components. This test will also supply the acoustical polarity of the components from a distance as far as several hundred feet.

COHERENCE and EQUALIZABLE SPECTRA – In real time this test measures the arrival times of each individual frequency ($1/12$ octave bands) and displays in a percentage how close it is to the acoustic distance measured in the delay test. With the simple push of one more button, **Iasys** will display a frequency response curve showing only the frequencies that can be equalized.

LIMITER – **Iasys** will safely determine the limitation of a speaker. The analyzer supplies you with maximum SPL, voltage from the amplifier, and a suggested setting for a limiter to protect the speaker.

Manual Tests

NOISE – Pink noise, digitally generated output while a sweeping auto ranging spectrum analysis is displayed on screen

SINE – 20 Hz to 20 kHz pure sine wave generator adjustable in $1/48$ octave steps

SWEEP – 20 Hz to 20 kHz sweep of pure sine waves with programmable start point, stop point and duration.

How Iasys Works

Iasys is a brand new, breakthrough product, though it is based upon acoustical principles laid down by audio pioneers over the last fifty years. Iasys measures amplitude, frequency and time for a variety of tests. Once the electrical hookups are made, it adjusts itself and makes some tests fundamental to its operation and based upon the energy signature of the speaker. By and large, you do not have to be concerned with what it is doing if you do not want to.

In the simplest form, Iasys applies a test signal and then selectively reads the results of that test signal. The test signal may be pink noise, sine, or warble (a pulsating sine wave) tone. All these test tones are digitally generated, very pure, and extremely precisely controlled. Since Iasys knows what the test signal it sends looks like, it analyzes what is different about the signal it receives back from the microphone. That difference may be amplitude, frequency or phase (time).

Iasys has various micro-processor controlled receive filters. That is, if the test tone is broad band pink noise, Iasys may only be listening to a very narrow slice of that noise or sweeping the receive filter across a frequency bandwidth. The principles for this kind of test were first laid down many years ago and refined and clarified by the late (and, in our opinion, great) Richard Heyser.

At first this concept of only listening to certain sounds is a little perplexing. For example, during an Iasys automatic test you will be hearing broad band pink noise and Iasys will only be listening to the part of that it wants to at that moment. If you are titillated by this, we suggest as a reference an anthology of the works of Richard Heyser published by the Audio Engineering Society entitled. "Time Delay Spectrometry". Generally, it is very readable and quite fascinating.

What Happens When You Turn Iasys On?

There is a short, few second pause after turning the power on. During this time, Iasys is loading it's operating system, starting it's programs, and, importantly, self calibrating itself. You do not have to do anything except wait about five seconds. Also, during this waiting period, Iasys displays on the bottom of the screen, what software version is installed.

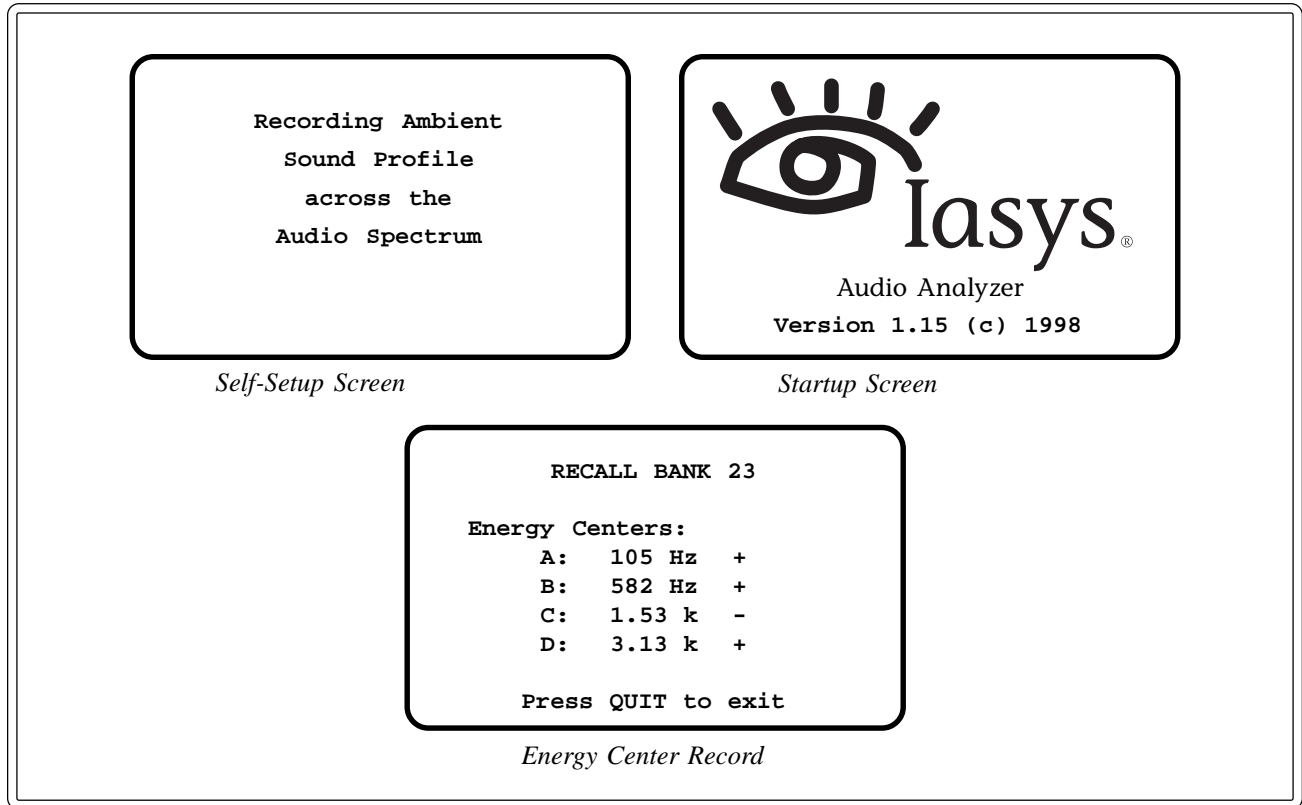
What Happens During Automatic Tests?

The test procedure is described from an operator standpoint in other sections, but from the point of view of theory, Iasys reads the environmental background levels, sends out pink noise as a test signal to gauge where to set the microphone preamp and the testing levels. This is the self-setup function. All the self-setup steps are automatic and started simply by one button push.

Next, Iasys automatically starts to scan the signal it is receiving back from the microphone before commencing a much more detailed analysis of the measured signal. This detailed analysis is a very narrow band sweeping receive filter only 1/48th of an octave wide. Test time is a function of the



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bandwidth of the device being tested, the frequency (lower frequencies take longer), and the quality of the data received (poor quality data requires more passes and takes more time). This test analyzes the bandwidth energy characteristics of the speaker and is a prerequisite to all other **Iasys** tests.

The energy characteristics of the driver are those at the microphone position for the speaker in its position within the acoustical space. That is, the results for the identical speaker may differ in different places. If the speaker tested is a multi-way driver with a crossover, **Iasys** will read this the same as a single driver taking into account the energy characteristics of the crossover and the multiple drivers. For a multi-driver array with a number of the same drivers all playing, **Iasys** will see them as one source.

After exploring the entire bandwidth of the speaker tested, **Iasys** calculates the energy center of that speaker. That is, the energy center is the centroid of the energy dissipation of that speaker in that space at that microphone position. Through many years of research, we find that the energy center is a single number which tells a great deal about loudspeaker consistency and wear. **Iasys** uses the energy center and other bandwidth test data for calculating recommended crossover frequencies, reading crossover gain levels, measuring delay distances, determining equalizable frequencies, and testing the onset of power compression.

Iasys Test Procedure

Iasys is a fuzzy logic based test instrument that performs most steps of its test procedure automatically. Once you understand the protocol behind the Iasys tests, working with the instrument is quite easy. All the tests follow a basic procedure of setup, selecting a memory, and initiating the automatic test sequence.

Format of Automatic Tests

Every Iasys automatic test, which are those controlled by the light gray buttons, follows a basic and uncomplicated procedure. The steps in that procedure are:

- 1** Make the system connections necessary (see diagram in each automatic test module);
- 2** Press the button for the test desired (CROSSOVER, LIMITER, DELAY/POLARITY, etc.);
- 3** Select the memory with the results from a prerequisite test or an empty memory (a diamond \diamond signifies data from the prerequisite test is present);
- 4** Press the TEST button to start; and
- 5** Let Iasys set the test level and other parameters automatically.

Prerequisite Test

The initial and fundamental test which Iasys runs before any automatic test

- measures background ambient noise levels,
- sets microphone pre-amplifier gains,
- adjusts the test tone level,
- characterizes the energy output of the device, and
- computes the energy centroid of the device.

This test is a pre-requisite to running any other test. It is not repeated if already run or is run automatically if the information is needed to perform the test selected. We call this prerequisite test, the bandwidth test.

System Requirement

Iasys tests either sound systems (or electronic devices) and set its own levels so it has only one system requirement. That is, the system must be able to play at a minimum of 85 dB or 18 dB above the ambient level at the microphone. Practically, the only time this is a problem is when the ambient levels are quite high, usually associated with low frequency background noises like heating and ventilation systems.

Memories

Memories are organized by groups of four (A,B,C,D) within 32 banks (128 total memory positions). All the data for a 2, 3, or 4-way system should logically go into one bank. When you select a memory position (for example, bank 3 position A), Iasys then automatically accumulates the answers from all subsequent selected tests (delay, limiter, etc.) in that position. When you select that bank to print out, then the data for all the tests run is printed. You need not select, for a given speaker, different memory positions for different tests.

References

📖 Section 6 page 5 for more information on memories including erasing

📖 Section 6 page 1 for information on printing test results

📖 Section 6 page 7 for custom setting of test levels



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Adjusting Pink Noise
Output for a
Volume Setting of
85 dB SPL
Ambient = 55 dB
Noise = 74 dB

Analyzing Ambient
Sound Levels
before running the
Bandwidth Test
Pass count:25
SPL:55dB

Scanning at 1/3
octave intervals
to find approximate
bandwidth and center
frequency of driver:
F = 105 Hz
SPL = 85 dB

Bandwidth Test
in Progress
at F = 188 Hz

Press QUIT to abort

Bandwidth Test Screens

On screen symbols:

- ◇ Bandwidth test data present
- ± Acoustic polarity measured
- ! Wheel active
- △ Press Enter for next function

Select memory EX (bank 33) for an example of the answers saved. When in memory EX, select CROSS-OVER, DELAY/POLARITY, and LIMITER to see what we are talking about.

Getting Help

You probably have already figured out what we are going to say in this section. If you want more information about the function of any of the buttons of **Iasys**, you

- 1** Press the HELP button
- 2** Then that particular button that you wish to know more about
- 3** Press QUIT to exit the help function. You may have to press QUIT twice as the first press may give you the help screen for the QUIT button itself.

Other Things to Know

- ✓ Since the information stored from the prerequisite test (bandwidth test) includes the background noise level and implicitly the microphone position, you should re-run this test if either has dramatically changed. If you are using only the crossover level setting feature, it is not necessary to re-run the bandwidth test since the test level is user set.
- ✓ The “Quit” button always functions and you should use it any time you want to stop or back out of a function. You will find yourself using the QUIT button often to stop or back out of a test routine.
- ✓ Unlike most computer programs and other instruments, **Iasys** does not erase or overwrite an existing memory until the test is complete. This means you can stop any test before completion and still find the results that previously were in that memory.

A Tour of the Front Panel

The front of the **Iasys** (pronounced “I assist”) is the core of it’s use. The position, colors, and grouping of all the controls are for a reason—to make the use of **Iasys** intuitive. First, you will notice that there are a lot of separate buttons so that you do not have to use menus and submenus. And, all these buttons are labeled with their function. In a very short time, you will know what all these controls do if you do not already just from reading the markings.

The **Iasys** front panel

At first glance there are a great number of items on the **Iasys** front panel. But with a little explanation, you will find they are all grouped together in a logical way to make using **Iasys** effortless. Section by section, here is more information on inputs, outputs, the display screen, automatic tests, manual tests, and more. Now the excitement of using **Iasys** starts to build.

Keyboard Layout

Before we get into the detail, a quick look at the front panel layout shows

- *inputs and outputs* on the left of the front panel
- gray buttons for *automatic test* just to the right of the inputs
- the *display screen* in the middle
- *octave frequency select* buttons under the display screen
- *a wheel* for on-screen movement with the enter and quit buttons just to the right of the wheel
- and in the lower right, buttons for the *manual tests*.

❶ Inputs

Input 1 is where the microphone supplied with the **Iasys** (the CM-10) plugs in. We do not recommend any other microphone. You can plug the output of a limiter, delay or other electronic unit directly into this input, yet be aware there is 12volt phantom power on this input. Input 2 is reserved for future, to be defined, applications and expansions. Input 2 is electrically complete but is not addressed by the microprocessor for now. The Speaker Level input is for monitoring of the speaker level signal during the limiter test.

❷ Output

From here **Iasys** puts out a variety of test tones.

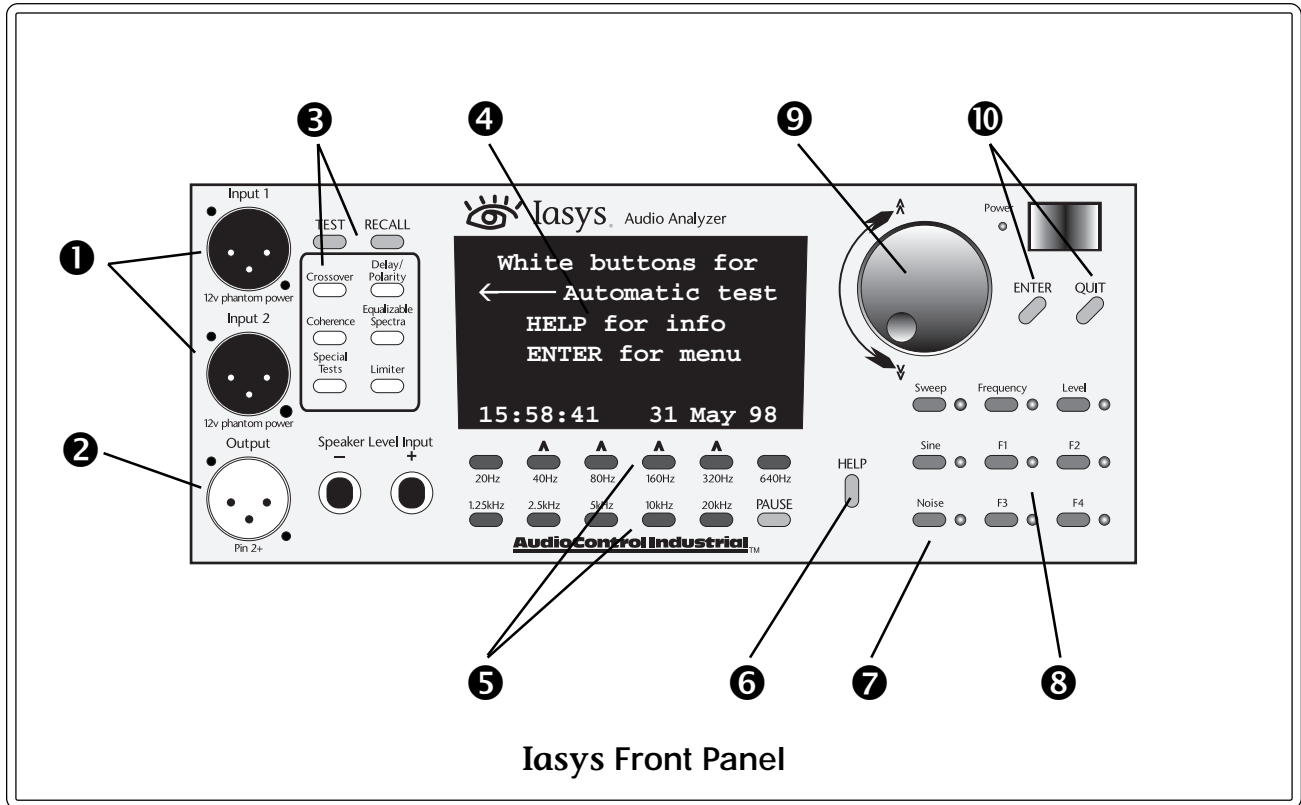
❸ Automatic Tests

The gray and two blue buttons to the right of the inputs are for the automatic tests of **Iasys**. From these tests, you get answers on how to set the tools noted by the label of the buttons. That is, for setting delay times, you select the delay button and similarly for crossovers and limiters. Push any of these gray buttons and **Iasys** will give you instructions on what to do next.

