



Digitally Steerable Line Array Loudspeaker Systems

# IC Live

## ICL-FR & ICL-FR-DUAL

USERS MANUAL

Assembly  
&  
Installation Instructions



Version 1.4



## IMPORTANT SAFETY INSTRUCTIONS

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions
5. Do not use this apparatus near water. The apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on it.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Make sure the power cord remains readily accessible at all times.
12. The AC Power Cord is the AC Mains disconnect.

13. Only use attachments/accessories specified by the manufacturer.
14. Disconnect this apparatus during lightning storms or when unused for long periods of time.
15. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

"WARNING - TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE"

"CAUTION: THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED SERVICE PERSONNEL ONLY. TO REDUCE THE RISK OF ELECTRIC SHOCK DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO".

### Explanation of Graphical Symbols



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "Dangerous Voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to humans.



The exclamation point, within an equilateral triangle, is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

### Erklärung der graphischen Symbole



Der Blitz mit nach untenzielendem Pfeil in einem gleichseitigen Dreieck weist den Benutzer auf das Vorhandensein einer unisolierten, "gefährlichen Spannung" im Gehäuse hin, die stark genug sein kann, einer Person einen gefährlichen elektrischen Schlag zu versetzen.



Das Ausrufezeichen in einem gleichseitigen Dreieck weist den Benutzer auf wichtige Betriebs- und Wartungsvorschriften in den beiliegenden Unterlagen des Gerätes hin.

### CAUTION

**RISK OF ELECTRONIC SHOCK:  
OPEN ONLY IF QUALIFIED AS  
SERVICE PERSONNEL**

To reiterate the above warnings: servicing instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than that contained in the Operation Instructions unless you are qualified to do so. Refer all servicing to qualified personnel.

### VORSICHT

**GEFAHR EINES ELEKTRISCHEN SCHLAGES:  
NUR VON QUALIFIZIEREM WARTUNGSPERSONAL  
ZU ÖFFNEN**

Eindringliche Warnung: Wartungsvorschriften dienen nur der Benutzung durch qualifiziertes Personal. Zur Vermeidung eines elektrischen Schlages keine anderen als die in den Betriebsvorschriften beschriebenen Wartungsarbeiten ausführen, es sei denn Sie sind dafür qualifiziert. Wartungsarbeiten auszuführen.

### IMPORTANT

Your Iconyx Steerable Column Loudspeaker contains no user-serviceable parts and all service should be referred to qualified service personnel.

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## INTRODUCTION

Congratulations on your purchase of a Renkus-Heinz RHAON Empowered digitally steered Iconyx IC Live column loudspeaker. We hope you enjoy it.

Your Iconyx IC Live steerable column loudspeaker was carefully tested and inspected before leaving our factory and should have arrived in perfect condition. Please carefully inspect the shipping carton(s) and loudspeaker(s) for any noticeable damage, and if any damage is found, immediately notify the shipping company. Only you, the consignee, may institute a claim with the carrier for any damage incurred during shipping. Be sure to save the carton(s) and all packing material for the carrier's inspection. It is also a good idea to save the carton and packing material even though the loudspeaker arrived in good condition. If you should ever need to ship the loudspeaker, it should be shipped in its original factory packaging.

## TECHNICAL SUPPORT

If you have any questions about RHAON-Empowered Loudspeakers or encounter a problem designing, installing, setting up or operating a RHAON system, please call our technical support staff at 949-588-9997 and ask the operator for technical support on RHAON. Call Monday through Friday from 8:00 AM to 5:00 PM Pacific Time.

The latest information on RHAON Technical Support is always available online at <http://www.renkus-heinz.com/support/software-support/rhaon/e-mail.html>. You will also find a support request form at <http://www.renkus-heinz.com/support/request-info/tech-info/index.html>.

## ICL-FR-DUAL ASSEMBLY INSTRUCTIONS

To simplify shipping and handling, ICL-FR-DUAL arrays are shipped as two modules in separate cartons and need to be assembled in the field. All the hardware needed to assemble the ICL-FR-DUAL is included in the cartons.

If you ordered a HK-ICL series mounting hinge kit with your ICL-FR array, the hinge hardware will be packed with the other hardware.

In the following instructions, the term "module" is used to refer to one of the 8-channel sections of the finished assembly, which is called a column or a column array.

Prepare an assembly area. Each module is 4 feet long, so you need a flat surface at least 8 feet long to assemble the dual array. We suggest covering the assembly area with a heavy cloth or some other soft material to prevent damaging the finish on the cabinets while assembling them.

Avoid resting the modules on their grille. The modules are heavy and may deform the grille. Instead, rest the modules on their sides or back.

Place the modules in their respective positions on the assembly area.

Note: The proper way of assembling the two modules is to join the horn sections together as shown in this photo.

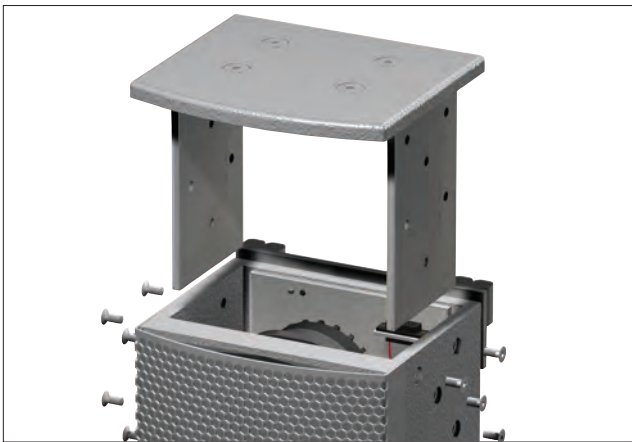




If you purchased two ICL-F arrays separately and now want to turn them into a ICL-F-DUAL array, you will also need an ICL-F-KIT-UP joining kit..

The first assembly step is to remove the top of both modules. To remove the top, remove the eight machine screws from each side of the cabinet and lift the end piece and its mounting brackets out of the cabinet as shown.

The next step is to install the two heavy joining plates. They will be packed with the hardware if you ordered an ICL-FR-DUAL.



**Note:** The graphics that follow show the two joining plates mounted in one cabinet. In actual practice, it is better to mount one plate in one cabinet and the other in the second cabinet. They should be attached to the side where the small db15 signal cable connector is located. This reduces the possibility of damaging the connector while sliding the two cabinets together.

Use the mounting bracket machine screws you removed to install the two heavy joining plates. Tighten the screws lightly. The joining plates need to be a little loose to slide easily into the other cabinet.



Attach the heavy joining plate to the rear of the cabinet using the machine screws provided with the hardware. See below. Tighten the screws loosely to allow a little movement while joining the two modules.



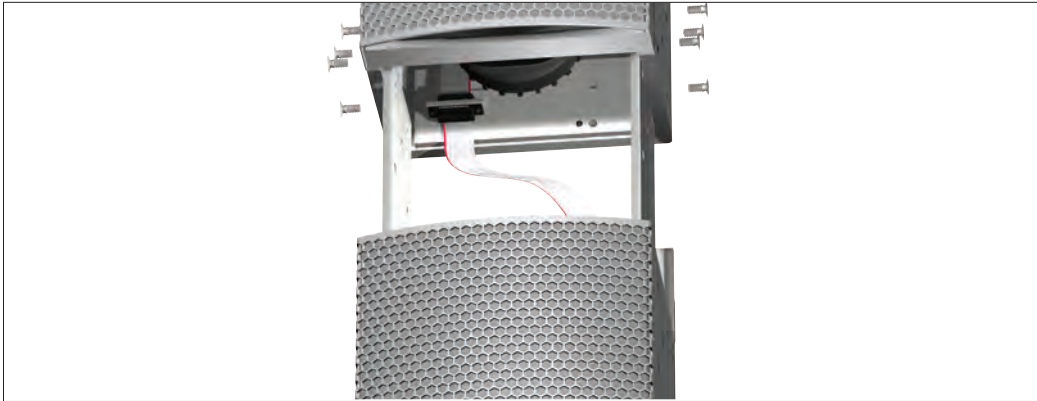
Plug one end of the flat wire signal cable into the socket provided. It only goes into the socket one way and the cable is reversible. It does not matter which end goes into which module. Using a #1 Phillips screw driver, secure the connector with two 4-40 Phillips head screws (supplied). Make sure the connector is fully seated. See below.





Align the two modules to be joined on a tabletop or on the floor so that the top of the lower one and the bottom of the upper one are close to one another, say 4" (10 cm) apart.

Insert the free end of the short ribbon cable into the socket on the second module. Using a small Philips screw driver, secure the connector with two 4-40 Philips head screws (supplied). Make sure the connectors are fully seated. If necessary, use a flashlight to check because if the connectors are not seated properly, you may have to disassemble the column in order to seat them correctly.



Align the two modules and slide them together, making sure the holes in the heavy joining plates align with the holes in the modules. Install the remaining screws into the joining plates and tighten all the screws.



The assembly is now complete.

#### Address Number Verification

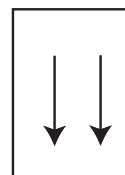
All that remains is to identify which module is the Master and which is the Slave. This is accomplished with the Master/Slave dip switches located on the input panel. See page 50 for a detailed view of the input panel. The bottom module will be the Master and the top module the Slave. Set both dip switches on the bottom module to "00" (off & off) and the dip switches on the top module to "01" (on & off). On single ICL-FR arrays the dip switches should always be set to the Master setting ("00").

Note that certain functions will be disabled on the Slave module as their control has been turned over to the Master module. Preset Up, Preset Down, Preset Enter , Input Pad, Volume Up & Volume Down, AES/EBU Input and Mute functions are all controlled only by the controls on the Master module. Signal cables must be brought into the Master module. AC power must be brought separately into the two modules.

Note: If you connected power to the two modules before setting the dip switches, you will need to disconnect it and then reconnect it before the dip switch settings will take effect.

Master Switch Setting

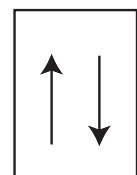
SLAVE



MASTER

Slave Switch Setting

SLAVE



MASTER



## INTRODUCTION TO RHAON

Your digitally controlled, steerable Iconyx IC Live ICL-FR series column loudspeaker is RHAON Empowered.

RHAON ("rayon"), the Renkus-Heinz Audio Operations Network, is the first practical system to combine digital audio distribution with precise control and supervision of self-powered loudspeakers. RHAON uses standard Ethernet hardware, advanced CobraNet technology and on-board DSP (digital signal processing) to turn self-powered Renkus-Heinz loudspeakers from "black boxes" into "smart boxes" that can respond to user input in real time.

### General Information

Your RHAON-Empowered Loudspeaker's amplifier stores all onboard DSP settings, including the input source selection, in non-volatile memory. Analog Input 1 has been pre-selected at the factory so you can use the loudspeaker as an ordinary self-powered loudspeaker. Just connect a line level audio signal to Analog Input 1, connect the AC power and turn the loudspeaker on. This input is always available for testing the loudspeaker and amplifier, regardless of the programmed input settings.

You will need a computer with a NIC (Network Interface Card) and Windows-based RHAON software to change the input selection or any of the other DSP settings. Once your DSP settings are stored in non-volatile memory, the computer can be disconnected from the network. You will need to connect a computer only when you want to change the settings or when you want to use the supervise feature.

Renkus-Heinz engineering has programmed the onboard DSP to optimize the loudspeaker's performance and to ensure its safe operation. Replace the RHAON hardware module only with another unit that has been factory programmed for the same loudspeaker. Contact our Technical Support Department for details and assistance.

### Access Control Note

RHAON systems feature several levels of password-protected access control to prevent inadvertent or unauthorized changes of the control settings. Even when you connect a computer running RHAON software, you may be denied access to some or all of the Connect and Control mode functions, depending on how the access control system is configured. For further information on password protection refer to page 42 of this manual or contact the person responsible for the setup and tuning or commissioning of your system.

## Important

If you will be controlling/supervising your RHAON empowered system with a laptop, do not close the laptop's lid or allow your laptop to go to sleep (hibernate) during operation. Some CobraNet components may not wake up from hibernation when your computer awakens. Your system will continue to operate normally until you attempt to change any of the settings. For example, until you attempt to change your Presets (they won't load) or change your EQ settings and you can't save them to the loudspeaker(s). Communications between your computer and the loudspeakers on the network have been disrupted by the malfunctioning CobraNet components. To prevent this set your laptop's Hibernation / Sleep settings to "Never".