❹ Display Screen

The display is the gas plasma type for comfortable viewing in most light conditions and extremely good visibility from side angles.





Iasys Front Panel

5 Octave Selects and Soft Keys

Below the display screen are dark gray buttons, each for an octave center point. These are quite useful to go quickly to a frequency. They are used in more tests than we can mention here and, usually, applied in conjunction with the wheel for fine tuning. The four right below the screen with the \wedge above, are used to select on-screen options.

6 Help

After pressing the “HELP” button, press any other button for a brief explanation of the function of that other button. To exit help, press “QUIT”.

7 Manual Tests

Pure sine wave, sweep sine wave and pink noise with real time analyzer are the manual tests available from the same labeled buttons on the lower right of Iasys. The wheel is used after selecting either frequency or level to fine tune those aspects. For the sweep, the octave select buttons program the start and stop points of the sweep.

8 Function Keys

“F1” through “F4” are special keys which now and in the future take on different functions in different tests.

9 Wheel

With the wheel you can scroll through numbers, memories, or other functions. When the wheel is active, a small circle (O) shows in the upper right hand corner of the display.

10 Enter and Quit

The “QUIT” button always functions and you should use it any time you want to stop or back out of a function. Enter is used with the special functions menu.

A Tour of the Back Panel

It is all business on the back of the **Iasys** audio analyzer; connectors, fuses and the like. Here is more information on what is there now, space for in the future, and why.

The **Iasys** back panel

❶ Power

A standard IEC connector for hooks the **Iasys** to main power. The model you have is either for 100 to 120 volt operation (50 to 60 cycles) or for 200 to 240 volt operation but not for both. **Iasys** is pretty tolerant of voltage variations within these ranges, if you have to use a step down or up transformer. Note the power requirement is only 30 watts.

❷ Fuse

The fuse lives conveniently behind the "X" on the fuse holder. A Phillips screwdriver removes it quickly. Be sure and replace with the correct fuse for the voltage of your unit. A fast blow fuse is preferred.

❸ Parallel Connector

This connects a Centronics standard printer (IBM PC type) to **Iasys** for documenting the results of tests. **Iasys** prints out in either Epson or Hewlett Packard PLC language including all the formats to produce a nice report. The pinout of this connector is shown in the specifications section of this user's guide.

❹ Serial Connector

Above the parallel connector is space for a serial connector which may be installed from the factory or added later.

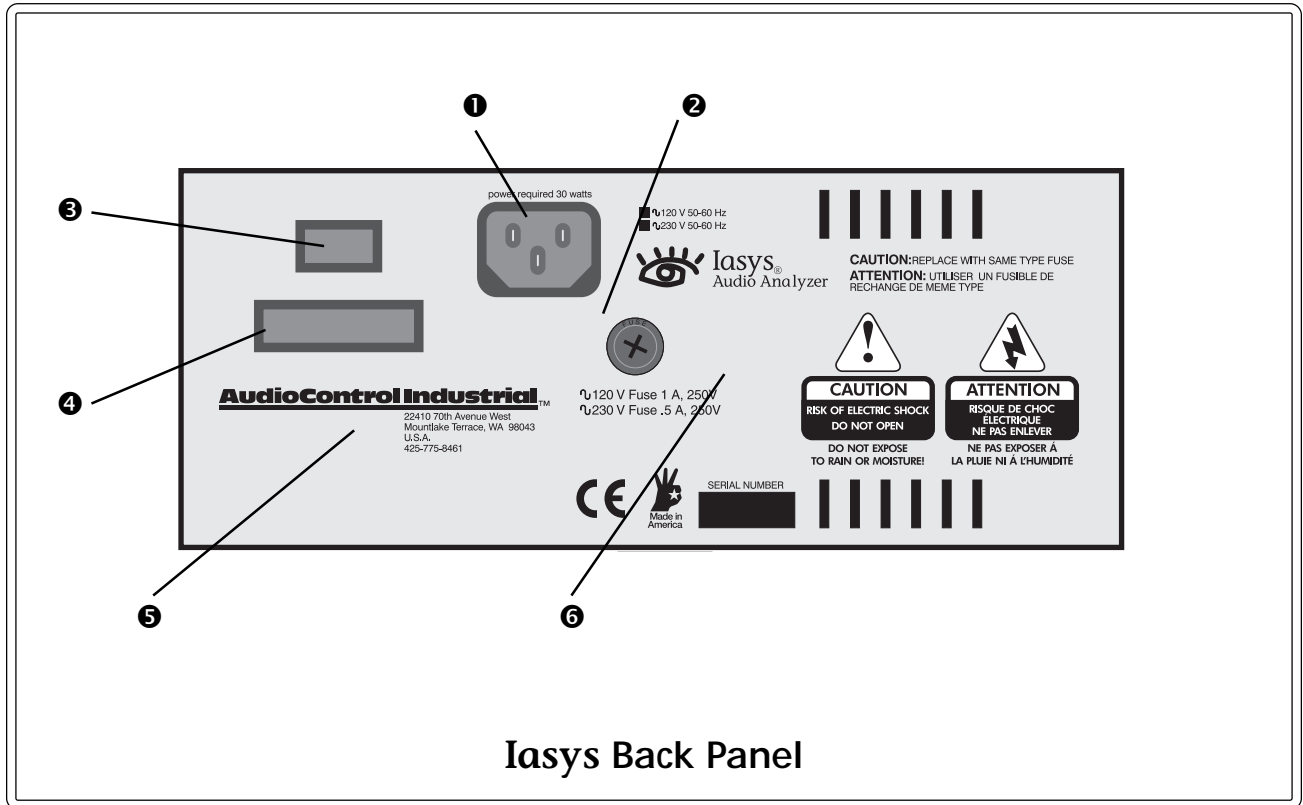
❺ Space for the future

Below the parallel connector, we have left space for future additions of connector cards or the like. We do not know what the future holds, but we have planned some space for add-ons.

❻ Other information

In addition to the cautions about opening up and working on **Iasys** and general safety information, you will find the information on how to contact us.





Making Measurements

For test instruments there are some good practices that help produce useful and repeatable results. These practices should become habits with **Iasys** or any other audio analyzer. If in doubt, it is always good to err on the side of caution, particularly when it comes to safety concerns like wearing ear protection.

Acoustic Measurements

In any acoustic measurement there are too many variables which are outside of your control. But this is a fact of life that we must live with. The trick is to control as many as possible.

Iasys helps significantly by using fuzzy logic to adapt itself to many test conditions. Yet, **Iasys** just like any other test instrument relies upon the operator to use good test practices. Some of those good practices are:

- place the microphone carefully. The microphone should be in a typical listening area which means it should be in the coverage pattern, on-axis, and not too close to reflecting surfaces or other noise sources.
 - keep the mike in the same position. If you are doing a series of tests, which is typical, do not move the microphone during the series. Not moving the mike is particularly crucial during the time (phase) type tests.
 - perform the test in similar circumstances to the performance. **Iasys** can run many of its tests with typical background noise like during a venue setup. However, you should be sensitive to the situation where the test conditions in terms of background noise level and type, acoustic conditions like room dividers, HVAC systems, etc., and temperature and humidity are significantly different than those anticipated for the performance.
 - keep cable runs within reason. For **Iasys**, this means microphone cable runs of 200 feet or less. In addition, always stay aware of how good the connections are in general. The impedances within **Iasys** makes it relatively immune to cable impedance but it will not like things like unconnected ground wires.
 - wear ear protection. Many **Iasys** tests are typically at 18 dB above the ambient level, which in some cases may be in excess of 100 dB. The limiter test, in specific, is very loud since it is for testing the highest limit of the loudspeaker. Few of us wear ear protection as often as we should.
- ! Note; **Iasys** measures the background noise level and runs its automatic tests at 18 dB above that level or a minimum of 85 dB unless you set a different level (see section six). This means the system under test must be able to achieve those levels, at the microphone position, without stress or damage (to equipment or operator).

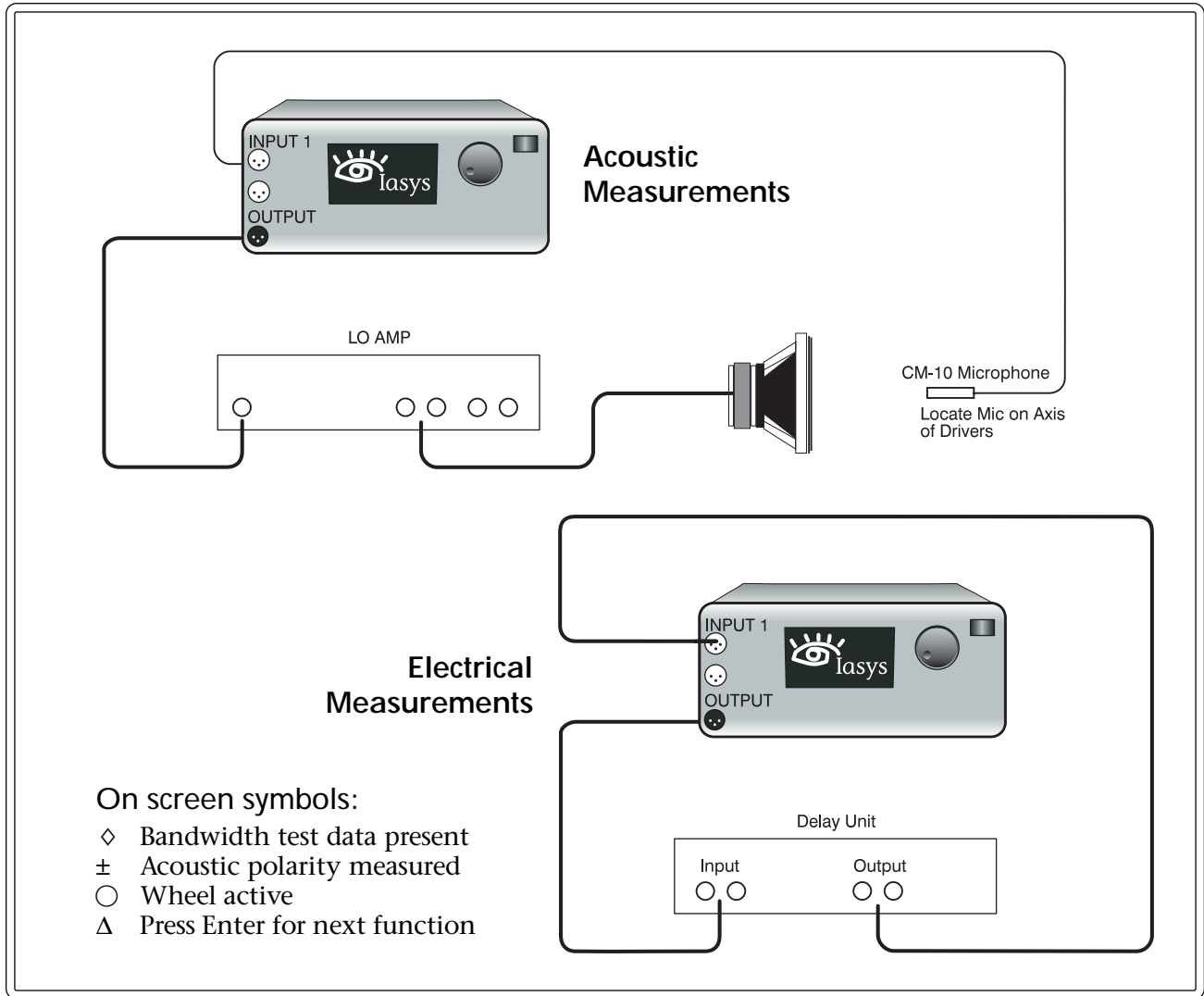
Reference

📖 Section 2 page 5 for test procedures specific to **Iasys**



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Electrical Measurements

Iasys is designed to measure and give answers for setting loudspeaker systems taking into account the acoustic environment during the test. Nevertheless, you can make tests entirely electrically to check the performance of a component. We can only think of a few cases where this makes sense yet you may think of more. The two which come to our minds are:

- double checking a delay. Since digital delays have inherent internal lags due to processing, the display on the delay you are using may be either “total delay” or “net delay”, that is including the internal delay or not. To test this with **Iasys**, hookup the output of **Iasys** to the delay and the output of the delay to the input of **Iasys**. Use a setting like 100 msec, then 50 msec, and see what you measure.
- verifying a limiter. This is the same process as with the delay. **Iasys** is checking for where the peak limiting value should be set. Obviously, you will get some different answers based on the ratio set and the built in knee of the limiter. One of the nice things about this test, is that you will definitely know more than before the test.

Crossover Frequency Recommendation

After making initial tests on the characteristics of the speakers being measured, **Iasys** recommends the correct crossover frequency point. This crossover point recommendation takes into consideration the acoustical space during the test.

Iasys will automatically

- measure the background noise during the first part of the test
- set the microphone pre-amps to the correct level
- ramp up the test signal to 18 dB above the background, a minimum of 85 dB, or another pre-set level
- scan the driver under test before conducting a detailed analysis

Performing a crossover frequency test

This test is completed on individual drivers (or sets of drivers) based upon the design of the system. For example, with a three-way system, test the lowest driver or group, then the mid-range, and finally the high frequency components.

To perform a crossover frequency test:

- 1** Connect **Iasys** output to the amplifier powering the driver (or set of drivers) for the lowest frequency. If there are any electronics between **Iasys** and the amplifier, they should be bypassed or their effect will be measured as well.
- 2** Place the microphone within the listening area and on-axis for best results
- 3** Connect the microphone to Input 1 of the **Iasys** audio analyzer.
- 4** Press the CROSSOVER button on **Iasys**
- 5** Select a memory (A,B,C,D) to store the results for this speaker or speaker set. There is data already present in the memory if a diamond (◇) is above the letter.
- 6** If you wish to select a different bank of memories, press RECALL and use the wheel to scroll through the memories. To erase a memory, push ENTER for the special functions menu.
- 7** Press TEST and everything else is automatic. Use QUIT to interrupt the test.
- 8** Now repeat the above steps for a different driver using a different memory (A,B,C,D).