Note that this does not affect normal operation. Your system will continue to operate normally until you try to change some of the settings. If this occurs or some other Windows™ event causes the CobraNet components to malfunction, you will need to either Restart your computer or use the Windows Task Manager to return to normal operation. To use the Task Manager, close RHAON (and, if running, CobraNet Discovery) and use "Ctrl-Alt-Delete" to open the Task Manager. Select the "Processes" tab and look for 'PACNDISCO.EXE' and 'PASSBRIDGE.EXE' (Windows may shorten the names and add '~1'). Select them and click "End Process". Then re-open RHAON.

## RHAON ORGANIZATION: Three Fundamental Audio Operations

Before we go on, let's take a look at the structure of RHAON. Audio operations comprise three fundamental areas that are necessary for the success of any sound system:

### CONNECT

In a RHAON system there are both physical connections and network (software) connections. The physical connections are made using UTP cable meeting at least CAT5e standards and/or analog cables as well as AC power cords. Network connections are established in the software. You don't have to make the two types of connections in a particular order. RHAON software allows you to set up a "virtual system" using beam steering, pre-configure DSP settings for individual loudspeakers and establish and store preset configurations before the physical connections are made. If you are using RHAON's CobraNet digital audio functions, you will also need to connect a CobraNet source (an analog to CobraNet converter) to the network.

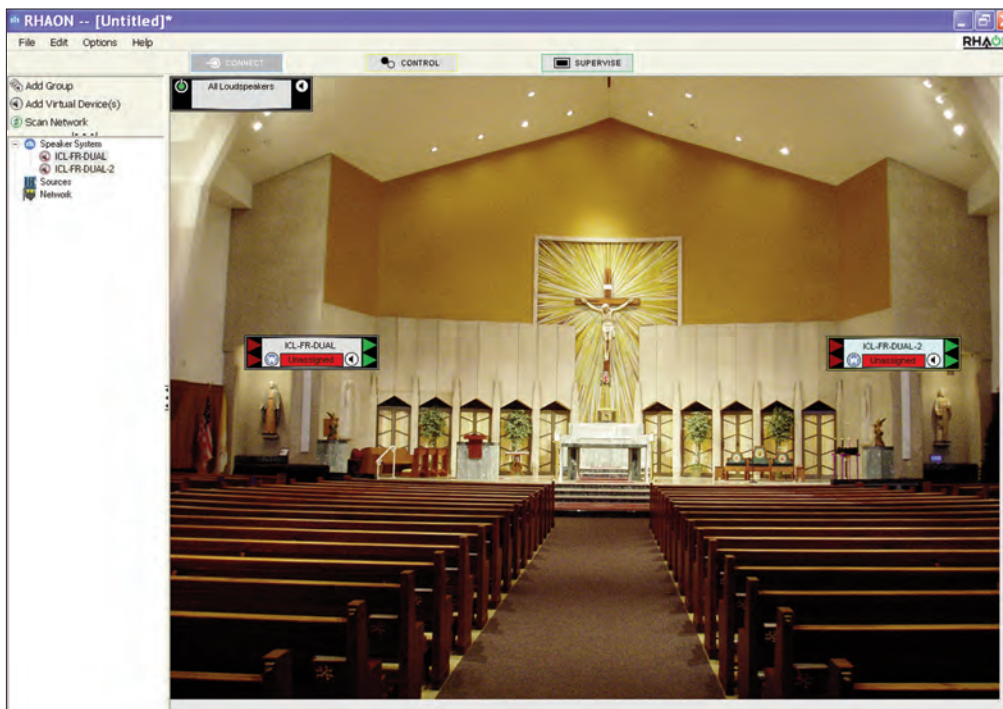
### CONTROL

You can control many DSP parameters in real time, and/or pre-configure them in software prior to installation and make final adjustments during commissioning or setup. Preset configurations are available for instant recall.

### SUPERVISE

RHAON allows both real-time supervision while the system is in use, and remote supervision with fault logging and operator alerts via e-mail, text messaging, etc. In steerable arrays, every single driver is supervised and its status displayed, any failures detected trigger an alarm.

At any time you can switch into any of the three RHAON operating modes using the Connect | Control | Supervise tool bar directly above the work space. You can also switch between the three modes and the B beams / Presets folder using tabs inside the Loudspeaker Properties windows.





# RHAON TYPICAL PROJECT WORKFLOW

## ✓ PREPARATION



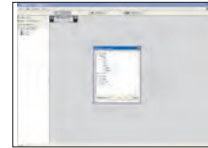
**INSTALL RHAON**  
software under  
Windows 2000,  
Windows XP



**SET STATIC IP ADDRESS TO 192.168.1.1**  
(or a different value if you need to).  
192.168.xxx.xxx are local IP addresses  
that won't appear on the Web.



**CHOOSE BACKGROUND IMAGE**  
This can make it easier to see  
where Groups and Loudspeakers  
are in the venue



**ADD VIRTUAL SPEAKERS**  
or scan network for actual  
loudspeakers



**GROUP VIRTUAL SPEAKERS**  
or group actual loudspeakers  
found on your network

## 🔗 CONNECT



**SCAN THE NETWORK**  
RHAON assigns  
IP Addresses as needed



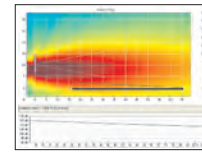
**ASSOCIATE VIRTUAL &  
ACTUAL LOUDSPEAKERS**  
Drag from left panel,  
drop on icon in right panel



**SELECT DIGITAL and/or  
ANALOG INPUTS**



**ROUTE COBRANET**  
CobraNet Source  
Drag-and-Drop Tx/Rx links



**BEAM STEERING**  
Configure and Aim  
Array's Sonic Beams



**PRESETS**  
Control & Store  
Presets

## 🎛️ CONTROL



**CONTROL PANEL**  
Configure Loudspeaker  
Array



**EQUALIZATION**  
8-band parametric EQ,  
hi-and lo-shelving  
hi-pass and lo-pass



**COMPRESSION**  
Threshold / Ratio  
Attack / Release  
Soft Knee / Trigger Point



**DELAY**  
0 to 340 milliseconds @ 48 kHz  
0 to 170 milliseconds @ 96 kHz



**PRIORITY OVERRIDE**  
Attack / Release  
Threshold / Hold  
Engage / Disengage

## 📊 SUPERVISE



**OPERATOR ALERTS**  
RHAON indicates problems  
such as over temperature,  
clipping or driver failure at  
System, Group and  
Loudspeaker levels



**DETAILED INFORMATION**  
Just click through to the  
loudspeaker's Supervise screen  
to identify the nature of the  
problem and take corrective  
action



**FAULT LOGGING**  
RHAON logs the fault  
conditions you specify to a  
file on your hard drive



**OPERATOR NOTIFICATION**  
via e-mail or text message  
(if your computer has a second  
NIC with an Internet  
connection)



**MULTI-LEVEL PASSWORD  
PROTECTION**  
restrict access to Connect and  
Control functions

## Software Installation

You need a Windows PC running RHAON software in order to maximize the performance of RHAON-Empowered loudspeakers and your RHAON system. You can use RHAON software during the design stage, for system setup, tuning and commissioning, and for remote control and supervision. You can disconnect the computer from the network after commissioning the system, if you or your client are not using RHAON's system supervision capabilities.

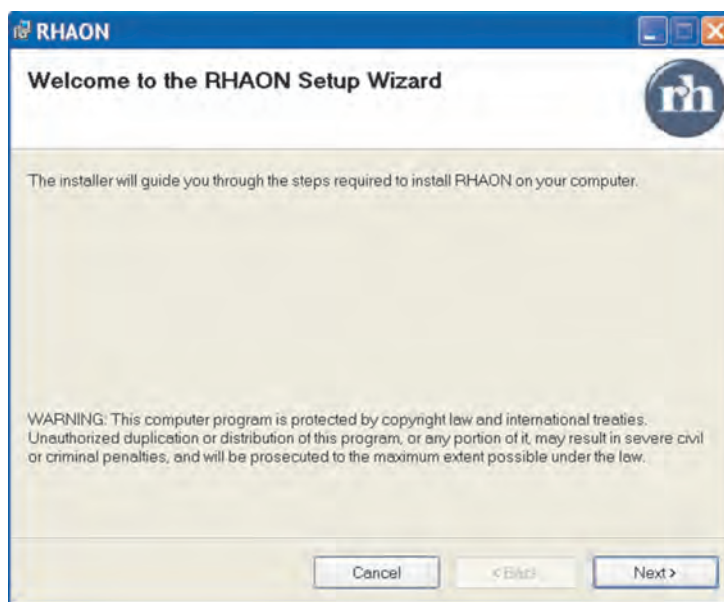
RHAON software will run on any PC computer that meets or exceeds the following requirements.

Processor / Speed:	Pentium / 800 MHz minimum (faster recommended, especially for large systems)
RAM:	256 MB minimum (more recommended, especially for large systems)
Interface:	At least one Network Interface Card (NIC) with a 100 BaseT (100 MB/second) or faster Ethernet Port; two NICs are needed if the computer will also be used to e-mail alerts
Operating System:	Windows XP, Vista and Windows 7 with either 32-bit or 64-bit processors
Associated Software:	.NET Framework 3.5 or higher (supplied with RHAON installation CD)
Screen Resolution:	1024 x 768 or higher

To install the software insert the RHAON installation disk into the computer's CD drive. The installation program should start automatically. During the installation you will need to select either the 32-bit or the 64-bit install. RHAON 1.4 is downwards compatible with earlier versions of RHAON Microcontroller and DSP firmware so you do not need to uninstall a previous version of RHAON before installing program version 1.4.. However, new program features may not function in loudspeakers running earlier versions of firmware.

If the installation program doesn't, start automatically, go to your Start menu. Then select Settings/Control Panel & Add/Remove Programs. Click on Install to start the installation manually.

The RHAON Setup window shown below will open.

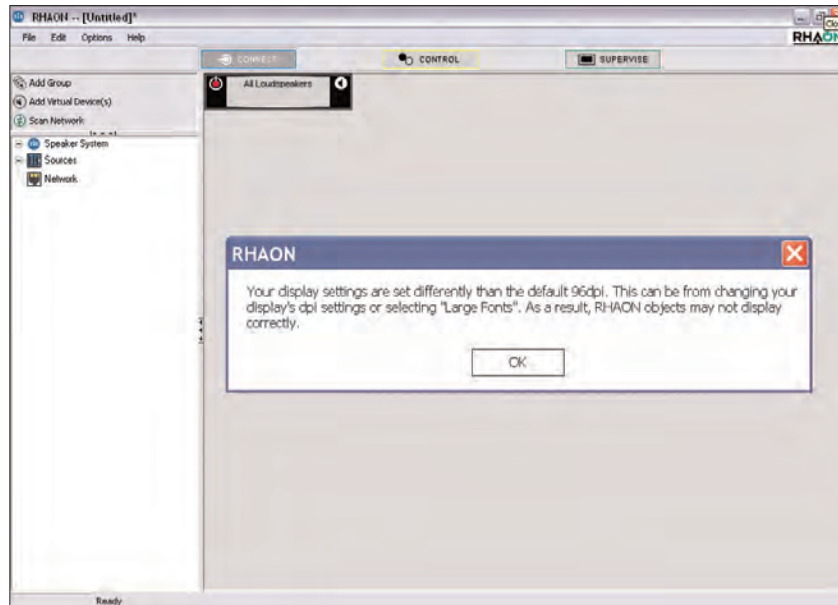


Click on Next to proceed to the next step. Then follow the screen prompts until the installation is complete.

During the installation you will be asked if you want to install the CobraNet Components. Answer "Yes", even if you will not be using CobraNet digital audio distribution. These CobraNet files are needed by RHAON for control and supervision.

The installation program will install RHAON in a Renkus-Heinz/Rhaon folder on your hard drive. It will not uninstall earlier versions of RHAON. Use Settings/Control Panel and Add/Remove to uninstall an earlier version, if you want to delete it.

The RHAON Installer puts a RHAON Icon on your desktop. Double click on it to open the RHAON software program. You should see the opening screen shown below.



Notice that the program warns you if your display settings may cause viewing problems. If you are using "Large Fonts," we recommend you change to the default 96 DPI setting to avoid possible viewing problems.

The grey background with RHAON watermark can easily be changed to something more useful, such as a block diagram of your system or a photo of the venue. To change the background, go to the Options pull-down menu and select Background Image/Load Image. Then browse to the drawing or photo you want to use.