Some things to consider

- ✓ The microphone position. The microphone should be in the coverage pattern and on-axis of the speaker tested. It is very important not to move the microphone position during the tests.
- ✓ Testing with a passive or active crossover. **Iasys** can test with a crossover active and then measures the energy output of the combination of

References:

📖 Section 2 page 1 for **Iasys** test procedure

📖 Section 3 page 5 for info on making measurements

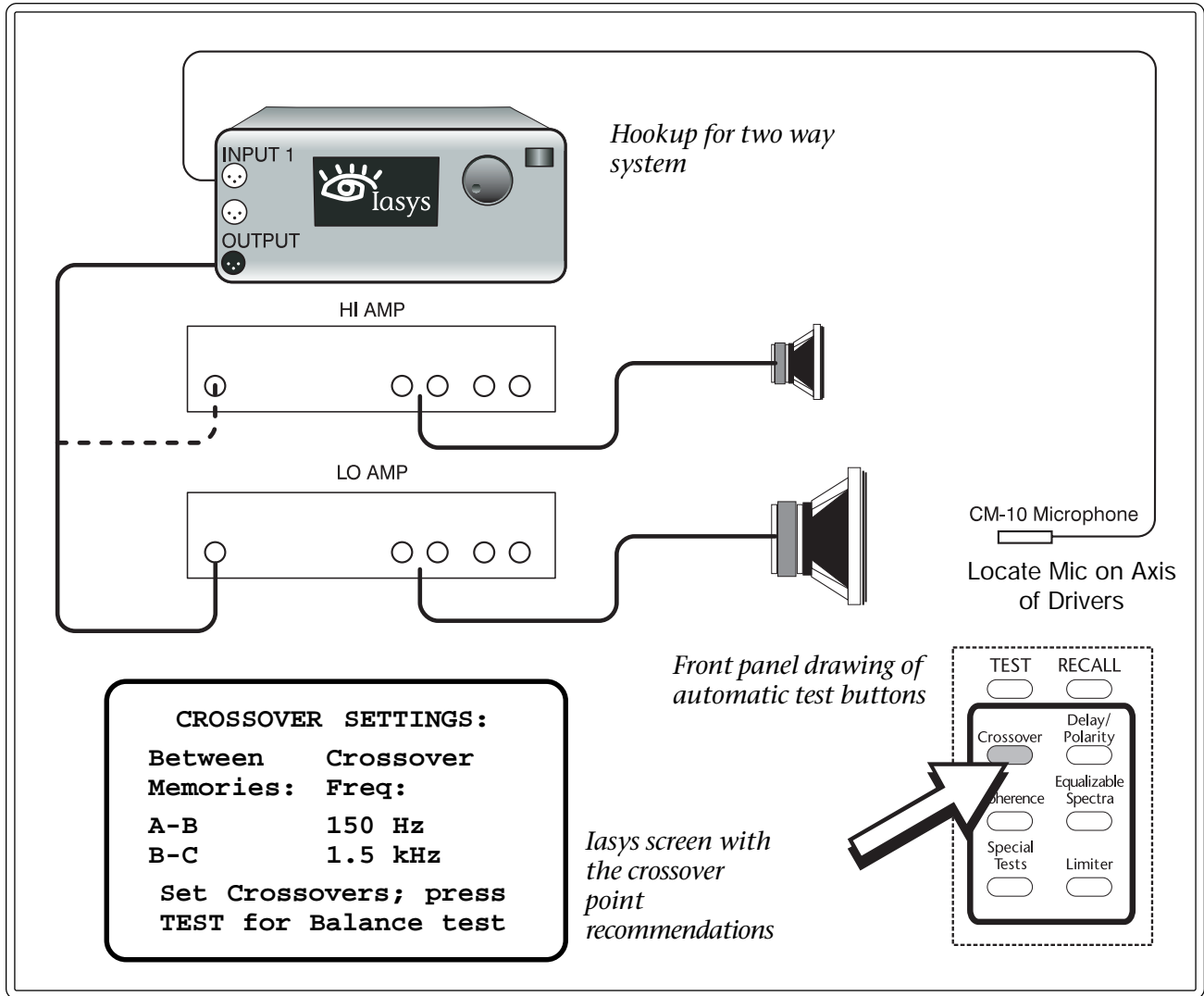
📖 Section 6 page 5 for information on memories and their management

📖 Section 6 page 7 for custom setting of test levels



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drivers and crossovers. This can be useful if the system is a combination of active and passive crossovers.

- ✓ Applications where the recommendation may not apply. If you wish to band limit a driver (like a subwoofer) for reasons other than the capabilities of that driver, the normal recommendations of **Iasys** may not apply. In this case, **Iasys** will let you override or insert a new bandpass frequency for the level setting functions.

Error Screen Messages

During the crossover frequency test, **Iasys** may pause or stop and display the following error messages

- ✓ Missing microphone; **Iasys** is not seeing the level changes it expects on input 1. This may be due to the microphone not being connected, very, very low gain levels in the system, or improper or faulty wiring.
- ✓ +4 dB level reached; when the output level of **Iasys** is +4 dBu, you must push the F1 button before **Iasys** will increase the level further. This is to ensure the signal chain gain levels are set as intended.
- ✓ Output too low; when the output level is +20 dBu, **Iasys** displays an error message suggesting different system gain settings or the lowering of the ambient background level.

Crossover Gain Level Setting

The gain levels of crossovers dramatically affect the overall tonality of a system. With **Iasys**, setting the levels is much easier and quicker allowing crossover gain adjustment for each change in venue and consistently better sounding systems.

Iasys will automatically

- configure itself for whatever is appropriate; a two-way, three-way, or four-way system
- use the crossover frequency points recommended from the prior test to display bandpasses
- for each bandpass, only measure the sound level in that bandpass
- begin with the test tone volume at a very low level

Adjusting crossover gain levels

Iasys assists you in preparing a consistent sounding system, performance after performance, by showing when the energy in each band is equal. Proper gain setting makes equalization easier and more effective. Since the user sets the volume level, this test may be run with a memory from a test made prior, even weeks prior.

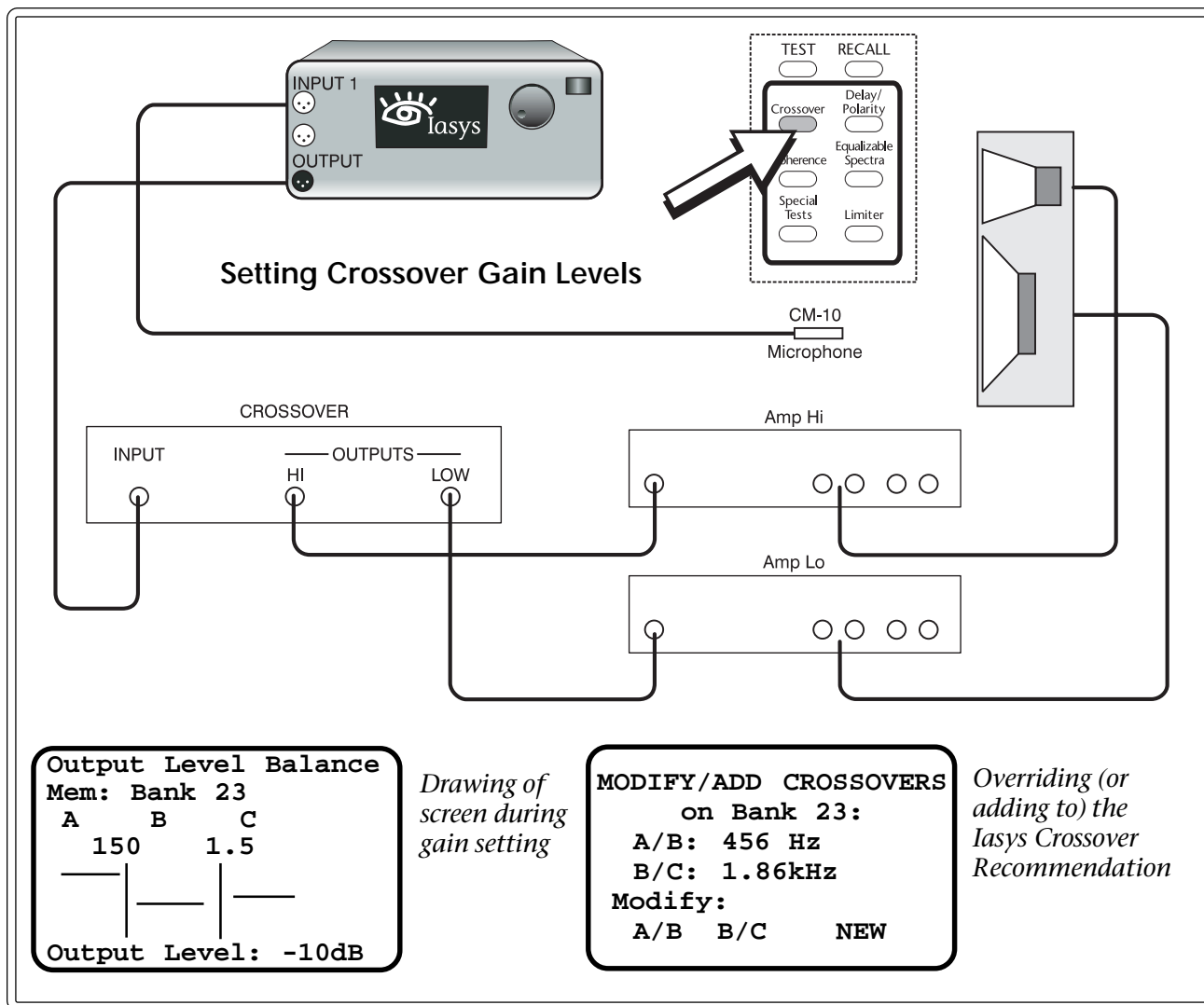
To adjust crossover gains:

- 1** Adjust the crossover (or crossovers) in the system to the frequencies **Iasys** recommended.
- 2** Make sure the crossovers are inserted into the signal path with the output of **Iasys** feeding the first crossover.
- 3** Place the microphone in the coverage pattern on-axis.
- 4** With the crossover frequency recommendations for this set of speakers on the **Iasys** screen, press TEST and you will be prompted to ensure the connections are all made. If you are in the wrong memory, use RECALL and the wheel to scroll to the correct memory.
- 5** Press TEST a second time and the pink noise will start at a low level.
- 6** Adjust the level of the pink noise using the **Iasys** wheel until level is approximately that of the intended performance.
- 7** Using the gain controls on the crossovers, adjust the output of each bandpass until the horizontal bars are even across. Each horizontal line movement is one dB if you want one particular bandpass to have more presence than another.

Overriding the **Iasys** frequency recommendation

You may override the crossover frequency recommendation. If are using a crossover point different than recommended by **Iasys** (like for a subwoofer, for example), then to ensure that **Iasys** is reading the energy in the proper passband, enter the correct crossover frequency.





To override (or add to) the crossover frequency recommendation:

- 1** Push CROSSOVER to go to the first screen displaying memories to select (A,B,C,D).
- 2** Press F1 for manual input.
- 3** Select via the buttons below the screen to either “Modify” for changing the existing points or “New” for adding points. Adding frequencies can be done even if there is nothing in any of the memories (A,B,C,D).
- 4** Choose the crossover frequency desired by using the octave select buttons below the screen to get close and the wheel for fine tuning the frequency. Press ENTER when at the correct frequency.
- 5** At the “Crossover Settings” screen, you will see this new number marked by an asterik to denote that it is a manually set crossover frequency.
- 6** If you wish to add or modify more than one crossover point, repeat this procedure. The frequencies are retained in memory for future use.

Measuring Delay Times and Distances

When there is more than one speaker, acoustic distances (path lengths) to the listener differ. To adjust electronic delays in this situation, **Iasys** helps by measuring the acoustic distance from the driver to the microphone. For example, this can be for adjusting the different bandpasses in an array or tuning delay towers.

Iasys will automatically

- characterize the speaker if the crossover test has not already been run;
- adjust the level of the test by first using a sine wave as verification;
- estimate the rough distance by a series of “pings”;
- verify acoustic polarity before making final measurements;
- calculate the relative distance from the furthest driver.

References:

📖 Section 2 page 1 for **Iasys** specific test procedures

📖 Section 6 page 1 for how to print test results

📖 Section 6 page 3 for how to change distances between metric and English

Adjusting Delay Devices

This test uses sophisticated noise correlation to measure distance effortlessly while you go about other jobs. **Iasys** can measure the distance up to a couple of hundred feet (about 100 meters) and measure places where you could never run a tape measure. If there is a problem **Iasys** tells you why it is having trouble. Since **Iasys** uses “fuzzy logic”, the test adapts itself to most conditions.

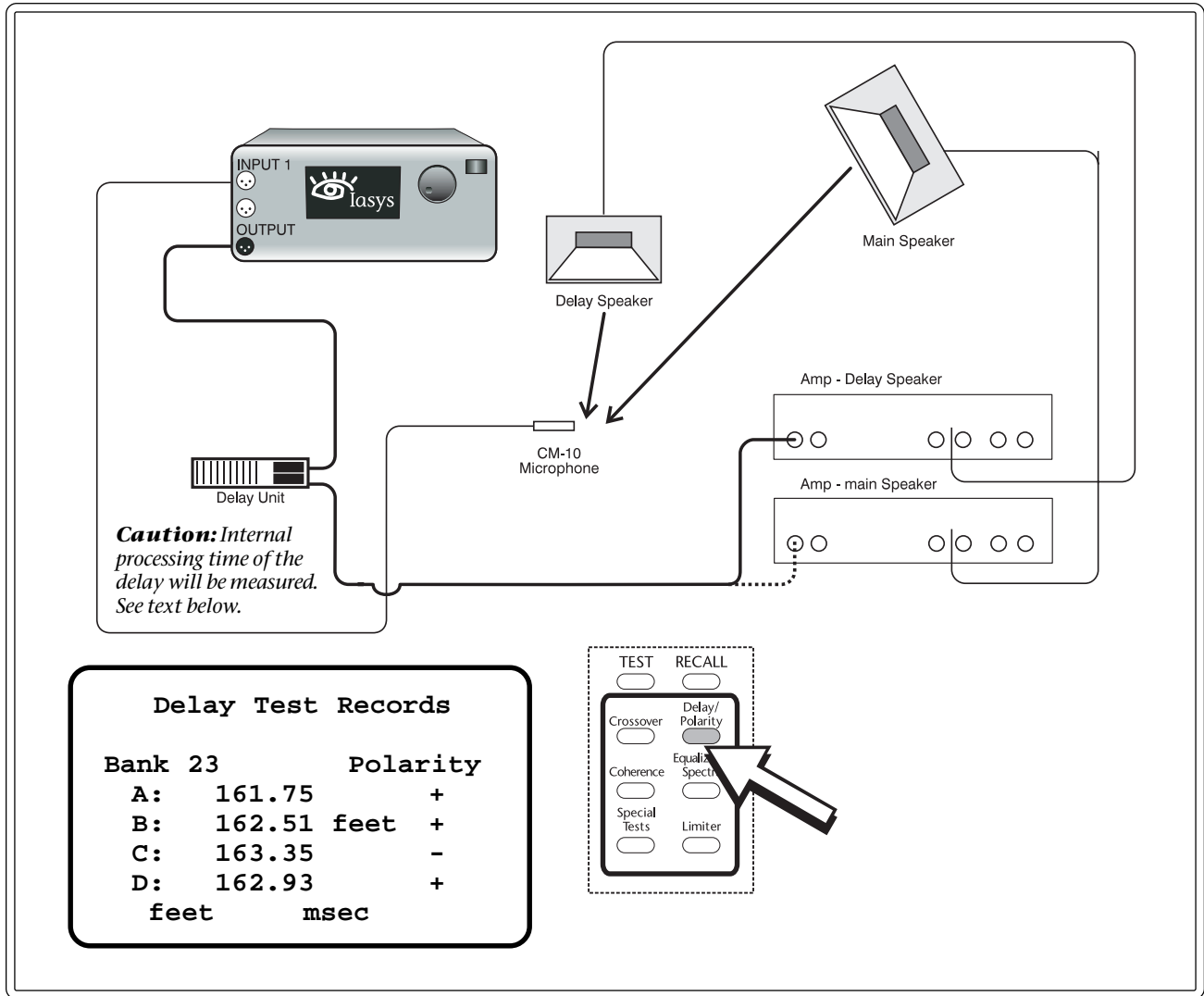
To measure distances:

- 1** Connect the **Iasys** output to the amplifier powering the driver (or set of drivers) you want to test. If there are any electronics between **Iasys** and the amplifier, they should be bypassed.
- 2** Place the microphone within the listening area at the place you want to measure the time delay and distance.
- 3** Connect the microphone to input 1 of the **Iasys** audio analyzer.
- 4** Press the DELAY/POLARITY button on **Iasys**.
- 5** Select the memory (A,B,C,D) in which is stored the results for this speaker(s) from the crossover test. There is data already present in the memory if a diamond (◇) is above the letter. If the crossover test is not being used, select an empty memory and **Iasys** will automatically run the part of the crossover test it needs.
- 6** If you wish to select a different bank of memories, press RECALL and use the wheel to scroll through the memories. To erase a memory, push ENTER for the special functions menu.
- 7** Press TEST and everything else is automatic. Use QUIT to interrupt the test.
- 8** If you are testing a set of speakers like in an array, repeat the above steps for a different driver bandpass using a different memory (A,B,C,D).
- 9** After testing a number of speakers, with the test results on the screen, push the DELAY/POLARITY button again and **Iasys** calculates the relative difference from the furthest driver.