Be aware that the photo or drawing you import needs to be of approximately the proper size and shape before importing. If it is slightly too large, scroll bars that allow you to shift the picture up and down and to the right or left will appear. If it's too small, blank space will surround it.



## Virtual System Design

RHAON software can save you time at the job site by enabling you to set up a complete virtual loudspeaker system before you go to the site. When you get to the site, you connect your computer to the network, link the virtual loudspeakers with their real counterparts, and upload the settings to each individual loudspeaker.

Your loudspeaker system can include individual loudspeakers, groups of multiple loudspeakers, or a combination of both. Groups as well as individual loudspeakers can be controlled (Muted, have their levels adjusted, etc.) using your mouse.

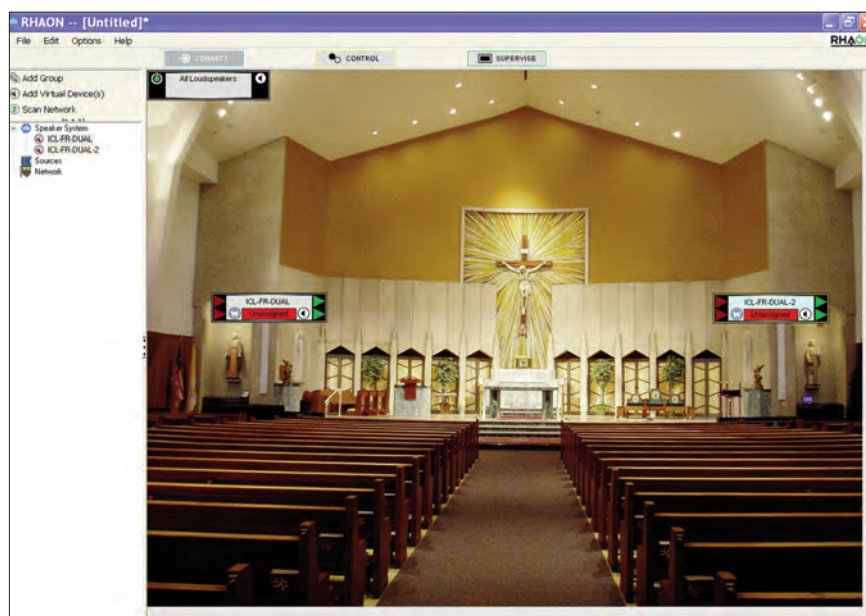
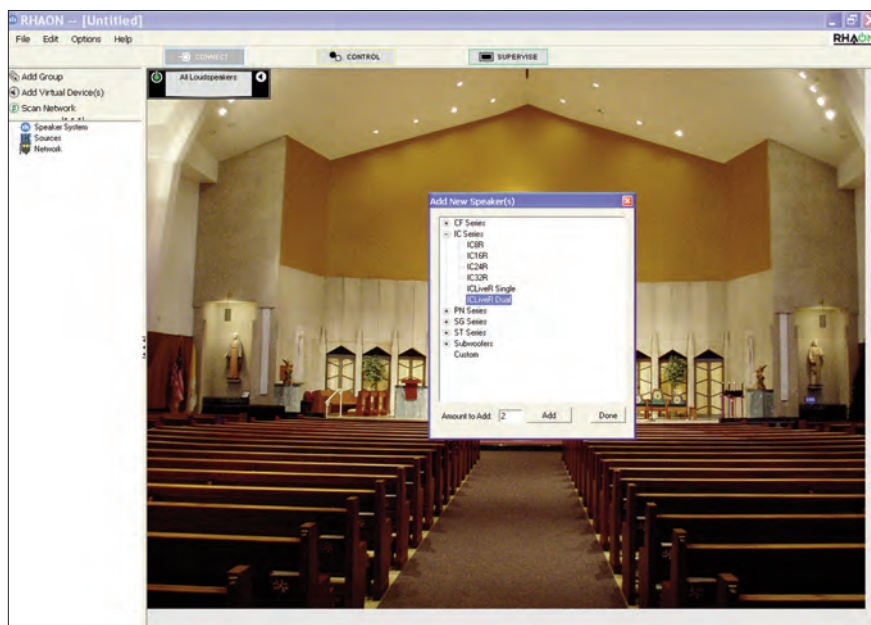
We recommend you consider using "Groups" in your designs. You can always control each individual loudspeaker, but quite often it's more efficient to have them grouped together..

You begin designing a virtual system in the main RHAON window, which is divided into two sections. The left vertical panel lists all the available devices in a directory tree format. The larger section on the right displays loudspeaker icons and other specialized work areas: the All Loudspeakers icon represents your loudspeaker system. It functions as a "group": control for all the loudspeakers. If you need more space on the right, minimize the left hand section by clicking on the Close icon on its right edge.

Lets say we want to add two stacked ICL-R arrays to our system. Clicking on Add Virtual Device(s) in the top left toolbar opens an Add New Speakers window. Browse to find the loudspeaker model you want to add (ICLive-R Dual in the example) and select it. Type a quantity (2 in our screen shot) into the Amount To Add field and click the Add button.

In the screen shot to the right, icons representing the ICLive-R Dual arrays have been added to the workspace and moved to their approximate location by grabbing them with the Mouse Cursor and moving them.

Now you can define initial DSP settings for your virtual loudspeakers. The DSP settings can then be uploaded to the actual loudspeakers once your computer has been connected to the loudspeaker network at the site.



## Assigning a Static IP Address to the RHAON Host Computer

You can begin your preparation offline in a virtual environment, but to make a RHAON system operational you have to connect your computer and RHAON-Empowered loudspeakers to an Ethernet network.

You need to associate the virtual loudspeakers you have created in RHAON with the actual loudspeakers installed in the system. The first step is to make sure the computer's Network Interface Card (NIC) is properly setup .

Your NIC must have a static IP address assigned to it: this enables RHAON software to communicate to all the loudspeakers on the network.

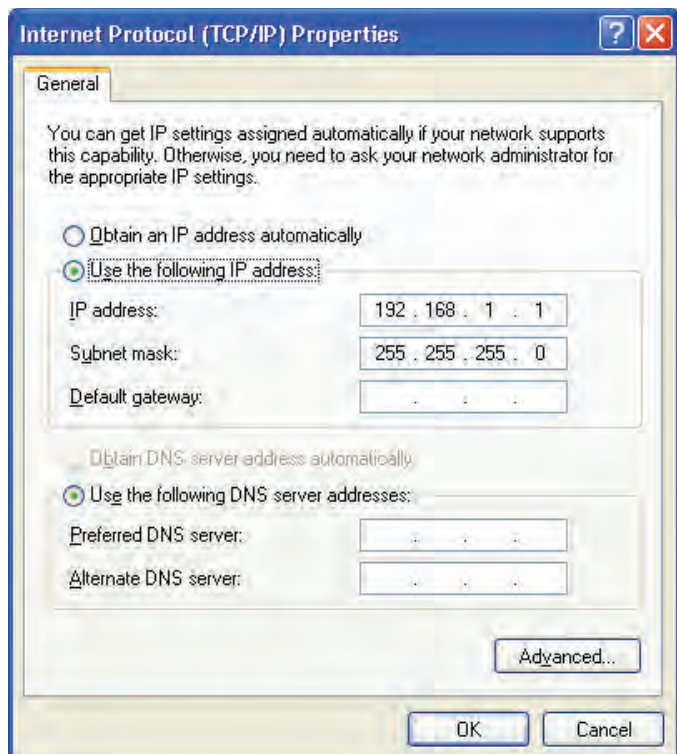
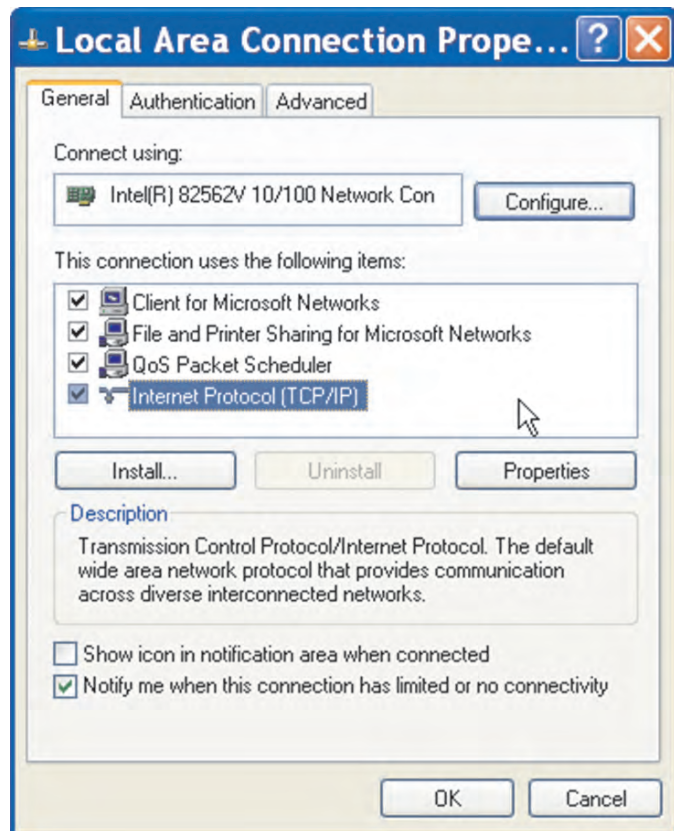
Each device on the RHAON/CobraNet network must have a unique IP address in order to communicate. RHAON software can assign the IP addresses to your networked loudspeakers automatically.

In Windows, go to My Computer/Control Panel/Network Connections. Find the connection you wish to use. It will likely be called "Local Area Connection", unless you have renamed it.

Also, note the model number of the NIC, as the RHAON software will require it later. Right click the icon and click "Properties" to open its Properties window.

Then, double click on Internet Protocol (TCP/IP) to open its Properties window. You will probably see that your computer is configured to Obtain an IP Address Automatically. Change this to Use the Following IP Address and enter an IP address of, for example 192.168.1.1. Next, insert 255.255.255.0 into the Subnet Mask field. Click OK and you are ready to connect to the RHAON/CobraNet network.

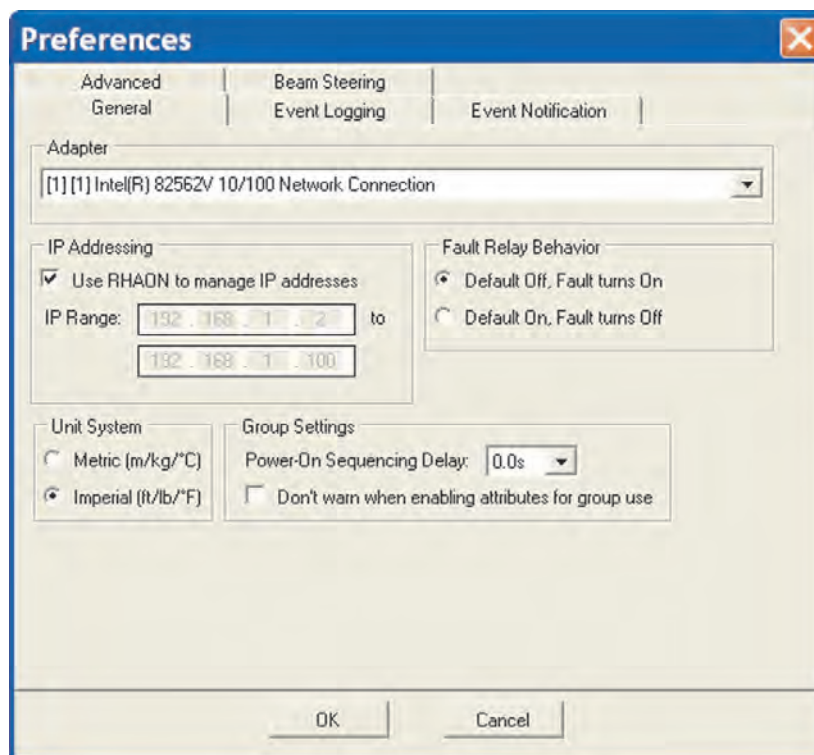
**Note:** IP addresses are in the format xxx.xxx.xxx.xxx where "xxx" is any digit from 0 - 255. Local IP addresses that appear only to other devices on a LAN (Local Area Network) are defined as ranges 192.168.xxx.xxx, 10.xxx.xxx and 172.16.xxx.xxx to 172





Prior to plugging a RJ-45 connector into your computer's Ethernet port, you need to make sure that RHAON has the correct network settings. In the RHAON software, go to the Options menu and select "Preferences". On the General tab, make sure the correct NIC is selected in the Adapter field. The available selections are based on the listing of your network connection you noted earlier. Refer to page 13.