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Some things to consider

- ✓ Accuracy of delay settings; since any digital processor has inherent internal lags due to processing, the readout on the delay you are using may be either “total delay” or “net delay”, that is including the internal delay or not. One way to test this with **Iasys** is an electronic hookup of the output of **Iasys** to the delay and the output of the delay to the input of **Iasys**. Use a setting like 100 msec and see what you measure. More than likely, the **Iasys** measurement will be longer due to internal processing time within the delay. **Iasys** is measuring true total delay.
- ✓ Distortion and coherence; **Iasys** uses noise correlation to measure distance. That is, **Iasys** knows the signal it is sending and looks for the time difference of the arrival of that signal at the microphone. This test relies upon the signal at the microphone being of reasonable quality. For best results, minimize background noise and sources of signal degradation like close reflections of high amplitude. If there is a problem, **Iasys** will display an error message.
- ✓ Temperature and humidity; **Iasys** measures the actual time of the acoustic delay and then calculates the distance based upon 1129 feet per second. Since the speed of sound changes with temperature and humidity, use the time measurement of **Iasys** to set the time of the delay rather than distance.



Checking Acoustic Polarity

Ensuring all parts of a sound system are wired consistently with regard to polarity is certainly a challenge. Even the most conscientious can make a mistake. **Iasys**, as part of the delay test, uses noise correlation to check acoustic polarity— and can run this test up to several hundred feet away from the speaker.

Iasys will automatically:

- characterize the speaker if the crossover test has not already been run;
- adjust the level of the test by first using a sine wave as verification;
- estimate the rough distance by a series of “pings”; and
- notify the user of acoustic polarity before making delay final measurements.

Acoustic Polarity Measurements

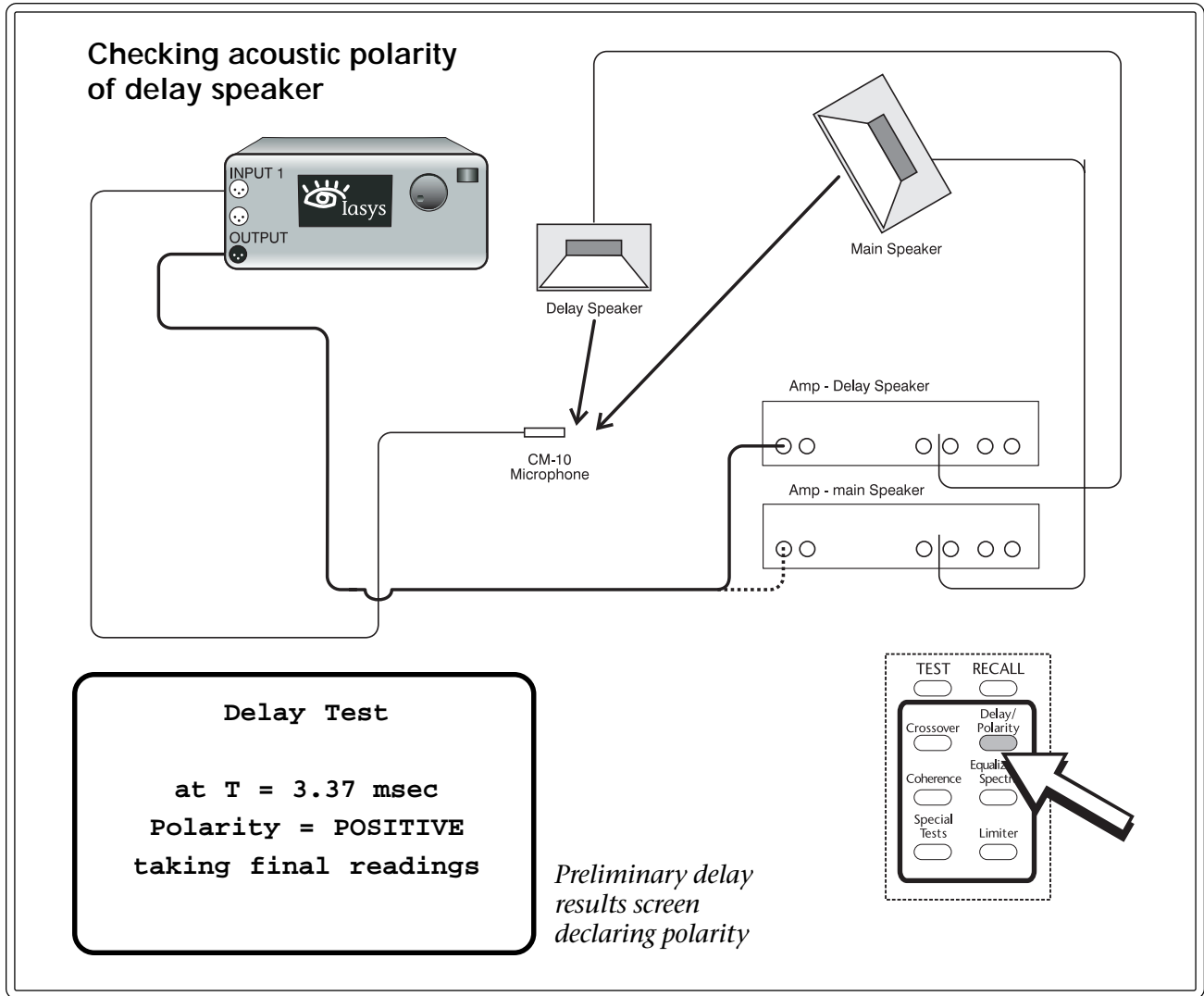
This test for acoustic polarity is absolutely accurate. Using a patent pending technique of noise correlation, **Iasys** can measure the polarity hundreds of feet away (if the SPL capacity of the speaker allows) rather than the few feet required by “clicker” type polarity pieces. You do not have to be able to get close to the speaker.

To check acoustic polarity:

- 1** Connect the **Iasys** output to the amplifier powering the driver (or set of drivers) you want to test. If there are any electronics between **Iasys** and the amplifier, they should be bypassed.
- 2** Place the microphone within the listening area at the place you want to measure the distance and on-axis for best results.
- 3** Connect the microphone to input 1 of the **Iasys** audio analyzer.
- 4** Press the DELAY/POLARITY button on **Iasys**.
- 5** Select the memory (A,B,C,D) in which is stored the results for this speaker(s) from the crossover test. There is data already present in the memory if a diamond (◇) is above the letter. If the crossover test is not being used, select an empty memory and **Iasys** will automatically run the part of the crossover test it needs.
- 7** If you wish to select a different bank of memories, press RECALL and use the wheel to scroll through the memories. To erase a memory, push ENTER for the special functions menu.
- 8** Press TEST and everything else is automatic. Use QUIT to interrupt the test at any time.
- 9** If you just want polarity but not distance, to speed up the test, use QUIT after the polarity determination is displayed (while **Iasys** is making final distance calculations) and go onto the next speaker. If you quit before completion of the test, the results are NOT retained in memory.
- 10** If you are testing a set of speakers like in an array, repeat the above steps for a different driver bandpass using a different memory (A,B,C,D). If



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you are testing different units of the same driver in an array, use the same memory but just connect a different driver.

Some Things to Consider:

- ✓ Distortion and coherence; **Iasys** uses noise correlation to measure polarity and distance. That is, **Iasys** knows the signal it is sending and looks for the polarity of that signal at the microphone. This test relies upon the signal at the microphone being of reasonable quality. For best results, minimize background noise and sources of signal degradation like close reflections of high amplitude. If there is a problem, **Iasys** will display an error message.
- ✓ Wind and moving air; when checking polarity and distance at more than 50 feet, air movements from wind when outdoors or heating and air conditioning systems when indoors, may interfere with the test. If **Iasys** is not able to complete the test with sufficient accuracy, it will state the problem as an error message on the screen.

Limiters Setting and Verification

Traditional methods of limiter setting involve calculations to published specifications and guesswork. Much better than these methods, **Iasys** measures the onset of thermal (power) compression, non-destructively, in the particular location desired. **Iasys** is the only test instrument that performs this kind of a test.

Iasys will automatically:

- characterize the speaker if the crossover or delay test has not already been run;
- adjust the level of the test by first using a warble tone as verification;
- while monitoring the SPL at the microphone and the output of the amplifier, ramp up the test signal;
- cease the test if amplifier clipping is discovered;
- stop the test if driver distress is detected;
- bring the test to a normal conclusion due to power compression and display the results; and
- verify the setting of the limiter when the test is re-run with the limiter in line and adjusted.

Setting Limiters

Knowing where to set limiters can impressively increase the reliability of the sound system by reducing equipment stress. At the same time, properly set limiters allow you to play the system up to a safe limit. You can eliminate transporting unneeded equipment because the system previously was set so conservatively to be safe. **Iasys** runs this test while you are busy doing something else or lets you teach someone, in a matter of minutes, to perform it for you. Since **Iasys** uses “fuzzy logic”, this test adapts itself to most conditions.

References:

📖 Section 2 page 1 for **Iasys** specific test procedures

📖 Section 6 page 1 for information on printing test results

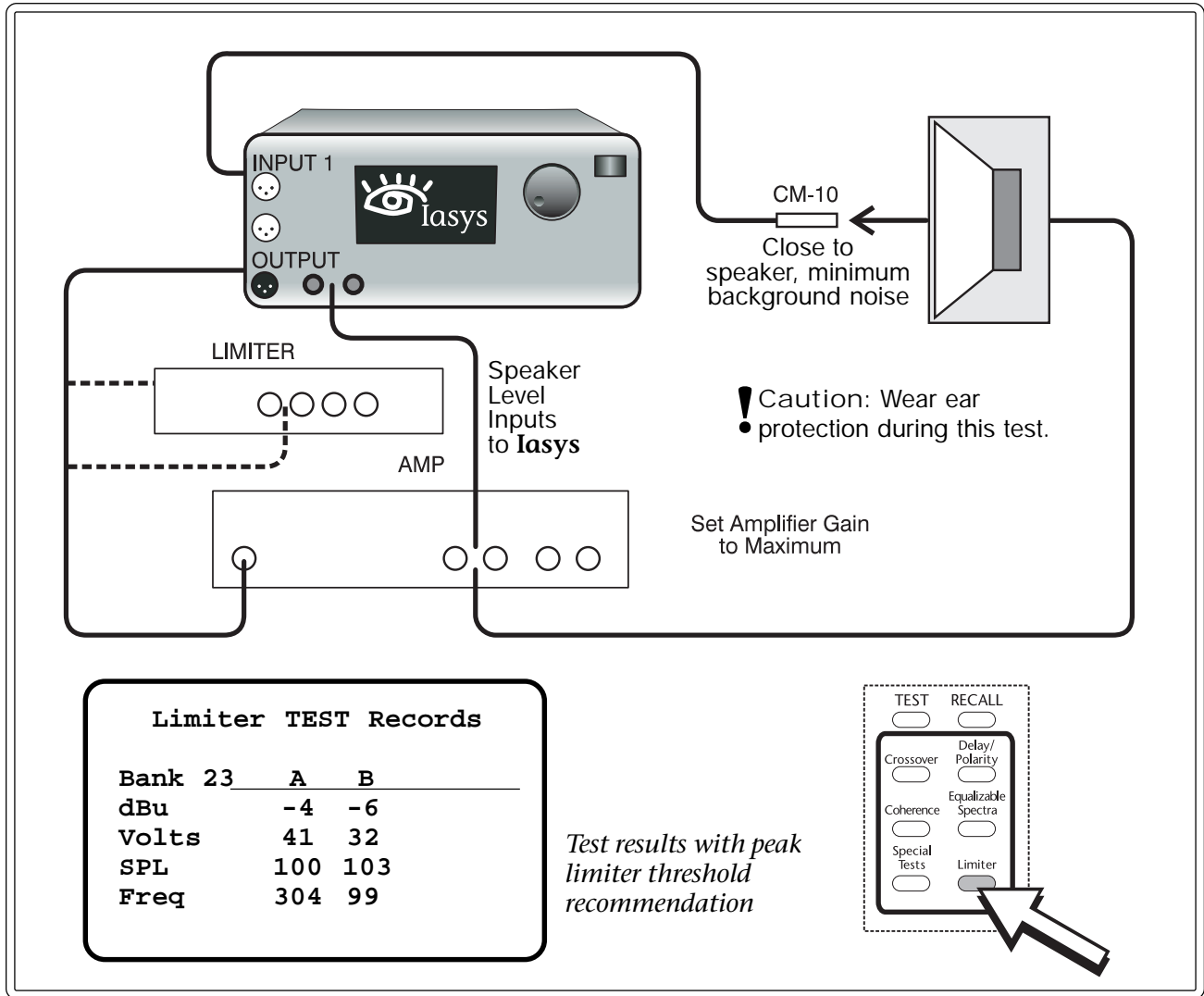
📖 Section 6 page 5 for memory management procedures

To measure thermal compression onset:

- 1** Connect the **Iasys** output to the amplifier powering the driver (or set of drivers) you want to test. If there are any electronics between **Iasys** and the amplifier, they should be bypassed.
- 2** Place the microphone close to the speaker within the listening area for best results. Minimize background noise as this test reads all sound in the environment.
- 3** Connect the microphone to input 1 of the **Iasys** audio analyzer.
- 4** Connect the output of the amplifier for that particular speaker to the Speaker Level Input on the front of **Iasys**. **Set amplifier gain to maximum.**
- 5** Press the LIMITER button on **Iasys**. Wear ear protection.
- 6** Select the memory (A,B,C,D) in which is stored the results for this speaker(s) from the crossover test. There is data already present in the memory if a diamond (◇) is above the letter. If the crossover test is not being used, select an empty memory and **Iasys** will automatically run the part of the crossover test it needs.
- 7** If you wish to select a different bank of memories, press RECALL and use the wheel to scroll through the memories. To erase a memory, push ENTER for the special functions menu.