Each device on the RHAON/CobraNet network must have a unique IP address in order to communicate over the Ethernet network. The RHAON software can assign IP addresses to all the RHAON-Empowered loudspeakers connected to your network. Since we want RHAON to manage the IP addresses for our loudspeakers, make sure the "Use RHAON to Manage IP addresses" feature in the IP Addressing section is checked.



Before RHAON can scan your network and assign IP addresses to the devices it finds, you need to specify a range of IP addresses to use. The static address assigned to the computer in Windows sets the "subnet" you will be using. A subnet is the first three parts ("octets") of the IP address. In the example, the subnet is 192.168.1. Therefore, all the IP addresses on the network will be in the form 192.168.1.xxx.

To define the range of IP addresses RHAON will scan, first uncheck the "Use RHAON to Manage IP addresses" box. Then type two valid IP addresses into the two fields: one for the lower limit of the range and the other for the upper limit. Since 192.168.1.1 is already in use by the RHAON host computer, the lower limit must be at least 192.168.1.2. The upper limit can be set as high as 192.168.1.255, but needs to be only high enough to accommodate all the devices on the network. Remember each device must have its own IP number.

After specifying the range of IP addresses that RHAON will assign to the loudspeakers, be sure the "Use RHAON to Manage IP addresses" command is checked before leaving this window. Click OK and connect the computer to the RHAON/CobraNet Ethernet network, i.e., plug in the CAT5e cable.

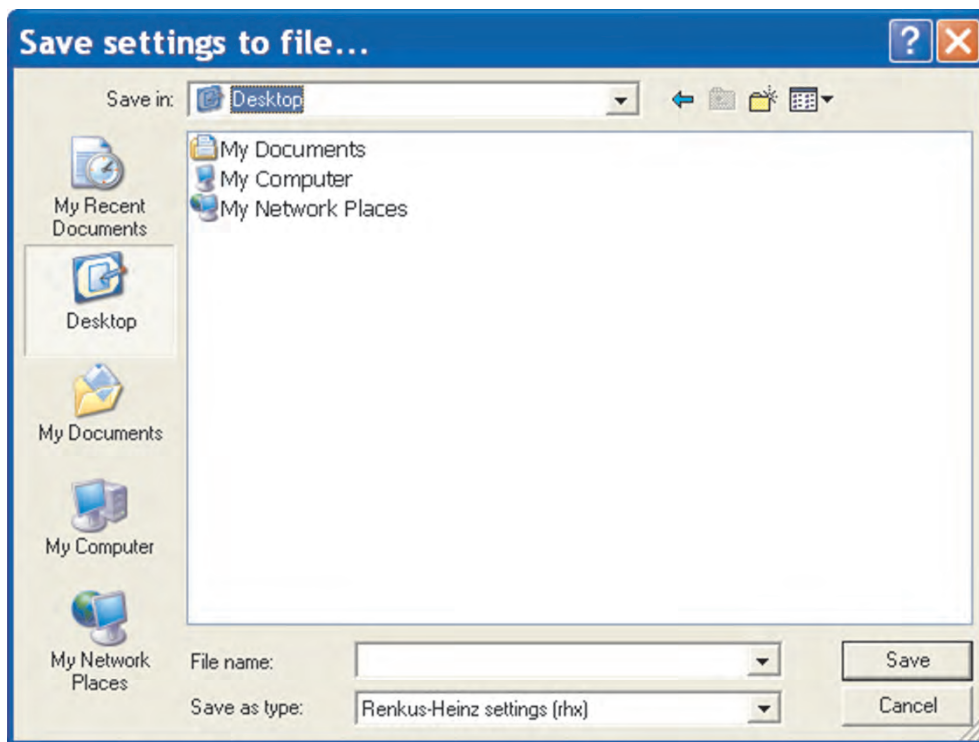
Unless you are pre-configuring a RHAON system off side and offline by creating Groups and/or defining initial DSP settings for virtual loudspeakers, there is no need to create virtual loudspeakers before connecting your computer to the network. RHAON software can scan the local Ethernet network, identify all connected loudspeakers, assign IP addresses to them, and place icons in your main project workspace.

### Saving Your Project

It's always a good idea to save your work regularly when using any computer software. If you have not done so, RHAON will remind you with a prompt if you attempt to close the program without saving.

When you are ready to save your work, select Save from the File pull down menu to open the familiar Windows File Save screen shown below. Name your project, browse to the desired file location and Save the file.

Note that you are saving the project file to your computer and not saving (loading) it into the loudspeakers.



### Saving Changes

Inside each loudspeaker's Connect, Control and Supervise Properties window is a blank black bar in the lower left corner. Whenever you make a change in the loudspeaker settings, the word Save will appear in this space. This is a reminder that a change has been made and needs to be saved if you want to keep it. Pressing the Save button will save the change(s) to the project file and to the loudspeaker's flash memory..

Note that although the changes are being sent to the project file, the project file itself is not being saved.

## Linking Software Icons with Networked Loudspeakers

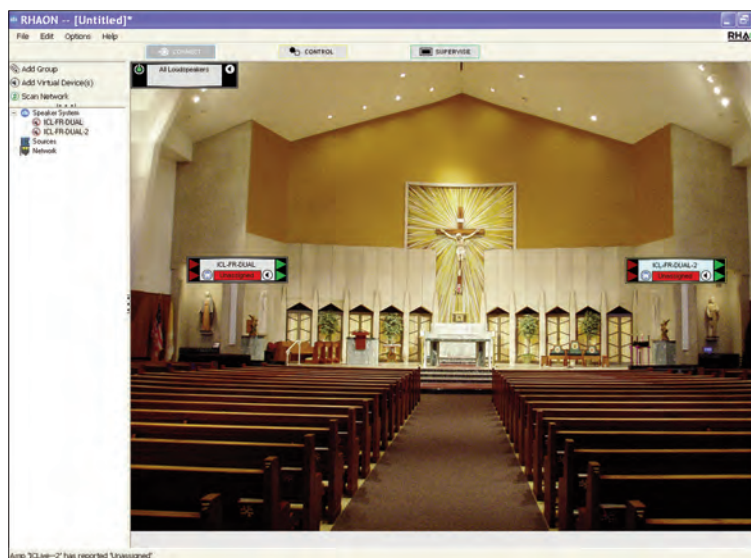
To connect a RHAON network, you first make all the hardware connections, and then (if you are using CobraNet for digital audio distribution) assign signal routing using RHAON software. Since all Ethernet connections are made using RJ-45 connectors and CAT5e cable, the network infrastructure is cost-effective and easy to install. You can also connect Serial Digital (AES3id aka AES/EBU) and analog audio to a RHAON-Empowered loudspeaker, as well as Fault Detect and Fault Relay lines. A typical amplifier input panel is shown on page 50 in Appendix 1.

Let's say you've connected all your Ethernet inputs and outputs. Every venue is different: so is every network. For examples of RHAON / CobraNet networks, see Appendix 1.

Remember: before connecting your computer running RHAON software to the network, you should have assigned it a static IP address. If you've done that, connect the computer to your RHAON network and click on the Scan Network icon. RHAON software will find all networked loudspeakers and assign them IP addresses automatically.

RHAON will also identify any other CobraNet devices on your network. CobraNet devices, including RHAON-Empowered Renkus-Heinz loudspeakers, will be listed under Network in the directory tree.

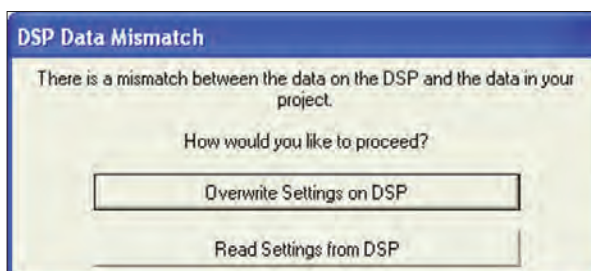
Note that you did not have to first create virtual loudspeakers. RHAON found the actual loudspeakers.



The next step is to drag each loudspeaker listing into the work space. This will create an icon for it.

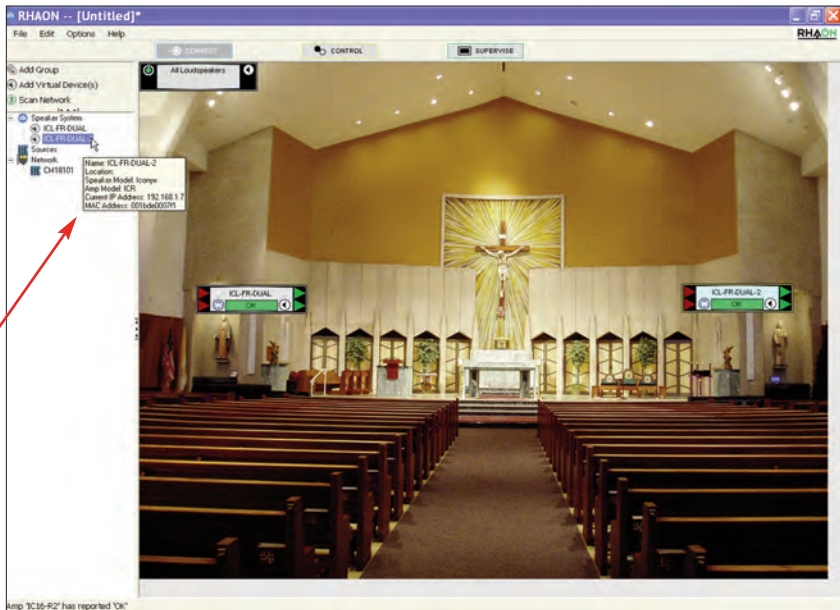
If you created virtual loudspeakers before scanning the network, drag each individual listing from the Network folder into the main work space and drop it on the appropriate icon.

When you link a networked loudspeaker with a software icon, RHAON interrogates the loudspeaker to make sure the DSP settings stored on your computer are synchronized with those in the loudspeaker's onboard memory. If they are not, RHAON displays a prompt that allows you to choose which settings to use. To upload settings from your computer to the loudspeaker, click on Overwrite Settings on DSP. To download settings from the loudspeaker and copy them into computer memory, click on Read Settings from the DSP.

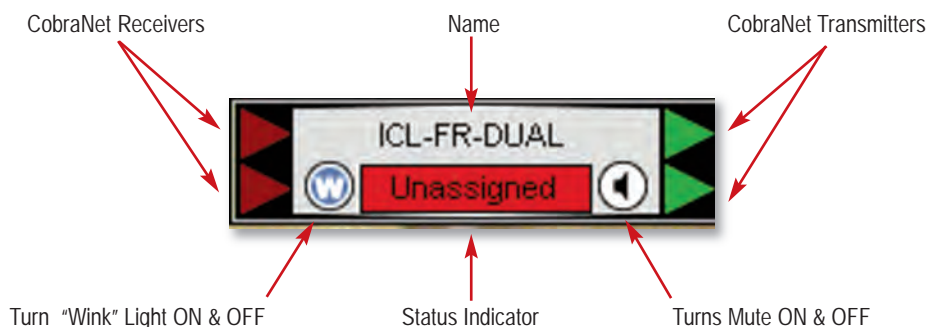


Continue until all networked loudspeakers are linked to icons in the main workspace. When an icon is linked to a networked loudspeaker, the status indicator under its name changes from Unassigned (Red) to OK (Green).

To confirm that the setup is complete, return to System Layout and place the cursor over the loudspeaker listings in the directory tree. As you can see from the pop up screens, RHAON has assigned IP numbers to each of the loudspeakers.



Let's take a closer look at the Connect Mode loudspeaker icon.



Clockwise from the top, the first item is the icon's name. By default this is the model number of the actual loudspeaker. The loudspeaker symbol on the right is a Mute control: click on it to mute or un-mute the loudspeaker. The green triangles on the far right represent CobraNet Transmitters (Tx). Each CobraNet Transmitter can transmit one channel of information from the DSP out to the CobraNet network. The Red Status bar at the bottom of the icon indicates that the icon is Unassigned: it will be green and read OK when this icon has been linked to a networked loudspeaker.