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- 8 Press TEST and everything else is automatic. Use QUIT to interrupt the test.
- 9 If you are testing a set of speakers like in an array, repeat the above steps for a different driver bandpass using a different memory (A,B,C,D).

To verify the setting of a limiter

- 1 Repeat the steps for measuring thermal compression with the limiter between the Iasys and the amplifier adjusted to the recommended setting. Depending on the ratio selected and the “knee” of the limiter, subtract a few dB from the Iasys recommendation for the limiter threshold setting.
- 2 Re-run the test with the limiter in the signal chain until you verify that the limiter is restraining the signal before the onset of power compression

Error Messages

- “No signal level on Speaker Level Input”; either the output of the amplifier is not hooked up, the connection is faulty or the amplifier is not putting out a minimum of 1.0 volts.
- Amplifier Clipping, Iasys will notify you if amplifier clipping is detected prior to power compression.

Coherence - Phase Alignment

Iasys displays a quasi real time graph of phase versus frequency called coherence. Coherence is an indicator to how synchronized one frequency is to another in time. The enemies of coherence are more than one speaker playing the same frequency, reflections, sympathetic vibrations, and distortion. The **Iasys** display encourages you to make changes and see the results, good or bad. The next section includes information on interpreting coherence graphs.

Time is difficult to see. For years we have enjoyed seeing amplitude (volume) versus frequency on real time spectrum analyzers. With the **Iasys** coherence graph, you see phase versus frequency in a fashion similar to the real time spectrum analyzer display. Like an RTA, you will see things that are not easy to understand and that you may not like.

The coherence test uses sophisticated noise correlation analysis based upon knowing the EXACT time the signal takes from leaving **Iasys** to arriving back through the microphone. If the signal arrives later (or earlier) than expected it has poorer coherence than a signal arriving in time.

Some Things to Consider

- Since wavelengths vary with frequency, small distance changes have larger effects at higher frequencies.
- You are the final judge of the audibility of less than perfect coherence as shown on **Iasys**. Many believe high frequency coherence (above 8 kHz) is both extremely tricky to correct over a meaningful audience area and not worth the consternation.
- Low frequency coherence (below a 100 Hz) is usually poor in small rooms due to the long wavelengths. Not surprisingly, the vocal ranges seem to have the most affect and room for improvement.
- For some measurements, multiple causes are affecting the results. In this situation, it is very difficult to tell what is the major cause and you will have to fall back on the process of elimination. Try turning off additional speakers and improving alignment as first steps.

To Run a Coherence Graph

- 1** Run a Delay test according to the instruction on pages 5 and 6, section four (this section) *immediately* prior to running a Coherence test. The Coherence test will only run directly after a Delay test to ensure that the distance to the microphone is correct.
- 2** With the pink noise still on at the end of the Delay test, press COHERENCE.
- 3** To make changes and then view the results, press PAUSE.
- 4** A second press of the PAUSE button restarts the tests from the highest frequency. Do not press QUIT since then you will have to re-run the Delay test.
- 5** Press EQUALIZABLE SPECTRA at any time to see the same data as amplitude versus frequency.

References:

📖 Section 4 page 5 for delay test measurements

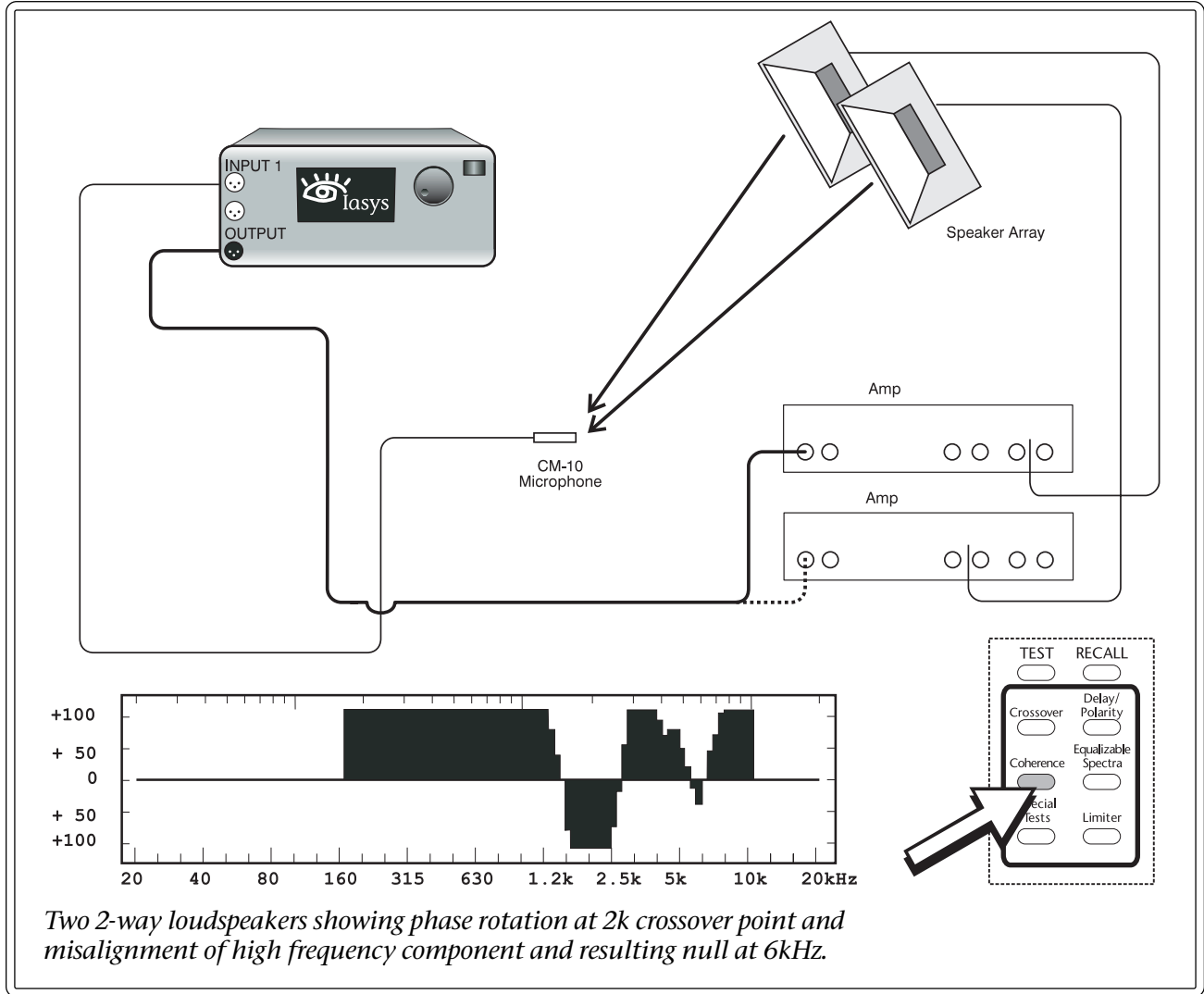
📖 Section 6 page 15 for amplitude versus frequency measurements

📖 Section 6 page 1 for how to print test results



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Coherence for Multiple Drivers

Most important is the use of coherence with multiple drivers operating. With multiple drivers, more than one speaker is playing the same frequency. The same sound coming from multiple speakers is a key enemy of coherence yet a situation you have some control over. In contrast, you have little control over reflections.

- 1** For two, three, and four way systems, perform the coherence test on the highest frequency driver (since the shorter wavelengths give the most accurate distance measurement). Then sequentially turn on the next lower speaker and tune the alignment for the best coherence throughout the frequency range.
- 2** For an array of multiple speakers of the same type, coherence can be used to check their alignment. Activate one speaker and do the coherence test as described below. Then successively activate other drivers in the array, one at a time. If you have delays available, fine tune the delay settings for each successive driver activated to achieve the best coherence graph. Physical distance and direction changes must be made if you do not have delays available.

How to Recall the Last Test

Iasys retains the data from the last test run. This is available to you either via the printout or on screen. To display on screen, select the desired memory bank, push COHERENCE, then push COHERENCE a second time. You may toggle between this graph and the Coherence graph as both are contained in the memory.



Coherence - Interpreting Graphs

Iasys displays a quasi real time graph of phase versus frequency called coherence. Interpreting these graphs takes practice and an understanding of what affects the time arrivals of the signal. Similarly, some situations matter more than others with regard to sound quality. The **Iasys** display encourages you to make changes, see the results, and learn what is important to you. The previous section includes information on running the test to generate coherence graphs.

With the **Iasys** coherence graph, you see phase versus frequency in a fashion similar to the real time spectrum analyzer display of amplitude versus frequency. **Iasys** knows the EXACT time the signal should take to arrive back through the microphone. If the signal arrives later or earlier than expected it has poorer coherence than a signal arriving in time.

How to Read the Graph

- Good coherence, or 100% in correct time, is at the top of the graph. Signals at the bottom of the graph are in time but out of polarity.
- The horizontal center line of the coherence graph is zero coherence. This means the signal is either not in time or not present.
- Each vertical bar on the display is 1/12th of an octave. You may use the wheel to move the pointer at the top of the screen to pinpoint the frequency of a vertical bar.
- To make changes and then view the results, press PAUSE. This is very useful since the pink noise ceases. A second press of the PAUSE button restarts the tests from the highest frequency. Do not press QUIT since then you will have to re-run the Delay test.

Hints on Interpreting Coherence Graphs

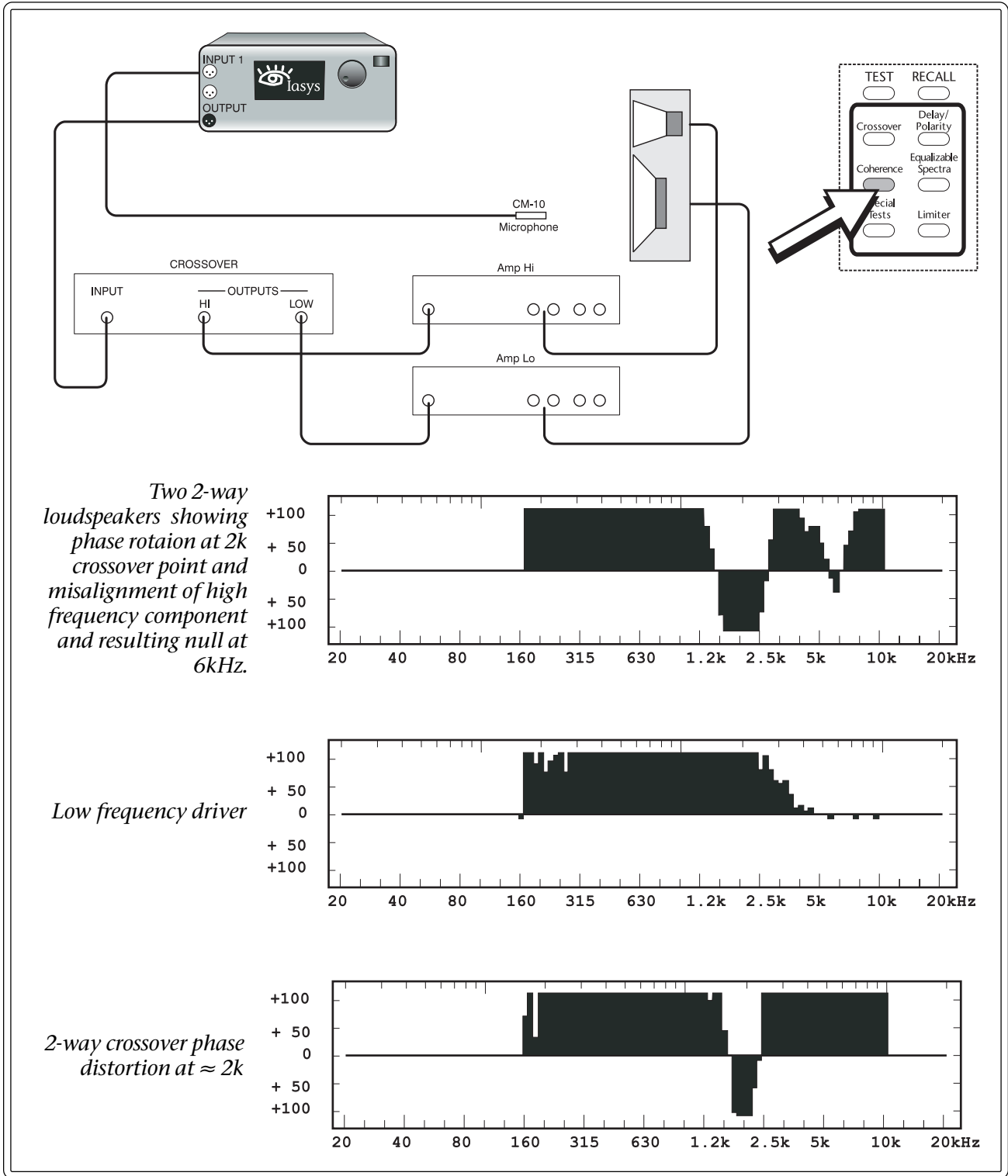
- ✓ Zero coherence, the horizontal center line, indicates the signal arriving is not in time with established time of the delay test. Or, it indicates the lack of a signal. The absence of a signal within an established bandwidth is most likely caused by a null. A null comes from multiple signals of the same frequency canceling each other. At the edges of the bandwidth, the lack of a signal is simply the inability of the loudspeaker to reproduce those frequencies (see diagram).
- ✓ Arrays of multiple speakers are frequently not in the same acoustic plane. The results on the coherence graphs may be phase rotations due to comb filtering as well as nulls of certain frequencies (see diagram). See previous section for hints on array alignment.
- ✓ Speakers typically rotate phase at the lower frequencies of their bandwidth as the coherence display will show.
- ✓ Crossovers, both passive and active, will show poorer coherence and often complete phase reversals at the crossover frequency area. A narrow bandwidth coherence reversal from positive to negative is often phase distortion from a crossover. You can confirm this by comparing the frequency of the coherence disturbance and frequency of the crossover (see diagram).

References:

📖 Section 4 page 11
for running
coherence tests



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- ✓ Strong reflections hurt coherence. The effect is sometimes similar to the multiple speaker phase rotations.
- ✓ In outdoor tests, wind will cause varying effects as it gusts. You may see the same effect from heating and air conditioning systems.

Equalizable Spectra

Iasys displays amplitude versus frequency on a quasi real time basis but with a unique twist. The amplitude is shown only for those frequencies which can be controlled by an equalizer. The display resolution is very precise at 1/12 octave. You may toggle back and forth between the Equalizable Spectra graph and the Coherence graph.

Much like a real time spectrum analyzer, you see amplitude versus frequency with the **Iasys** equalizable spectra graph. However, there are some significant differences. **Iasys** only displays those frequencies whose amplitude may be changed by an equalizer. That is, the one-twelfth octave display omits the frequencies that will not have an acoustic output change consistent with the electrical signal change of the equalizer.

The reasons for equalizer adjustments not effecting acoustical changes include frequencies outside the physical limits of the speaker and areas of poor coherence including nulls. A null comes from multiple signals of the same frequency canceling each other and is revealed by the **Iasys** coherence test described in the prior pages.