To its left is a "W" button. Click on it to Wink the light on the front of the networked loudspeaker that is linked to the icon. This makes it easy to identify the loudspeaker and confirm its location. On the outside left edge of the icon are two red arrows representing CobraNet Receivers (Rx): each can receive one signal out of a bundle of up to 8 audio channels from the network.

Double clicking on any loudspeaker's Connect icon opens the Connect Properties window associated with the linked loudspeaker. More details on Properties windows are on the next page.

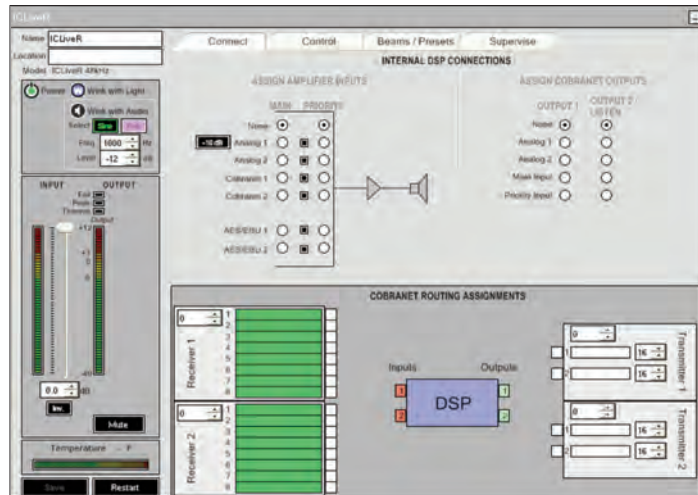


## Properties Windows

The three operational modes of RHAON, Connect, Control and Supervise all have their own unique Properties window (see below). Notice that the vertical pane on the left side of each window is identical. The Connect, Control and Supervise tabs at the top of the window allow you to switch between the three operating modes without returning to the main window.

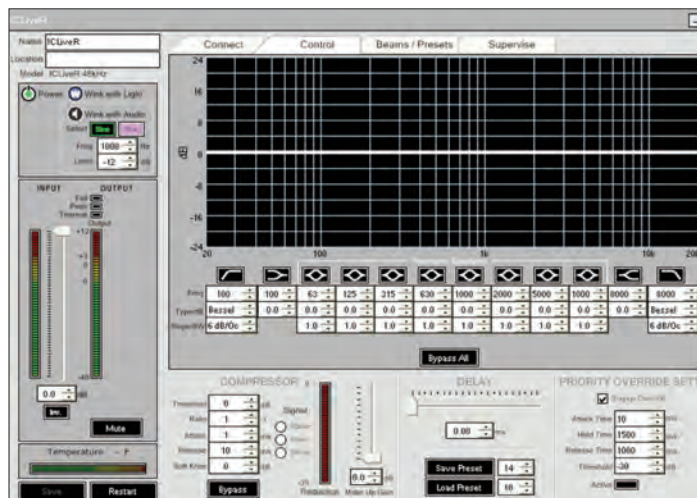
The Connect Properties window gives you the ability to:

1. Select and connect the multiple inputs of Rhaon empowered loudspeakers to the amplifier(s).
2. Select and send input signals to the CobraNet network.
3. Select one of the CobraNet digital audio channels, if CobraNet's multi channel digital audio capability is being used.



The Control Properties window provides setup and control facilities for the loudspeaker's onboard DSP. It includes controls for the:

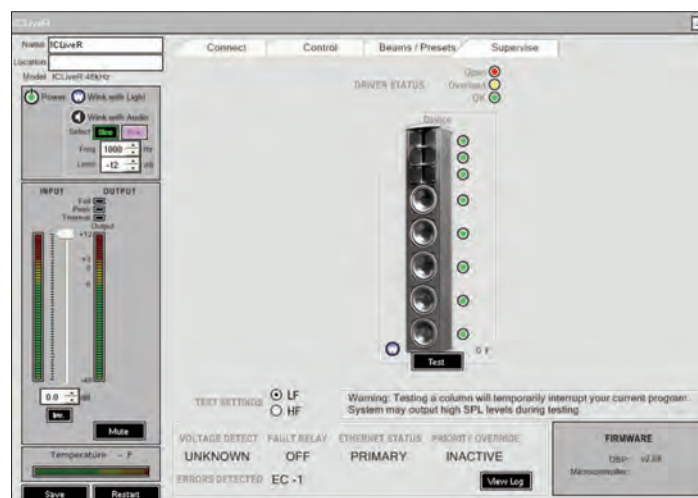
1. Built-in compressor.
2. 8-band parametric equalizer, hi & lo band rolloff and shelving filters.
3. Signal delay.
4. Priority override controls.



The Supervise Properties window allows you to:

1. Monitor and test the status of each transducer's driver.
2. Check the status of the voltage detect circuit, the fault relay and the Ethernet network.

Notice that each one of the Array's loudspeakers is being supervised.





The vertical pane in each properties window provides for loudspeaker identification and selected control features. See below for details.

The screenshot shows the ICLive properties window with the following components and annotations:

- Name:** ICLive (Text field for entering a name for the loudspeaker and listing its location.)
- Location:** (Empty text field)
- Model:** ICLive 48kHz (Listing of the loudspeakers model number and the sample rate (either 48 kHz or 96 kHz) of its DSP. See Appendix III for more details.)
- Power:** (Green power button icon) (Power button switches the amplifier(s) between On and Standby. (turning AC power on and off is an entirely manual operation.)
- Wink with Light:** (Wink button icon) (Press Wink with Light button to turn the loudspeaker's wink light on and off to aid in identifying the loudspeaker and its location.)
- Wink with Audio:** (Wink button icon) (Press Wink with Audio to send a Tone signal or Pink Noise to the loudspeaker.)
- Select:** (Sine button icon) (Sine button icon)
- Level:** -12 dB (Level control)
- Output status indicators:** (Fail, Peak, Thermal, Output) (Output status indicators for each amplifier. See Status Indicators below for details.)
- Input signal level bar graph:** (Bar graph) (Input signal level bar graph; "0" indicates the onset of input clipping. Analog inputs clip at +12 dBu without the 10 dB input pad, +24 dBu with the pad.)
- Volume control slider:** (Slider) (Volume control slider; adjust by grabbing slider with mouse or by using up/down arrows. Settings adjustable from "0" to -50 in 1 dB steps, then to -100 dB in one step; settings below -8 dB prevent the loudspeaker from reaching full output.)
- Inv button:** (Inv. button icon) (Inv button inverts the input signal polarity; glows green when signal is inverted. Use with caution.)
- Mute button:** (Mute button icon) (Mute button mutes the entire loudspeaker.)
- Temperature reading and bar graph:** (Temperature 0 F, bar graph) (Amplifier temperature reading and bar graph.)
- Save indicator:** (Save button icon) (Save indicator; indicates Save whenever a change is made to show the change need to be saved.)
- Restart button:** (Restart button icon) (Press to restart the loudspeakers DSP in the event of a malfunction.)

**Status Indicators:** The Thermal, Peak and Fail indicators above the output meter provide critical information on the array's status. The Peak indicator will flash yellow or red whenever the device's peak limiter is triggered. It's normal for the indicator to flash occasionally if the loudspeaker is being used close to its rated output. Flashing frequently is a sign that the system volume needs to be turned down. The Thermal indicator will start to flash yellow as the amplifier temperature approaches a preset level and will turn red if the temperature continues to increase as a warning the amplifier is about to be shut down. The Fail indicator glows red when the amplifier has been shut down by the protective circuitry. Heat related shutdowns will reset automatically after the amplifier cools down to a safe temperature.

As a further protective measure, the amplifier's gain will gradually be reduced in response to overheating and/or to high an input level. However, it's best to manually reduce the input signal level (overall system volume) in response to distress signals.

## Assigning Digital and Analog Inputs

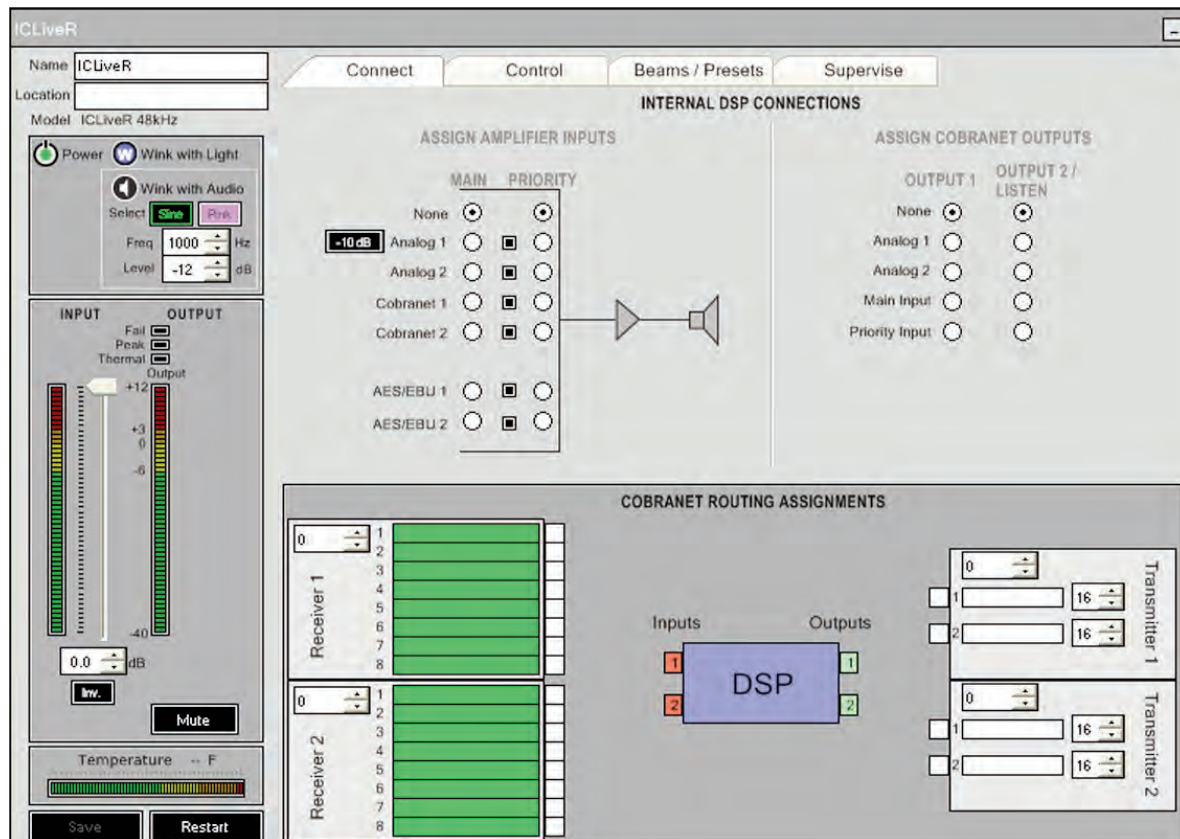
The larger right portion of the Properties windows vary with the operating mode. The Connect window is divided into an upper light grey Internal DSP Connections section and a darker grey lower CobraNet Routing Assignments section.

The Assign Amplifier Inputs portion of the upper section is where you select which one of the Array's multiple inputs will be routed to the Main input and which one will be used for the Priority override circuit. RHAON Empowered loudspeakers have provisions for two CobraNet digital audio inputs, two analog audio inputs and a serial audio (AES3id format) digital input. Selecting the input is as simple as clicking on one of the radio buttons.

Notice that the Analog 1 input includes a 10 dB pad. In the On position it inserts a 10 dB pad into the Analog 1 input, allowing input signals as high as +24 dBu. Without the pad, the analog inputs clip at +12 dBu.

The square Signal Present indicators turn green whenever a signal is present.. You can activate any of the analog and CobraNet digital inputs in the upper group. If you select either of the AES/EBU inputs in the lower group, all Analog and CobraNet inputs are disabled.

The right hand Assign CobraNet Outputs portion of the upper section lets you use any of the audio inputs or amplifier outputs as an output to the CobraNet network, except for the AES/EBU inputs. AES/EBU signals are clocked separately from CobraNet and cannot be output to CobraNet from RHAON.



The lower CobraNet Routing Assignments section is where you select which CobraNet input channel you want to use and set up the output transmitter.

You can use RHAON without digital audio distribution via CobraNet to Control and Supervise your system, or you can combine digital and analog signal distribution for redundant signal path and/or life safety applications. However, if you use AES/EBU serial digital inputs, all other audio inputs are automatically disabled.