If you run the equalizable spectra test after you have adjusted the crossover frequency, crossover levels, and delay adjustments for best time alignment, you will find the amplitude graph does not include narrow band peaks or dips and is quite smooth.

References:

📖 Section 4 page 11 for running coherence tests

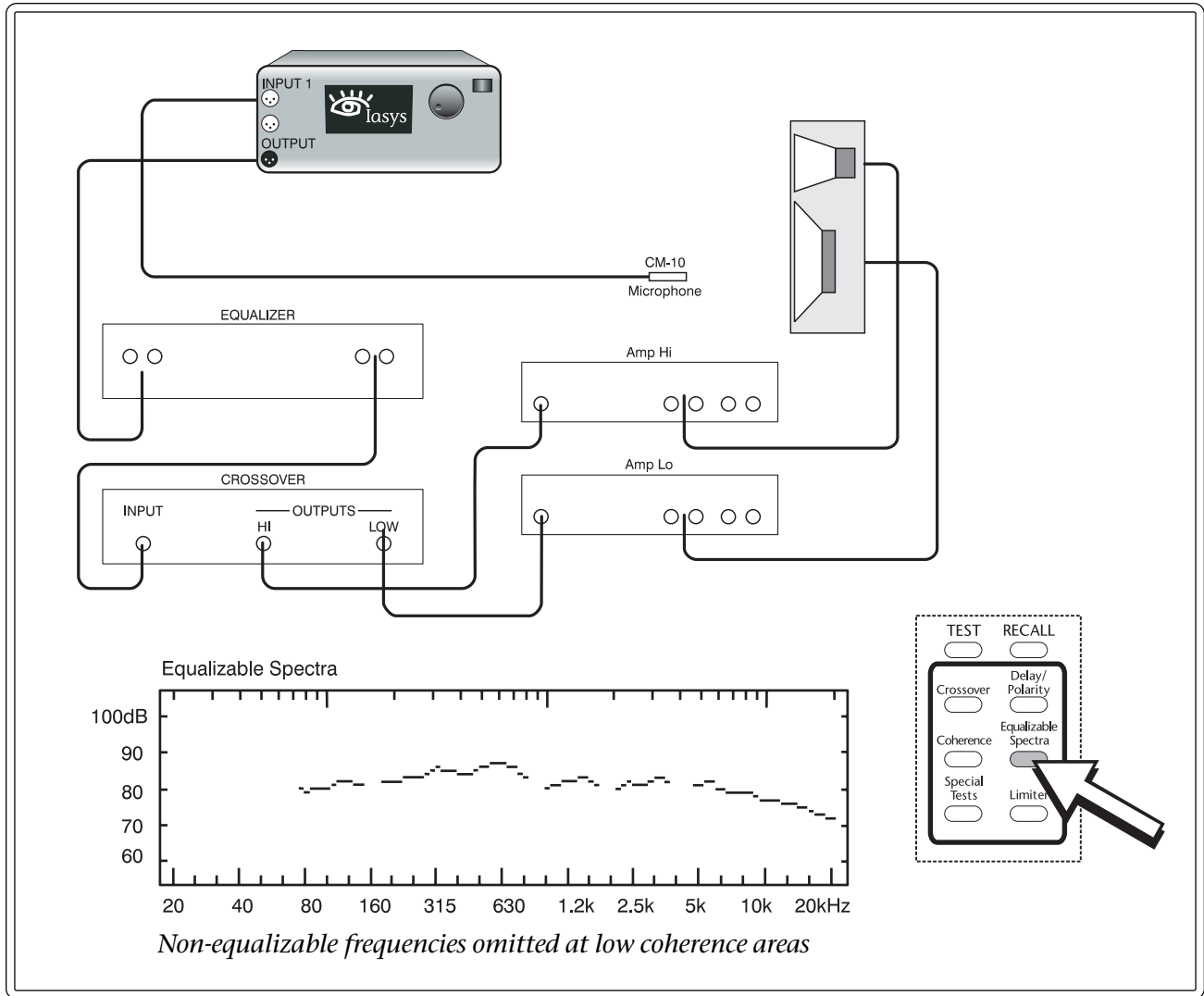
📖 Section 6 page 1 on how to print test results

To Run an Equalizable Spectra Graph

- 1** Run a Delay test according to the instruction on pages 5 and 6, section four (this section) immediately prior to running an Equalizable Spectra test. The Equalizable Spectra test (like the Coherence test) will only run directly after a Delay test to ensure that the distance to the microphone is correct.
- 2** With the pink noise still on at the end of the Delay test, press EQUALIZABLE SPECTRA.
- 3** To make changes and then view the results, press PAUSE.
- 4** A second press of the PAUSE button restarts the tests from the highest frequency. Do not press QUIT since then you will have to re-run the Delay test.
- 5** Turn the wheel to move the pointer at the top of the graph to pinpoint the frequency of a particular area.
- 6** Press COHERENCE at any time to see the same data as phase versus frequency.



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How to Recall the Last Test

Iasys retains the data from the last test run. This is available to you either via the printout or on screen. To display on screen, select the desired memory bank, push EQUALIZABLE SPECTRA, then push EQUALIZABLE SPECTRA a second time. You may toggle between this graph and the Coherence graph as both are contained in the memory.

How to Read the Graph

- Frequencies which are omitted are both not shown as part of the graph and signified by an additional bar at the top most of the screen. If only one or two 1/12 octave bands are omitted, they can be hard to see.
- Each step (pixel) in the vertical direction on the graph is one decibel. The entire graph contains a range of approximately 50 decibels.
- If a large portion of the graph is higher or lower than the main graph, you may want to check the crossover levels again before equalizing.

Pink Noise and Single Sine Wave Tones

Very sophisticated test tones are part of the automatic tests of **Iasys**. These test tones are available manually controlled via the buttons on the lower right of the **Iasys** front panel. Here we explore two of them— single sine wave tones and pink noise.

Iasys will automatically:

- begin this test at a very low signal level
- display the SPL at the microphone
- display the signal level of the output
- for sine waves, begin at the last frequency used, even after the unit is turned off; and
- restart at the same signal level after test is paused

Pink Noise

Sounding a lot like hiss, and akin to water torture after long periods of use, pink noise is full bandwidth noise. The pink noise from **Iasys** is pseudo random and digitally created sequence repeating approximately every three seconds.

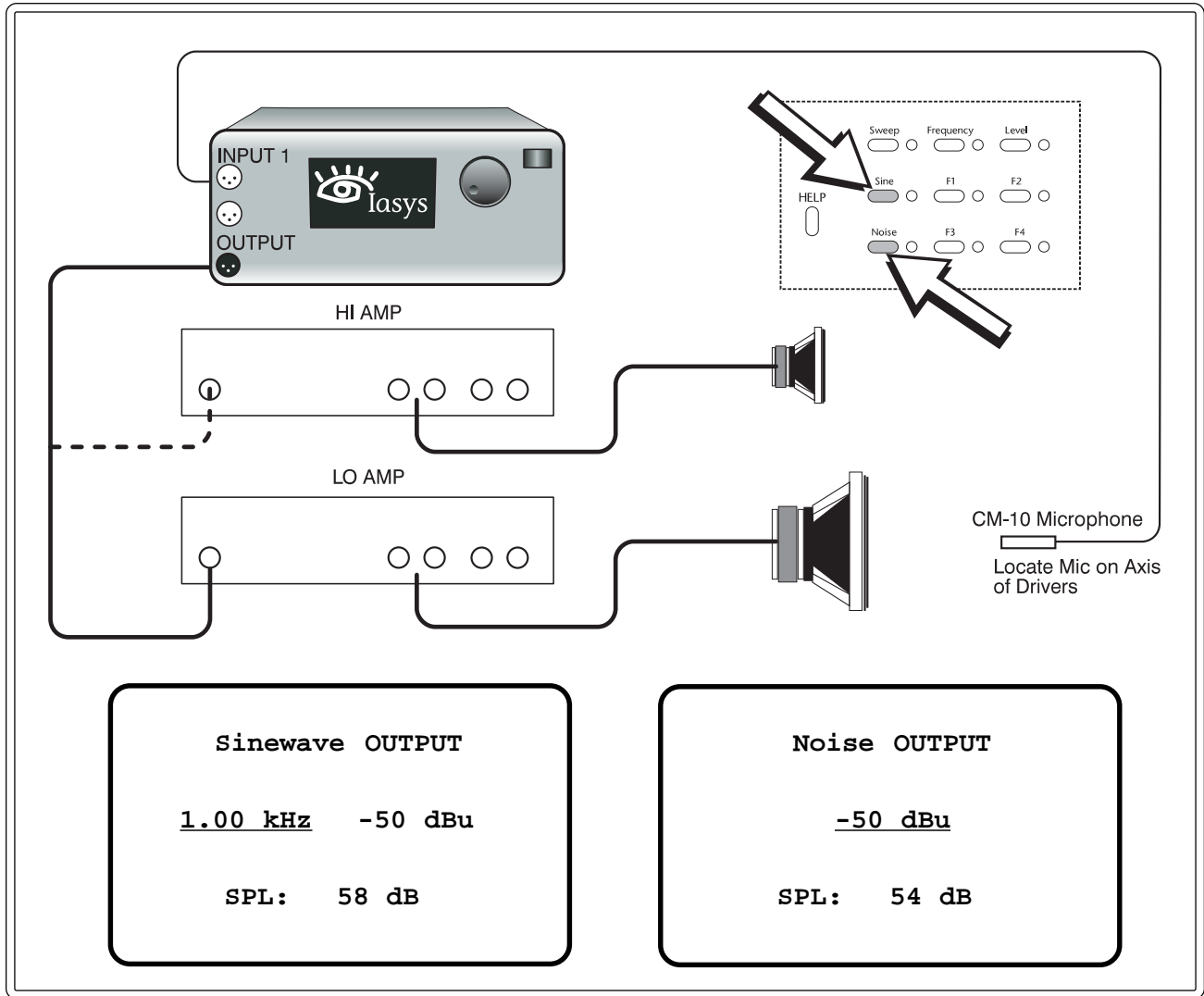
To use pink noise:

- 1** Connect the **Iasys** output to the amplifier powering the driver (or set of drivers) you want to test. If testing an electronic component, hook the output to the input of the device being tested.
- 2** Place the microphone within the listening area and connect to input 1 of the **Iasys** audio analyzer.
- 3** For an electronic test, connect the output of the test device to Input 1 of **Iasys**.
- 4** Press the NOISE button on **Iasys**.
- 5** Adjust the test level with the wheel while monitoring on the display screen the dBu of the signal output and the SPL of the input to **Iasys**.
- 6** Press PAUSE to mute the test signal and press PAUSE for the second time to resume at the previous level.

Single Sine Wave Tones

- 1** Connect the **Iasys** output to the amplifier powering the driver (or set of drivers) you want to test. If testing an electronic component, hook the output to the input of the device being tested.
- 2** Place the microphone within the listening area and connect to input 1 of the **Iasys** audio analyzer.
- 3** For an electronic test, connect the output of the test device to Input 1 of **Iasys**.
- 4** Press the SINE button on **Iasys**.
- 5** Adjust the test level with the wheel while monitoring on the display screen the dBu of the signal output and the SPL of the input to **Iasys**. You are in the signal level adjustment mode when the line is underneath the dBu value on the middle right of the screen.





- 6** To adjust the frequency, press the FREQUENCY button and then use the wheel only for fine tuning.
- 7** For quick jumps to a new frequency, use the OCTAVE SELECT buttons under the display screen. If you are in level setting mode, and press an octave select button, this will put **Iasys** automatically in the frequency select mode as noted by the underline beneath the frequency on the display screen.
- 8** Press PAUSE to mute the test signal and press PAUSE for the second time to resume at the previous level.

Some Useful Information

- ✓ Randomness of pink noise; by its nature the amplitude of pink noise gyrates. If you are viewing the output of **Iasys** on a real time spectrum analyzer (like those from AudioControl Industrial, fine products by the way), then select a slow or averaged viewing speed and a dB per step of about 3 dB for best results.
- ✓ Sine wave purity; due to its digital origin, the sine wave created by **Iasys** is very accurate (± 1 Hz). This makes the output of **Iasys** useful with other test instruments.
- ✓ Speaker stress; a fixed frequency sine wave can be by far the most stressful test of a speaker. You should take extreme care in frequency and, particularly, level and duration when testing a speaker with a static sine wave.



Sine Wave Sweeps (Programmable)

A swept pure tone sine wave can be very useful for finding sympathetic vibrations, checking for buzzes and rattles in speaker boxes, using with an RTA, and many other uses. The swept sine from the **Iasys** is doubly useful since you can program the start and stop frequencies as well as the duration of the sweep.

Iasys will automatically:

- begin this test at a very low signal level;
- display the SPL at the microphone;
- display the signal level of the output;
- continue running the sweep until stopped;
- begin at the last start, stop and duration settings used, even after the unit is turned off; and
- restart at the same signal level after test is paused.

Programmable Swept Sine Wave Tones

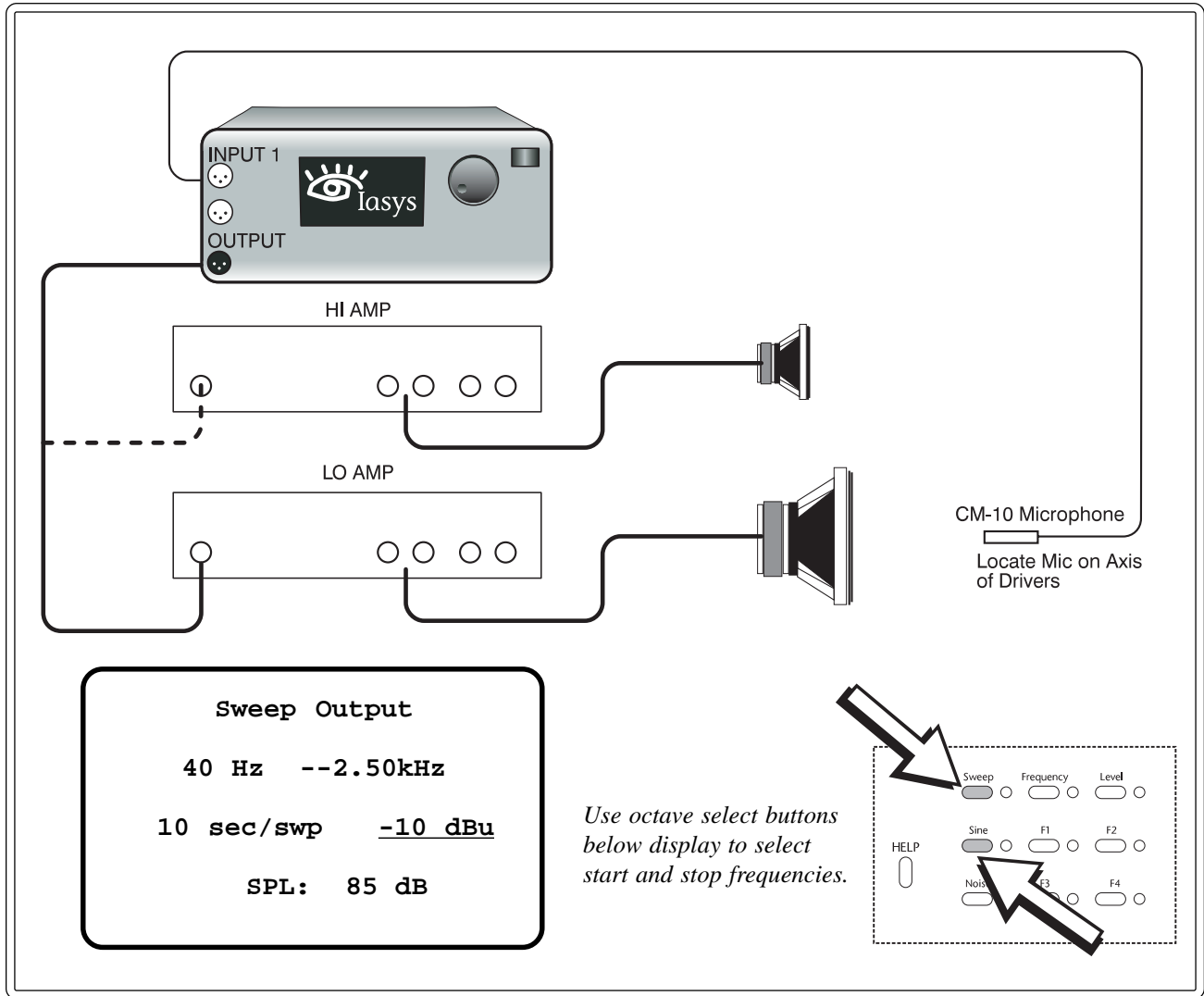
The sweeping sine wave tone of **Iasys** is continuous. Once the swept tone reaches the upper limit programmed, the tone starts once again from the lower limit automatically. This repeating feature, along with the ability to select start frequency, stop frequency, and duration, may make this your favorite manual test with **Iasys**.