If you are not using CobraNet for digital audio distribution in your RHAON system, you can skip the next few pages and move on to Beam Steering (page 23).

CobraNet devices transmit and receive digital audio (48 or 96 kHz, 16, 20 or 24 bit) in bundles of up to 8 channels. The number of channels per bundle can vary, depending on settings for latency and resolution. The number of bundles available depends on network bandwidth.

Each CobraNet bundle has a number from the following ranges:

- |                  |  |
|------------------|--|
| 0:               | Disables the receiver or transmitter.                          |
| 1 thru 255:      | Multicast mode (many receivers can access the same bundle).    |
| 256 thru 65,279: | Unicast mode (allows only one receiver to receive the bundle). |

In order for CobraNet devices to communicate, their Tx (Transmit) and Rx (Receive) bundle numbers must match. RHAON devices are equipped with two receivers and two transmitters, their bundle numbers must be assigned correctly so they can send and receive audio via the network. RHAON software makes this easy.

In most cases the settings of a CobraNet source will have already been established with the source's own proprietary software and can be changed only the manufacturer's software. However, if the manufacturer's software allows you can set or reset both receiver and transmitter bundle settings of any device found on the CobraNet network using RHAON software.

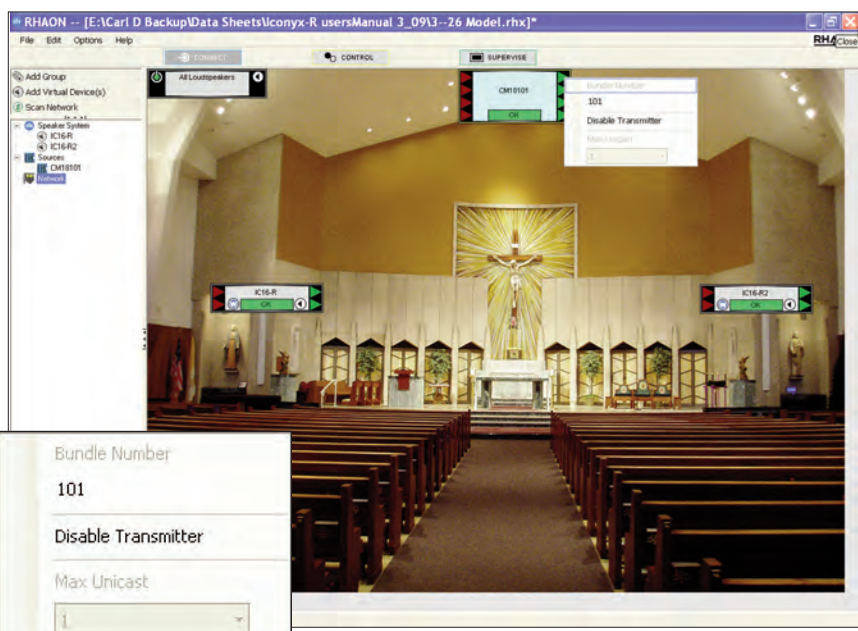
The first step in setting up CobraNet routing is to drag the CobraNet Source that was detected by Scan Network into the system.

The CobraNet Source and the devices connected to it must have the same Sample Rate and Latency settings. Right clicking on the CobraNet Source Icon will open a pop up screen showing the Sample Rate and Latency settings. We suggest you accept the Source's default settings unless you have a specific reason to change them.

You will then want to check the device settings to make sure they are the same as the Source's settings. The settings must be the same for the source and for all devices connected to it.

While latency may be changed here via point-and-click, the sample rate is pre-programmed in the DSP firmware running in the loudspeaker. You can switch sample rate by uploading the appropriate firmware to your device. Please refer to "APPENDIX III: Updating DSP Firmware" for information on how to upload new firmware to your device.

Next, check the bundle settings of the CobraNet Source device. The Source in our example has 4 Receivers and 4 Transmitters. The red triangles on the left of its icon represent Rx bundles and the green triangles represent Tx bundles. Right clicking on one of the triangles will open a pop up window that shows the bundle number and allows you to change it.





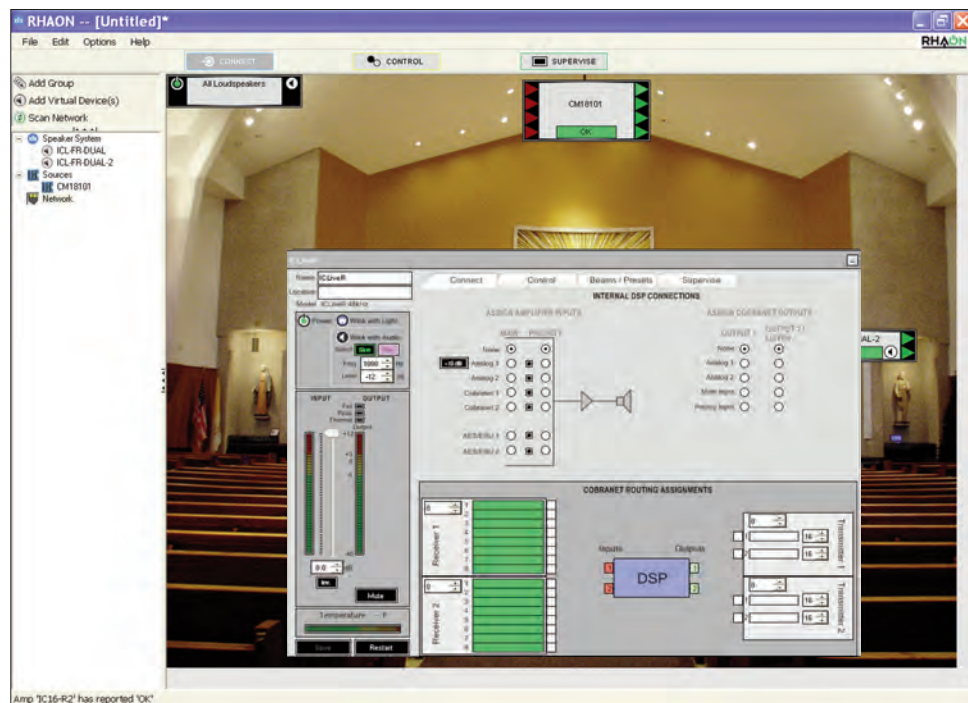
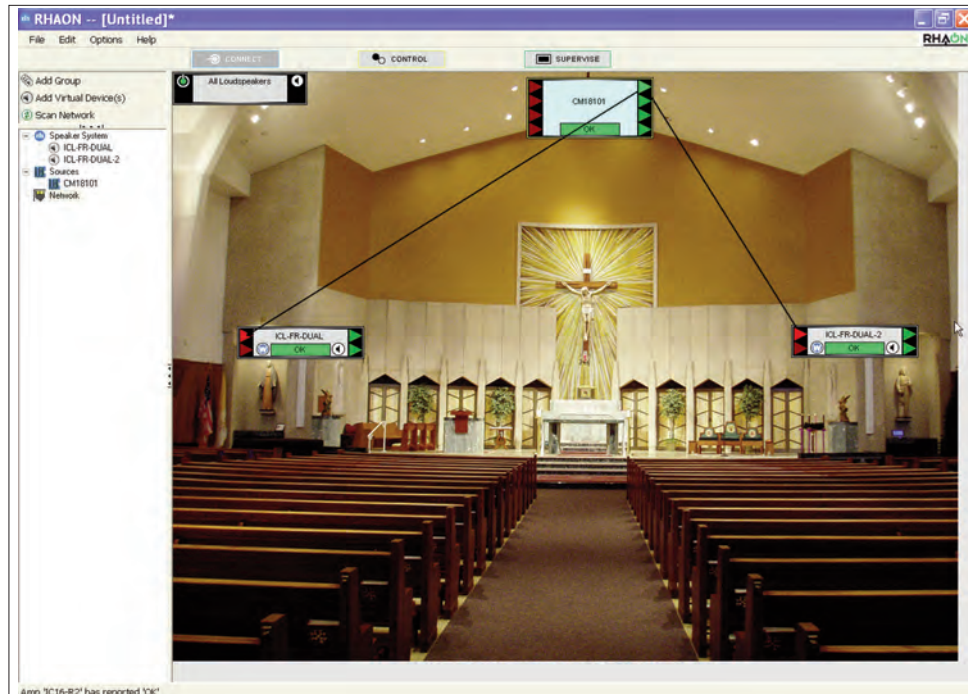
The next step is to connect CobraNet Source Transmitters to the CobraNet Receivers in the RHAON loudspeakers. Double click on one of the Source's green Tx triangles and then double click on one of the loudspeaker's red Rx triangles to connect the two. A connection line will let you know the connection is completed. The loudspeaker's Receiver automatically inherits the bundle settings of the Source Transmitter. Keep repeating these steps until all the loudspeakers are connected.

To correct a mistake or change an assignment, click on the Receiver whose assignment you want to change to select it or right-click on the Receiver Icon and select Disable Receiver from the menu that pops up. Either method will break the connection and allow you to make a new one.

Since each CobraNet bundle can carry 8 channels of digital audio, you must make channel selections individually.

Once your Tx and Rx bundle assignments have been made, open each loudspeaker's Properties window by double-clicking its icon. If the window does not open in Connect mode, click on the Connect tab at the top to display the window shown at the right.

In the lower-right section of this window, you make channel assignments by clicking and dragging to connect audio channels from the CobraNet source to the RHAON loudspeaker's CobraNet Receivers.

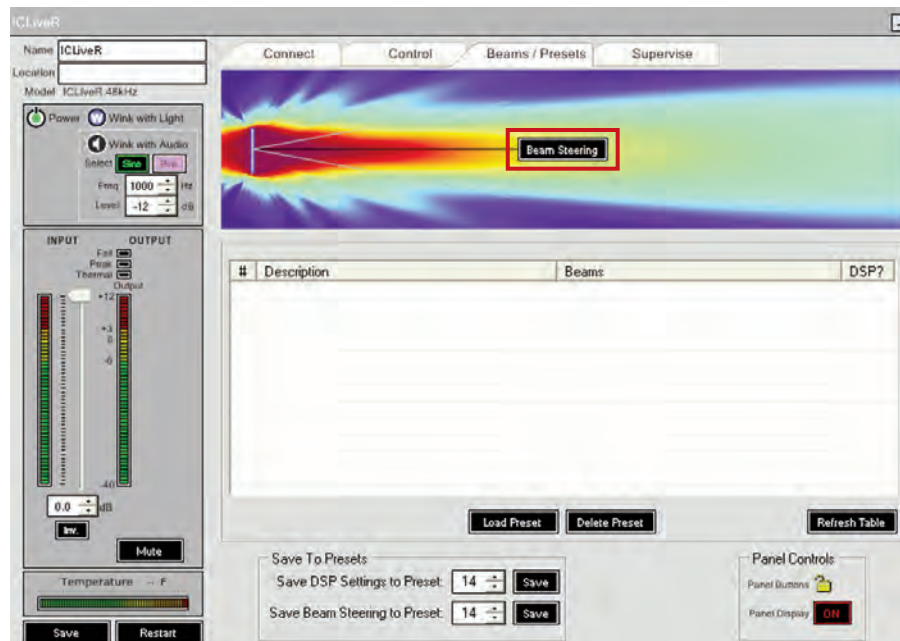


You can also assign Outputs 1 and 2 (selected in the upper section under Assign CobraNet Outputs) to the RHAON loudspeaker's CobraNet Transmitters.