- 1** Connect the **Iasys** output to the amplifier powering the driver (or set of drivers) you want to test. If testing an electronic component, hook the output to the input of the device being tested.
- 2** Place the microphone within the listening area and connect to input 1 of the **Iasys** audio analyzer.
- 3** For an electronic test, connect the output of the test device to Input 1 of **Iasys**.
- 4** Press the SWEEP button on **Iasys**.
- 5** Adjust the test level with the wheel while monitoring on the display screen the dBu of the signal output and the SPL of the input to **Iasys**. You are in the signal level adjustment mode when the line is underneath the dBu value on the middle right of the screen.
- 6** To adjust the start and stop frequencies, use the OCTAVE SELECT buttons under the display screen at any time.
- 7** To change the duration of the sweep, press the FREQUENCY button and then use the wheel while watching the display. The maximum and minimum possible sweep durations depend upon the bandwidth of the sweep selected.
- 8** Press PAUSE to mute the test signal and press PAUSE for the second time to resume at the previous signal level.



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Some Useful Information

- ✓ Sweep flatness; due to it's digital origin, the sweep created by **Iasys** is extremely flat ($\pm 0.1\text{dB}$). This makes the output of **Iasys** useful with other test instruments.
- ✓ Speaker stress; a sweeping sine wave can be a stressful test of a speaker (though not nearly as stressful as a fixed sine wave). You should take particular care with narrow frequencies bands, high levels and short durations when testing a speaker with a sweep sine wave.

Printing Test Results

Hard copy printout is useful for your own records. The hard copy is also valuable to demonstrate to the customer the tests performed, your expertise in setting up the system, and the baseline in case someone else “improves” the system while you are not there. With **Iasys**, printing those test results only takes the double press of a button.

Iasys will automatically:

- print all the information contained within the memory bank selected;
- print out the last complete coherence and equalizable spectra sweep;
- format the report;
- time and date stamp the report and the time of the tests; and
- retain the selection of printer type, even after the unit is turned off.

References:

📖 Section 6 page 3 for information on changing time, date and English/metric


📖 Section 6 page 5 for how to erase memories

To Print a Test Report

The format of the test report is pre-programmed in **Iasys**. All you have to do is connect the printer and load the paper. **Iasys** takes care of the rest of the work.

- 1** Connect the selected printer with an IBM type printer cable to the parallel (DB25) connector on the rear panel of **Iasys**.
- 2** Press RECALL to select the memory bank of test results you wish to print. After selecting the memory, press QUIT.
- 3** Press ENTER to display the “Special Functions” screen.
- 4** The print option is automatically highlighted as the top choice.
- 5** Press ENTER once more to commence printing
- 6** During printing, **Iasys** will display a message that it is printing
- 7** If you wish to print another memory bank of test results, select that memory with RECALL and repeat the procedure.

To Change Printer Type

- 1** Press ENTER to display the “Special Functions” screen.
- 2** Select “Setup” by scrolling the arrow with the wheel, to that function. Then press ENTER a second time.
- 3** Pick “Printer type” by scrolling the arrow with the wheel. To go to the next step, press ENTER once more.
- 4** Use the wheel to change the setting from “Epson” to “HP Deskjet”, pressing enter when the modification is complete. All capital letters indicate that printer type is selected. The new setting will be maintained until changed (non-volatile). Note: HP Laserjets (at the time of this manual) support HP Deskjet output.
- 5** During any step, pressing QUIT aborts the process without changing the present settings. 



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Print Test Report
Bank 23

Printer is PRINTING

Press:
F1 to start
QUIT to abort

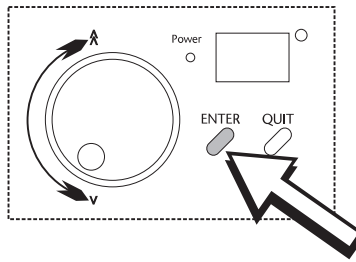
To Start Printing

-Iasys MENU -

Print
Memory
Setup ←

Select with WHEEL
Press Enter

Setup for Changing Printer Type



Iasys 0023
- Audio Analyzer -
Test performed by:

7:43 1 Sep 98

Facility Name: _____
Address: _____
Manager: _____ Phone: _____

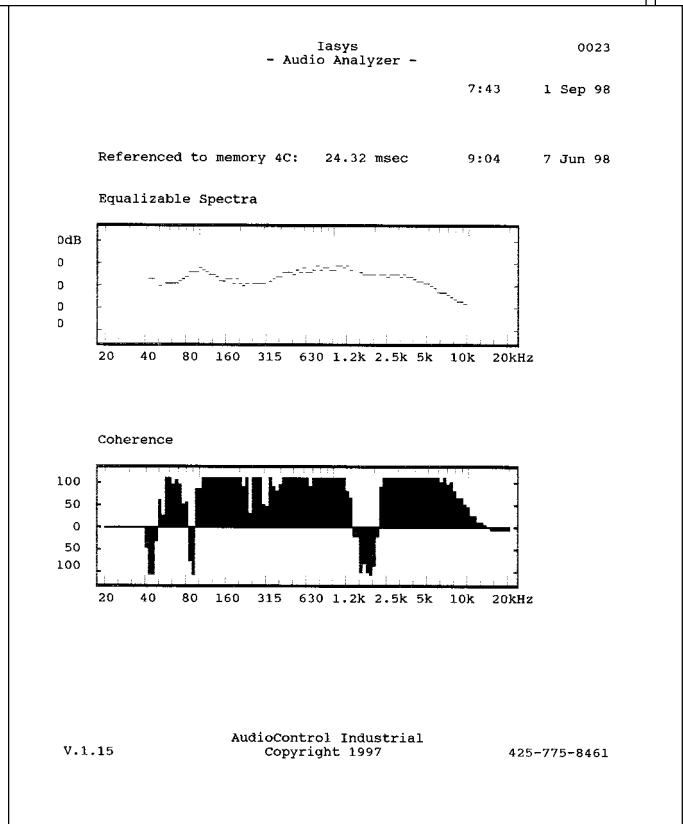
Contractor Name: _____
Address: _____
Analysis Conducted By: _____

System Designer: _____ Phone: _____
System Components: _____

Microphone Position: _____ Marked: Yes No

Memory Bank:	A	B	C	D
Energy Center (Hz):	104	754	2.73k	
Crossover Points (Hz):	A/B 278	B/C 1.43k		
Delay Time (msec):	23.55	24.43	24.32	
Distance (ft):	26.59	27.58	27.45	
Polarity:	pos	pos	pos	
Time of day:			9:03	
Date:			7 Jun	
Thermal Limit (dBU):	-29	+2	+10	
at Amp Voltage (V):	32	27	13	
at SPL (dB SPL):	115	113	115	
Frequency:	69	479	1.82k	

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Sample Printout

Changing Time, Date and Metric versus English

Within **Iasys** is a very precise real time clock which keeps track of both the time (to the second) and the date. For distance measurements as part of the delay test, **Iasys** can display the results in either English (feet) or metric (meters).

Iasys will automatically:

- maintain time and date after first set;
- display both time and date at the bottom of idle screens;
- compute distances in either feet or meters; and
- preserve all settings until changed.

To Change the Time and Date

The precise clock inside **Iasys** is not affected by whether the unit is on or off and plugged in or not. The lifetime of this internal clock is about nine years. The hours are displayed in 24 hour (military) time and the year 2000 is displayed as 00.

- 1** Press ENTER to display the “Special Functions” screen.
- 2** Select “Setup” by scrolling the arrow with the wheel, to that function. Then press ENTER a second time.
- 3** Pick either “Time” or “Date”, again by scrolling the arrow with the wheel. To go to the next step, press ENTER once more.
- 4** Now the octave select buttons at the bottom of the screen are functioning as soft keys to select the function (hour, minute, day, month, or year) to adjust. Use the wheel to change the setting, pressing enter when the alteration is complete.

To Select Metric versus English Measurements

Distance is the only measurement of **Iasys** affected by the selection of English versus Metric. The choice is feet versus meters.

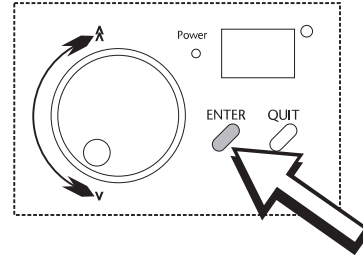
- 1** Press ENTER to display the “Special Functions” screen.
- 2** Select “Setup” by scrolling the arrow with the wheel, to that function. Then press ENTER a second time.
- 3** Pick “English/Metric” by scrolling the arrow with the wheel. To go to the next step, press ENTER once more.
- 4** Use the wheel to change the setting, pressing enter when the modification is complete. All capital letters indicate the one selected.
- 5** During any step, pressing QUIT aborts the process without changing the present settings.



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-Iasys MENU -
Print
Memory
Setup ←
Select with WHEEL
Press Enter



Setup Options
Time ←
Date
English/Metric
Select with WHEEL
Press ENTER

For Time Change

Setup Options
Time
Date ←
English/Metric
Select with WHEEL
Press ENTER

For Date Change

Set Time:
Press ENTER when done
or QUIT to abort
13:05
HR MIN

To Set New Time

Set Date:
Press ENTER when done
or QUIT to abort
23 - JAN - 89
| | |

To Set New Date

Memories Management

Data is automatically recorded by **Iasys** at the end of a test and stored in the memory you selected at the beginning of that test. There are 32 banks of four memories (A,B,C,D) or 128 total. By design, erasing these memories takes a series of actions much different than normal testing, something you will not do by accident. A single memory, a bank, or a group of banks all at once may be erased

Iasys will automatically:

- record test results in memory at the conclusion of a test;
- not change data in a memory if a test is stopped before completion;
- maintain data in memories until erased whether the unit is powered or not; and
- always have the same data in memory 33, the example memory.

To Recall Memories

The easiest way to recall memories is to use the RECALL button above the automatic tests buttons. RECALL activates the wheel as shown by the circle (O) in the upper right corner of the display screen. With the wheel you can scroll through the data stored.

If you use RECALL, the data you see depends upon where you were before pressing the button. In certain circumstances, the recall functions is not available. If not available, press QUIT, then RECALL. An alternate way to recall memories is from the Memory management menu accessed by pressing ENTER, the same as the procedure below for erasure.

Memory Conventions

When the initial speaker bandwidth characterization test is complete, that particular memory will show a diamond (◇) above the letter of the memory. If the delay/polarity test is concluded, either a plus (+) or minus (-) designates the polarity measured. Knowing that the speaker bandwidth test is complete by seeing the diamond above the memory letter not only tells you the memory has data but also means you may use that data to run other tests if, and only if, you have not changed the system, venue, or microphone position.

To Erase Complete Banks or Group of Banks of Memories

- 1** Press ENTER to display the "Special Functions" screen.
- 2** Select "Memory" by scrolling the arrow with the wheel, to that function. Then press ENTER a second time.
- 3** Pick "Erase Memory" by scrolling the arrow with the wheel. To go to the next step, press ENTER once more.
- 4** Press F1 for erasing the entire bank. Press F2, F3 or F4 to erase groups of banks
- 6** You are then prompted to confirm your decision to erase the entire bank by pressing ENTER.
- 7** During any step, pressing QUIT aborts the process without changing the present settings.



-Iasys MENU -

Print
Memory ←
Setup

Select with WHEEL
Press Enter

MEMORY

Erase memory ←
Recall Bank

Select with WHEEL

Erasing Memories

Press ENTER
to erase Bank 19

To erase by groups

F2 for banks 1-10

F3 for banks 11-20

F4 for banks 21-32

or QUIT to exit.

-DELAY TEST- ○

Select a Memory
or press DELAY
to see test results.

Bank: 23

◇+	◇-	◇+	◇+
<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>

◇ shows bandwidth test run and data present

+ or - shows measured and recorded polarity

Memory Symbols

To Erase Only Selected Memories Within A Memory Bank

You may want to erase only a single memory within a bank if you wish to re-run a test of a certain driver, for example, as part of the crossover frequency measuring function. **Iasys** will not overwrite an existing bandwidth characterization test memory. You must erase that data.

- 1** Press ENTER to display the “Special Functions” screen.
- 2** Select “Memory” by scrolling the arrow with the wheel, to that function. Then press ENTER a second time.
- 3** Pick “Erase Memory” by scrolling the arrow with the wheel. To go to the next step, press ENTER once more.
- 4** Press the buttons, now functioning as soft keys, under A, B, C, or D for erasing that selected memory.
- 5** You are then prompted to confirm your decision to erase the that particular memory by pressing ENTER.

Error Messages

While the **Iasys** does most of its own setup and adjustment, there are situations either outside of its control or ones in which **Iasys** wishes operator confirmation before proceeding. These are the error messages you may encounter and what they mean.

Gain and Signal Levels Messages

<<< WARNING >>>

Output Level is
+4 dBu.

Press:

F1 to go higher,
QUIT to abort.

+4 dBu Warning

In all cases, when the output signal level reaches +4 dBu, **Iasys** asks for operator intervention to continue to raise the amplitude past this point. Pressing F1 continues the test and increases the signal output. Alternately, you can quit the test, adjust the system gains, and resume the test.

Noise not Loud Enough, Test Stopped

At +20 dBu, **Iasys** stops the test and suggests the re-adjustment of the gains in the system. Sometimes the modification should be an increase in the amplifier sensitivity. Often times there is a gain reduction in some intermediate device in the signal chain like a mixer that can be easily corrected. **Iasys** will not proceed past +20 dBu signal level.

<<< ERROR >>>

Pink Noise
was not loud enough
at max output.
INCREASE AMPLIFIER
GAIN AND RESTART TEST

Press QUIT to go back

<<< ERROR >>>
Received Signal
strength is too low
to start
the Delay Test.
Increase the
Amplifier Gain
and restart the test.

Delay Test Does Not Run

There are a number of reasons a delay test will not run and each has a different error message and solution as explained below.

Signal strength is too low: since the signal at the microphone is not as loud as expected, this message probably means an amplifier or other gain has been reduced since running an earlier bandwidth test.