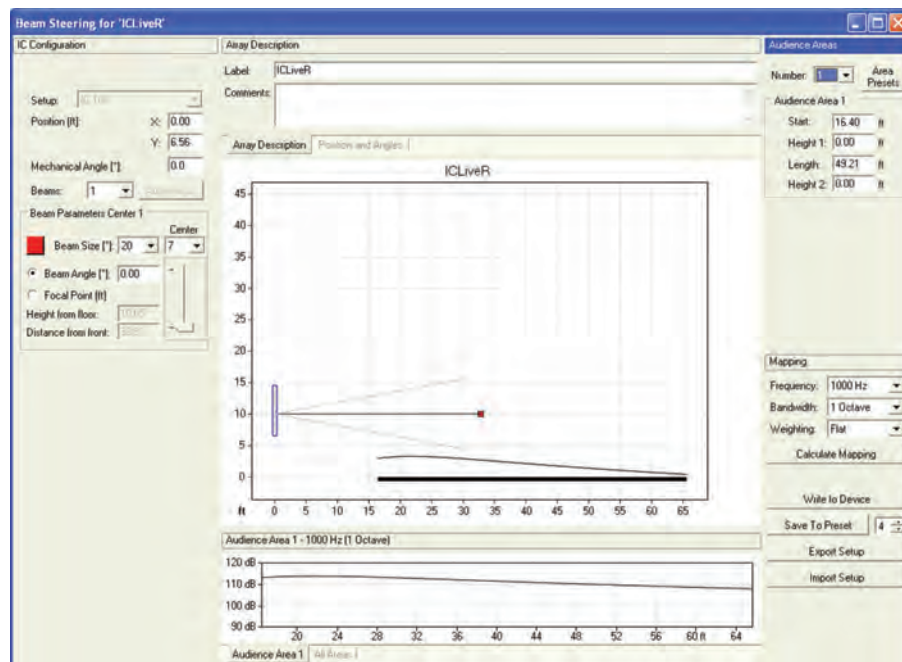
## Beam Steering

Iconyx IC-R digitally steered arrays produce tightly focused, precisely aimed beams of acoustic energy that maintain their intensity well over long distances. The FIR files that shape and aim these beams of energy are created within RHAON under Beam Steering and then either stored as a Preset or loaded into the array's DSP.

Presets are an Iconyx feature that allows you to store up to 10 preset beam steering and DSP control setup configurations in the array's DSP memory and then select between them. To enter Beam Steering, open the Beams / Presets Tab and click on Beam Steering.

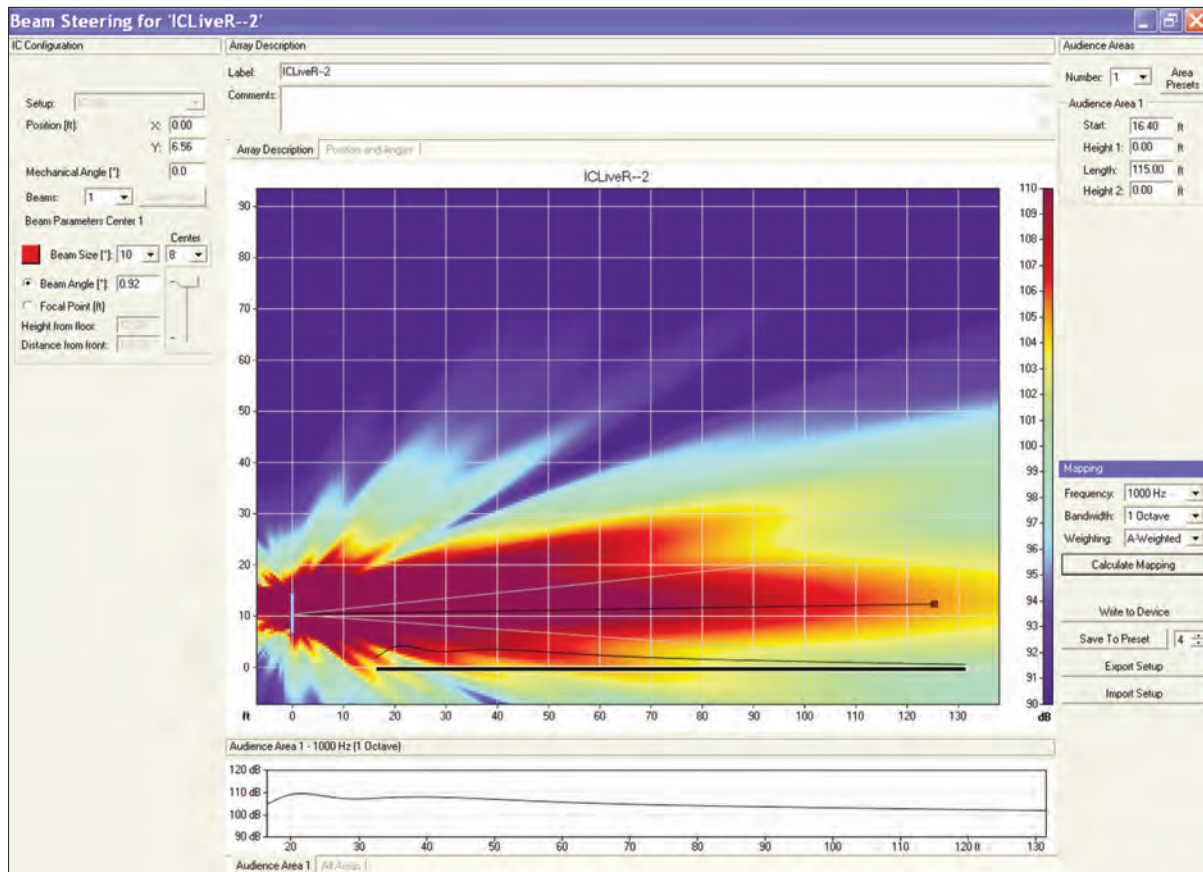


This will open the Beam Steering window shown below.





The opening Beam Steering window shown on the previous page doesn't show the array's beam. Pressing the Calculate Mapping button and following the prompts tells the program to calculate and display the beam. See below.



Note the four control buttons in the lower right corner of the Beam Steering window. Pressing Write to Device will send any beam steering configuration setting changes you have made directly to the array's DSP and write over any previous settings.

Pressing Save to Preset will store the configuration settings as a configuration Preset in the selected preset file. We'll go into Presets in more detail later.

Note that in both cases, only the beam steering information is being sent to the Array's.

Export Setup will generate a .rhs setup file that can easily be imported into an EASE and EASE JR model for a detailed acoustic evaluation. Beam Steering shows you the array's vertical coverage, but not the horizontal coverage or the effect of reflections on intelligibility and clarity. EASE and EASE JR do.

Import Setup allows you to import into Beam Steering any changes you may have made in the configuration settings in EASE or EASE JR.



Before going on you should first verify that the correct measurement system is being used (feet or meters). The default measurement system is feet but you may want to use meters.

To check or change the setting, select Preferences from the Options pull down menu in the tool bar section of RHAON or right click in the center of the beam steering window.

If you want to change from feet to meters, click in the Metric radio button.

Note that this window also allows you to control the behavior of the Fault Relay and the Power-On sequencing delay.

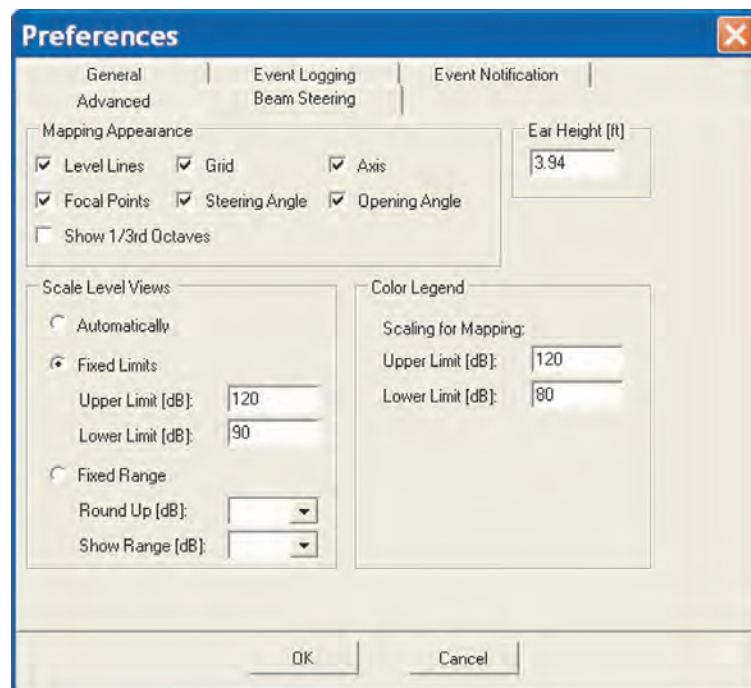
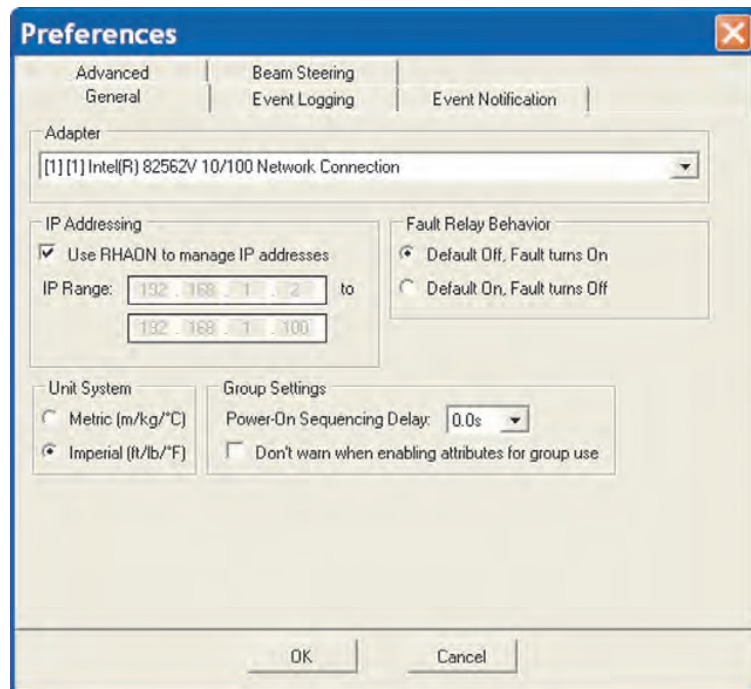
The Beam Steering tab contains the setting controls for the appearance of the Beam Steering window. The normal default setting are shown.

Notice that this setup window also allows you to change the height of the measuring plane (the *Ear Height*). Until you are more familiar with the program we suggest you accept the default setting. There are times, however, when you will want to change the height of the measuring plane. It is set to 1.2 meters (3.94 feet) which is fine for a seated audience, but not for a standing audience.

The Mapping Appearance section allows you to control the appearance of the main Mapping plot. For now, we suggest using the default settings. You can experiment with various settings later.

The Scale Level Views section gives you control over the scales used in the main Mapping window. Many experienced users like to use the *Fixed Range* option under *Scale Level Views*; setting the *Round Up* to 5 and the *Show Range* to 5. You may want to experiment with this to see which settings you like best.

We'll investigate the other tabs later.



You should know the physical dimensions of the area(s) you want to cover, so the next logical step is to set up the audience area(s) using the Audience Area section on the right side of the Beam Steering screen.

To simplify this step, Beam Steering provides five templates, the Standard one used as the default starting point and four others; Small Arena, Large Arena, Open Air and Theater. These templates are available by clicking on the Area Presets button.

You should become familiar with these templates, so we suggest you try each one of them and then choose the one that comes closest to matching your project. Note how the number of areas and the size of the Audience Areas change from one template to another.

Once you have selected the template, alter the Audience Area size(s) and location(s) to match your project's dimensions. Notice that you can also add or delete up to a maximum of 3 Audience Areas by using the Number field and associated drop down arrow.

The **Start** field establishes the beginning point of the Audience Area relative to the "0" point of the graph. The Start point is usually the first row of seating. Height 1 is the height of the front of the Audience Area. It usually is "0" for the front of the first floor area.

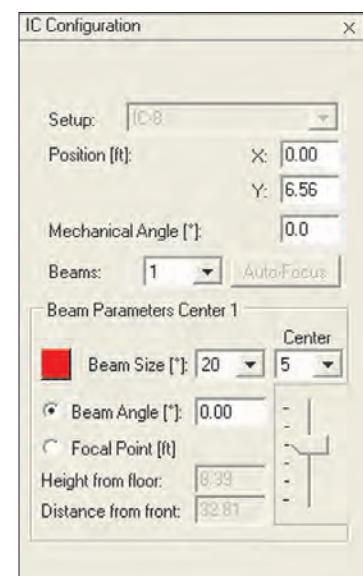
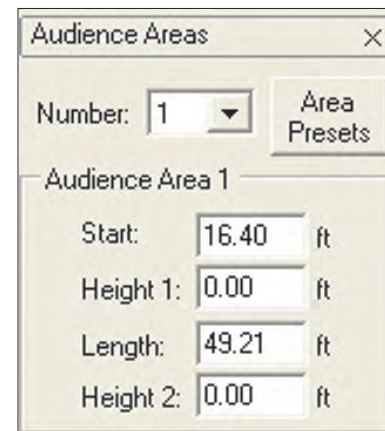
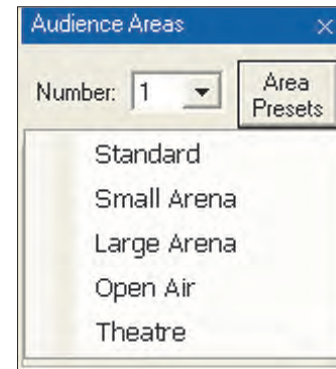
Length is the physical length of the Audience Area from the front edge to the rear edge. Height 2 is the elevation (height) of the rear of the Audience Area above the "0" plane.