Scatter in received signal: the delay test uses sophisticated noise correlation techniques. Because of this, background noise can be a problem. If you see this error message, the acoustical environment is too noisy to accurately run the test and you need to quiet things down or wait for break time. If the environment is not noisy, try moving the microphone two to three feet and attempt the test again.

<<< ERROR >>>
Too much scatter in
the received sound
to get a good
distance estimate.
Reduce ambient noise
then restart
the test.



<<< ERROR >>>
**Iasys does not hear
the audio signal
it is expecting.
Please check your
amplifier and driver
connections then
restart the test.**

Not the signal expected: based on knowledge from previous tests, **Iasys** looks for a response at a frequency consist with the capabilities of the driver. If you see this message, the most likely cause is that you are hooked up to a different type loudspeaker than the one tested earlier using this memory. For example, if the memory is for a high frequency horn and the loudspeaker hooked up is 15" woofer, **Iasys** will detect an inconsistency and ask for operator intervention.

Phase signal strength too low: the delay/distance test procedure needs a highly coherent signal. That is, a signal with good time alignment at the frequency of the test. Generally, **Iasys** knows what frequency to test at for good coherency from the prior tests determination of the energy center. The energy center of a single driver is a good phase point. However, the energy center may not be a good phase point if the microphone is in a null or bandwidth test was on a multi-way, crossovered system (either active or passive). With a crossovered system, the energy center may fall at the crossover point. Under these circumstances, to run a delay test override the frequency **Iasys** selects for this test by using the octave select buttons below the display screen. You want to keep the test frequency close to the energy center yet outside the phase effect region of the crossover. This region depends upon the slope (among other things) of the crossover. If this message occurs with a single dirve, the microphone may be in a null. Move it two to three feet and try the test again.

<<< ERROR >>>
**Phase Signal Strength
is too low.
Make sure the driver
is operated at a
usable Center Freq.
Press QUIT or DELAY**

<<< ERROR >>>
**Iasys cannot read
the distance to the
driver. Check:**

1. **Correct driver?**
2. **More than one
driver connected?**
3. **Near reflection?**

Delay Test Runs But Does Not Complete

This message means that **Iasys** was not able to satisfactorily complete the correlation of noise. In other words, the data was not of sufficient quality to give an accurate distance. This is another example of the fuzzy logic of **Iasys** meaning it doesn't give answers when they do not make sense. Look for background noise that became louder during the test, strong reflections, wrong driver connected, or multiple drivers creating interference patterns.

Limiter Test Does Not Run

```
<<< ERROR >>>
  No signal on
  "Speaker Level Input"

check your test setup
connections, then
restart the test.
```

Like the delay test, **Iasys** will inform you as to why it is having difficulty starting the limiter test.

No Speaker Level Input: Unique to the limiter test, **Iasys** looks for a speaker level input as well as signal from the microphone. It is easy to forget this hookup from the amplifier since it is not necessary for the other tests. This message may also come up if the speaker level connection is faulty.

Signal Strength Too

Low: Based on the level of the **Iasys** output signal, the analyzer expects a minimum speaker level power. Since the limiter test is a test of maximum system capability, the amplifier gains need to be at maximum for this test. If you see this error message, please check for gain reduction and correct it.

```
<<< ERROR >>>
"Speaker Level Input"
  signal strength
  is too low to start
  the Limiter Test.
  Increase the
  Amplifier Gain
  and restart the test.
```

```
SPL/Volts for Mem.
  at THERMAL LIMIT:
Frequency:

SPL=      dB/      Volts
Line Level:      dBu
```

Limiter Test Completion

When the limiter test is completed, **Iasys** will tell you why the test stopped. These are not error message but reasons as to normal completion of the test. There are three conditions that stop the test and they are:

Thermal limit; this is the thermal/power compression limit of the loudspeaker;

```
SPL/Volts for Mem.
  RAPID COMPRESSION:
Frequency:

SPL=      dB/      Volts
Line Level:      dBu
```

Rapid compression; **Iasys** detected a rapid decrease in signal output (compression) which could be a speaker in distress and about to fail; and

```
SPL/Volts for Mem.
  AMPLIFIER CLIPPING:
Frequency:

SPL=      dB/      Volts
Line Level:      dBu
```

Amplifier clipping; here the speaker limit was not reached as the amplifier limit was reached first.



Error Messages Related to Signal Connections

```

<<< ERROR >>>

No Microphone input
on the "Input 1" jack.

Check connections,
then restart
the Test.
    
```

Missing microphone/Input signal

This message is pretty much self-explanatory and means **Iasys** is not measuring an input signal on "Input 1". Rather than continue to increase the signal and possibly damage the system, **Iasys** tells you what is wrong. For acoustical tests, this means the mike is not plugged in or some other connection in the microphone input signal change is not complete. If you are working through a mixer this is an easy mistake to make.

You may also see this message if there is really low gain on the signal going into **Iasys**. This may result if the microphone is being run through a mixer or in a direct electrical test hookup. **Iasys** is looking for a signal level appropriate for a microphone. If you are using a direct hookup without a mike, increase the gain from the device under test and try the test again.

No Speaker Level Input

For the limiter test, **Iasys** looks for a speaker level input as well as signal from the microphone. This is the only test which uses a speaker level input. For more information on limiter tests error messages, see above.

Other Error Messages

```

You must run
a Delay Test
immediately before
running the Coherence Test.

Press DELAY,
or QUIT to exit.
    
```

Must Run a Delay Test First

To run either a Coherence or Equalizable Spectra test, you must run a delay test immediately prior. Both of these tests rely upon knowing the precise distance from the microphone to the speaker since these are time (phase) as well as amplitude results. To insure the accuracy of these tests, **Iasys** requires you to run the delay test so that there is no chance of using a memory for a microphone or speaker type different than the one presently being tested. For more information please refer to Section 4, page 11.

Iasys Specifications

Instrument type Acoustic analyzer for amplitude, phase and frequency, using fuzzy logic to recommend equipment settings, completely self contained and portable

Inputs:

Microphone: two balanced low impedance with +12v phantom powering
Connector: 3 pin XLR female
Impedance: Suitable for 150 ohm microphone, actual impedance is 5 Kohms
Amplifier: transformer isolated input
Connector: banana-type jacks
Impedance: 10 Kohms
Signal level: 120 volts rms maximum

Outputs:

Type: microprocessor or manually controlled test signals, balanced
Connector: 3 pin XLR male, pin 2 positive
Signal level: -50 dBu to +20 dBu

Display:

Type: high energy gas plasma, wide viewing angle
Resolution: 64 x 128 dot matrix, graphic

Memory: real time clock and CMOS memory with battery backup

Filters:

Max resolution: $1/48$ octave
Bandwidth: software controlled to $1/12$ octave

Automatic functions:

measure excursion and acceleration related bandwidth; recommend crossover frequency point; show crossover levels for easy adjustment; determine thermal compression onset; recommend limiter setting; measure acoustical distance, suggest delay adjustment; verify polarity; show coherence, display equalizable spectra, self-test on power up

Manual functions:

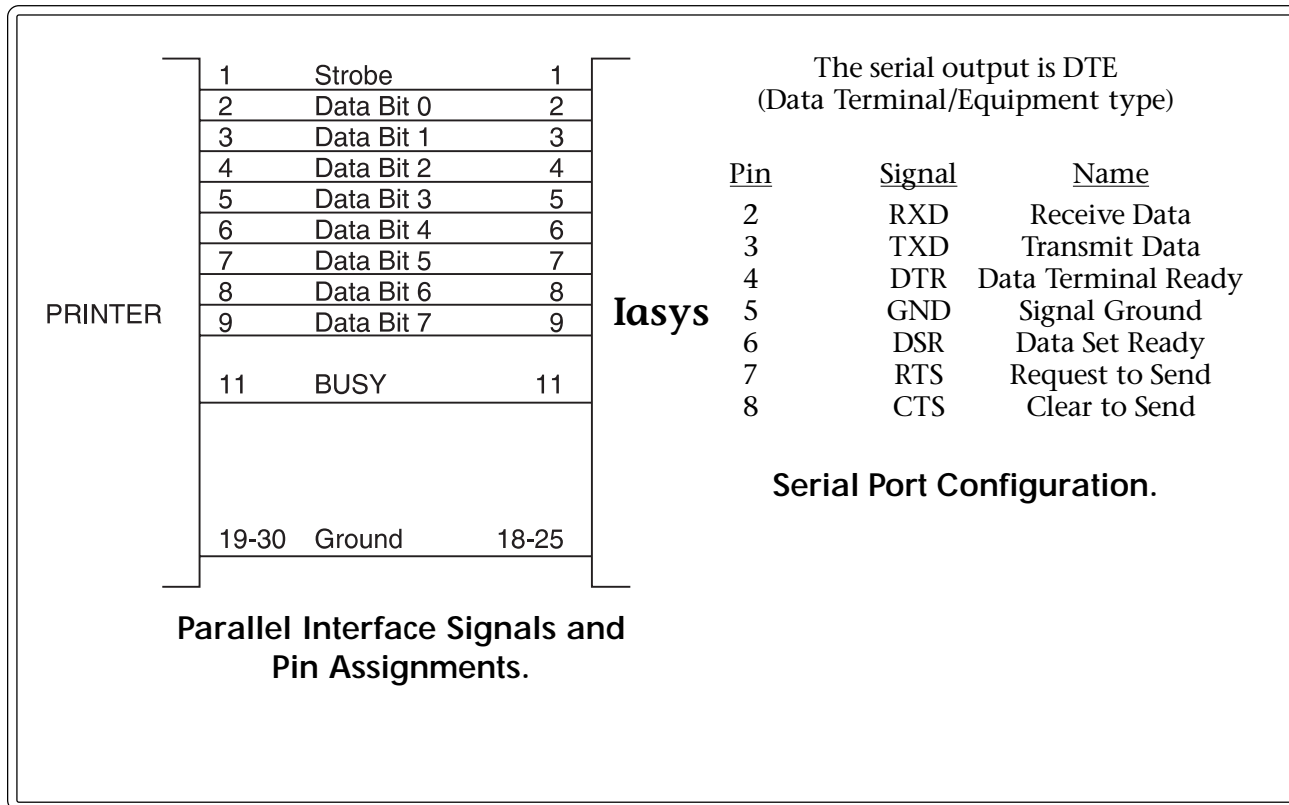
Output signals: sine, sweep sine, and pink noise
Sine Wave: accuracy to ± 1 Hz, 20 Hz to 20 kHz
Sweep: flatness to ± 0.1 dB
Pink Noise: total bandwidth ± 5 dB, -65 dBu to +20 dBu
RTA: sweeping spectrum analyzer, approximately seven second sweep, one-third octave, auto scaled, 60 to 110 dB SPL

Accessories Included:

Microphone: omnidirectional, flat frequency response, back-electret, condenser type with 15 foot cable (200 foot maximum)
Case: soft carry case with pocket for mike and cables plus shoulder and hand straps
Manual: complete operating manual; online help available from unit for any function



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Physical:

Dimensions: average large lunch box (4.1" tall x 10" wide x 13.5" deep)
 Shipping weight: 9 pounds


Electrical:

Power requirements: 100 - 130 VAC 50-60 Hz, 200 - 260 VAC 50 Hz
 Power consumption: 30 Watts

Patent Number: 5,555,311

Architect's and Engineer's Specifications:

The audio analyzer shall be the answer you have been waiting for. The analyzer shall be easy to operate and not require a Ph.D. to figure out what it is saying. It shall be smaller than a breadbox, yet big enough it does not sprout legs. It shall weigh less than a gallon of milk. The analyzer shall not contribute to the bottomline of large software companies in the Pacific Northwest. It shall not need to be married to a laptop or any other computer. The analyzer shall have thirty-two buttons and an On/Off switch. It shall have a cool feeling wheel that does not scroll through humungous menus. The analyzer's bright, easy to read screen shall make sense and can be used outside a darkroom.

 This equipment has been tested and found to comply with the following European Standards for Electromagnetic compatibility.
 Emission specification EN55013-1
 Immunity specification EN55103-2
 Low voltage specification EN60065

For continued compliance ensure that all input and output cables are wired with cables shield connected to pin 1 of the XLR. The input XLR pin 1 on equipment is generally connected to chassis via a capacitor to prevent ground loops while ensuring good emc compatibility.

The WARRANTY

People are scared of warranties. Lots of fine print. Months of waiting around. Well, fear no more. This warranty is designed to make you rave about us to your friends. It's a warranty that looks out for you and helps you resist the temptation to have your friend, who's "good with electronics", try to repair your AudioControl Industrial product. So go ahead, read this warranty, then take a few days to enjoy your new **Iasys Audio Analyzer** before sending in the warranty card and comments.

"Conditional" doesn't mean anything ominous. The Federal Trade Commission tells all manufacturers to use the term to indicate that certain conditions have to be met before they'll honor the warranty. If you meet all of these conditions, we will warrant all materials and workmanship on the **Iasys Audio Analyzer** for one (1) year from the date you bought it, and we will fix or replace it, at our option, during that time.

Here are the conditional conditions:

1. You have to fill out the warranty card and send it to us within 15 days after purchasing the **Iasys Audio Analyzer**.
2. You must keep your sales receipt for proof of purchase showing when and from whom the unit was bought. We're not the only ones who require this, so it's a good habit to get into with any major purchase.
3. The **Iasys Audio Analyzer** must have originally been purchased from an authorized AudioControl entity. You do not have to be the original owner, but you do need a copy of the original sales slip.
4. You cannot let anybody who isn't: (A) the AudioControl factory; or (B) somebody authorized in writing by AudioControl to service the **Iasys Audio Analyzer**. If anyone other than (A), or (B) messes with the **Iasys Audio Analyzer**, that voids your warranty.
5. The warranty is also void if the serial number is altered or removed, or if the **Iasys Audio Analyzer** has been used improperly. Now that sounds like a big loophole, but here is all we mean by it:

Unwarranted abuse is: (A) physical damage (don't use the Iasys Audio Analyzer to pound nails or beat clients who do not pay their bills); (B) improper connections (120 volts into the XLR jacks can fry the poor thing); (C) sadistic things. This is the best product we know how to build, but if you strap it to the front bumper of your Range Rover, something might break.

Assuming you conform to 1 through 5, and it really isn't all that hard to do, we get the option of fixing your old unit or replacing it with a new one.



AudioControl IndustrialTM

Phone 425-775-8461 • Fax 425-778-3166

Legalese Section

This is the only warranty given by AudioControl Industrial. This warranty gives you specific legal rights, and you may also have rights that vary from state to state. Promises of how well the **Iasys Audio Analyzer** will work are not implied by this warranty. Other than what we've said we'll do in this warranty, we have no obligation, express or implied. We make no warranty of merchantability or fitness for any particular purpose. Also neither we nor anyone else who has been involved in the development or manufacture of the unit will have any liability of any incidental, consequential, special or punitive damages, including but not limited to any lost profits or damage to other parts of your system by hooking up to the unit. Whether the claim is one for breach of warranty, negligence of other tort, or any other kind of claim. Some states do not allow limitations of consequential damages.

Failure to send in a properly completed warranty card negates any service claims.

The warranty included with the unit shall supersede this plain-text version, if there is any inconsistency between the two.

Repair service is available at:

AudioControl IndustrialTM

Attn: Service Department
22410 70th Avenue West
Mountlake Terrace, WA 98043 USA
(425)775-8461 • FAX (425)778-3166
e-mail: service@audiocontrol.com

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