The next step is to configure the steerable column(s) you will be using in your project, i.e., to position them, define the beam(s), etc. using the IC Configuration section on the left side of the window. See graphic to the right. The down arrow associated with the Setup field allows you to select between arrays in multiple array systems.

Now, it's time to locate (position) the steerable column. Usually it will be on the front wall ( $X = 0.00$ ) in the beam steering Project display. If it will be placed at the front of the stage away from the front wall, for example, move it forward by inserting its correct location. Note that after you insert a figure in the field, you need to press Enter on your keyboard to OK the change in location.

The **Y** field controls the height of the column array by positioning the bottom of the column above the Floor level (the "0" level). The default position is 6.56 feet (2 meters). The Mechanical Angle field tilts the column forward or backward (minus [-] numbers tip it back and plus [+] numbers tilt it forward). This parameter is usually left at 0.0 since the normal position for Iconyx arrays is flat against a wall and the array's output digitally steered down onto the audience area.

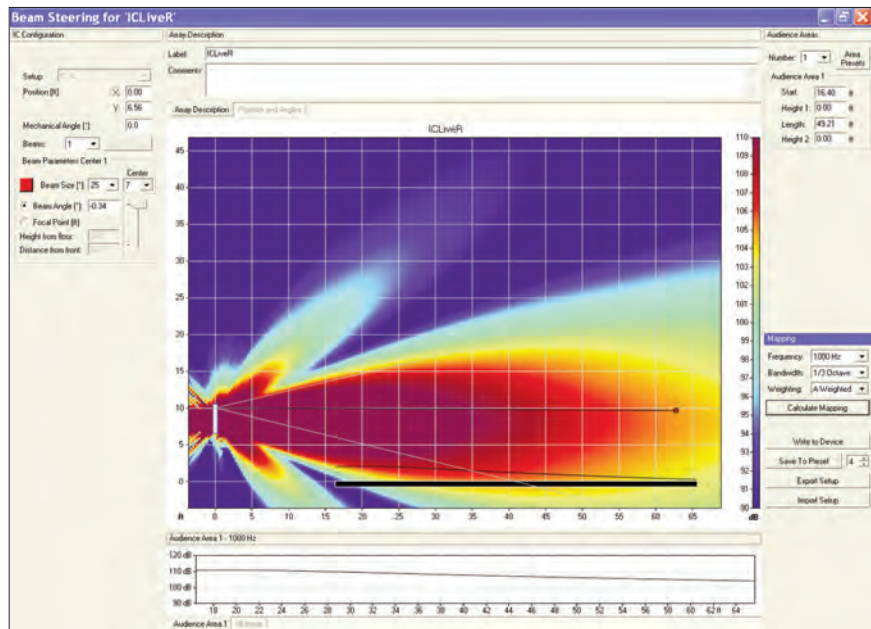
The next step is to choose the number of Beams using the Beams field and its associated drop down menu. One of the unique features of Iconyx steerable arrays is the ability to generate either single or multiple lobes. We'll be discussing multiple lobes later in this tutorial, so for now accept the default 1 beam configuration. Beam Size lets you choose the Array's opening angle which controls the sharpness of the vertical lobe (beam). Try it out using the drop down arrow. Notice how the opening angle of the array in the graphic varies as you choose different opening angles.





Beam Angle aims the vertical beam up or down. Try it out by selecting **Beam Angle** [°], changing the number and observing its effect. Note that after entering a new number you will need to press Enter to initiate the change. You will also need to do a new Calculate Mapping to view the change. The old map will have been wiped out by the program as you made the change.

Note that you can also check Focal Point [ft] and then enter the exact location of the beam's focal point in Height from Floor and Distance from Front. Another way to position the beam's focal point is to use the mouse cursor to grab the end point of the aiming axis and move it to the desired location. Try it out. It's easy to do. The SPL levels in the graphs will change as the setup parameters change.

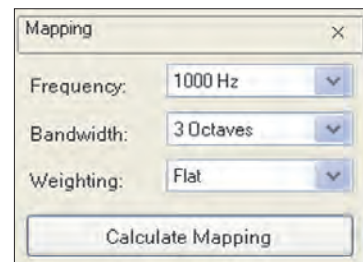


Note that at any point you can click on the Calculate Mapping bar to tell the program to map the array's performance on the audience area.

As soon as you press Calculate Mapping, a pop up screen will ask you to choose the resolution of the simulation. Low Resolution simulations are much faster to run than High Resolution ones. All you need to do to start the simulation is to make your resolution choice by pressing one of the bars.

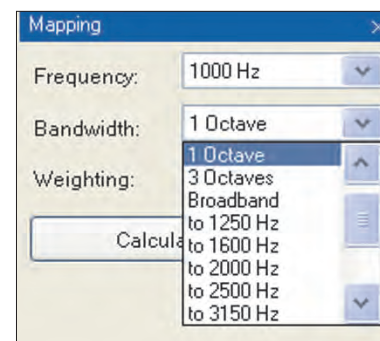


You also have the opportunity to choose the simulations Bandwidth, its Center Frequency and its Weighting. The Frequency section lets you select center frequencies from 100 to 10,000 Hz. The default selections for the Bandwidth section allows you to run the simulation over 1 octave or 3 octave bands or Broadband.



You can change this by going to the Options window (F9), selecting the Appearance tab and checking Show 1/3rd Octave. This adds a 1/3 octave selection to the drop down Bandwidth menu and the opportunity to set a specific bandwidth for the mapping simulation. In the graphic shown, for example, selecting "to 3150 Hz" would run the simulation over the frequency range of 1000 to 3150 Hz.

We'll choose the default settings for this exercise, but you may want to try out all the different settings to become familiar with them and the performance of steerable arrays.



Now, let's investigate the multiple beam capabilities of Iconyx.

In many installations, a single beam is the ideal solution for the room's acoustical challenges. In some cases, however, multiple beams are needed to provide the desired coverage. Rooms with a balcony are a good example; in most cases a single beam can't cover both the main floor and the balcony.

One solution is two line arrays, one for the floor and the other for the balcony, but this is expensive. In other cases, architectural considerations or microphone placement dictate that the column be mounted higher than is ideal and it's impossible to cover the audience area with a single beam.

Iconyx solves these problems by offering multiple beams. To explore this unique Iconyx feature, click on the drop down arrow associated with **Beams**.

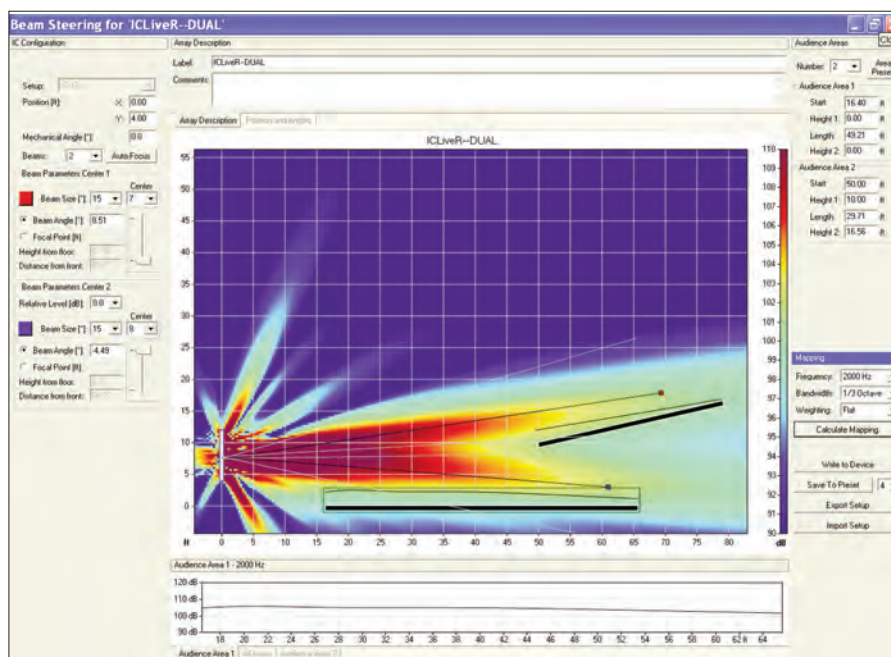
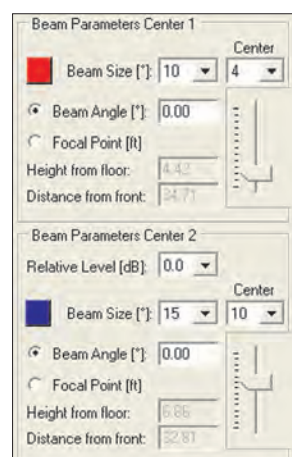
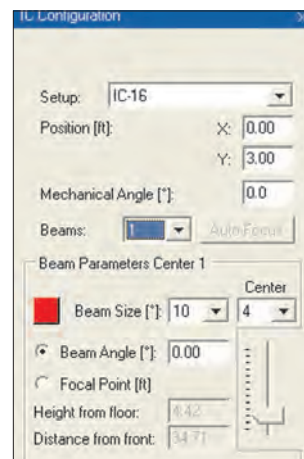
Notice that on the ICL-FR-DUAL you can select up to a maximum of 8 beams. It's up to four on an ICL-FR. For now, select 2 to add a second beam to the graphic.

At first glance it may appear that nothing happened since the program may have placed the second beam on top of the first beam. One way to tell that a second beam has been added is that the left side of the window now includes a Beam Parameter Center 2 section. In the graph, the second beam is identified with a dark blue aiming point.

Notice that the second beam also includes a Relative Level field. This allows you to reduce the level of this beam relative to the first beam, a useful feature when the second beam is covering the front of the audience area.

Take a few minutes now to become acquainted with the many design possibilities offered by Iconyx steerable arrays by playing around with the number of beams, their opening angles, their aiming and their relative levels.

One of the things you will notice is that as the number of beams increases, the output level of the individual beams decreases.





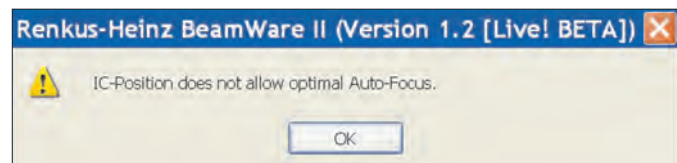
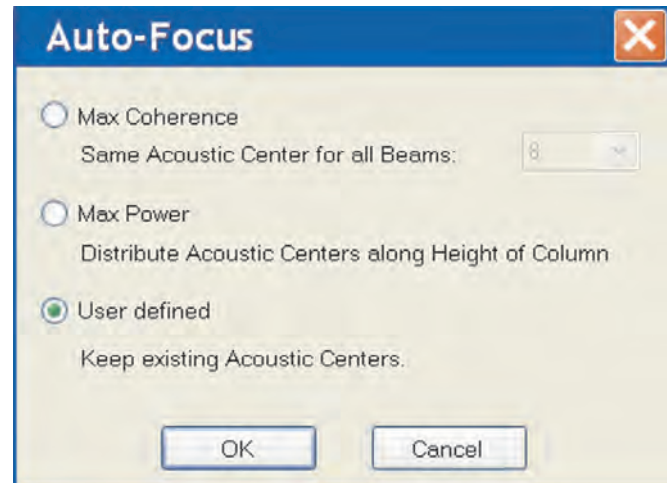
Now that we understand the basics of using Beam Steering, it's time to investigate one of the unique tools Beam Steering includes to even further speed the design process. It's called Auto-Focus and it is available as a design aid whenever you choose to use 2 or more beams. You'll find it in the IC Configuration section next to Beams.

Clicking on Auto-Focus will open the setup window shown to the right.

Since ICL-F and ICL-FR arrays have a fixed acoustic center only the Max Coherence function is operative. Approve its use by clicking on OK and the program will automatically determine for you the best focus point for each of the beams.

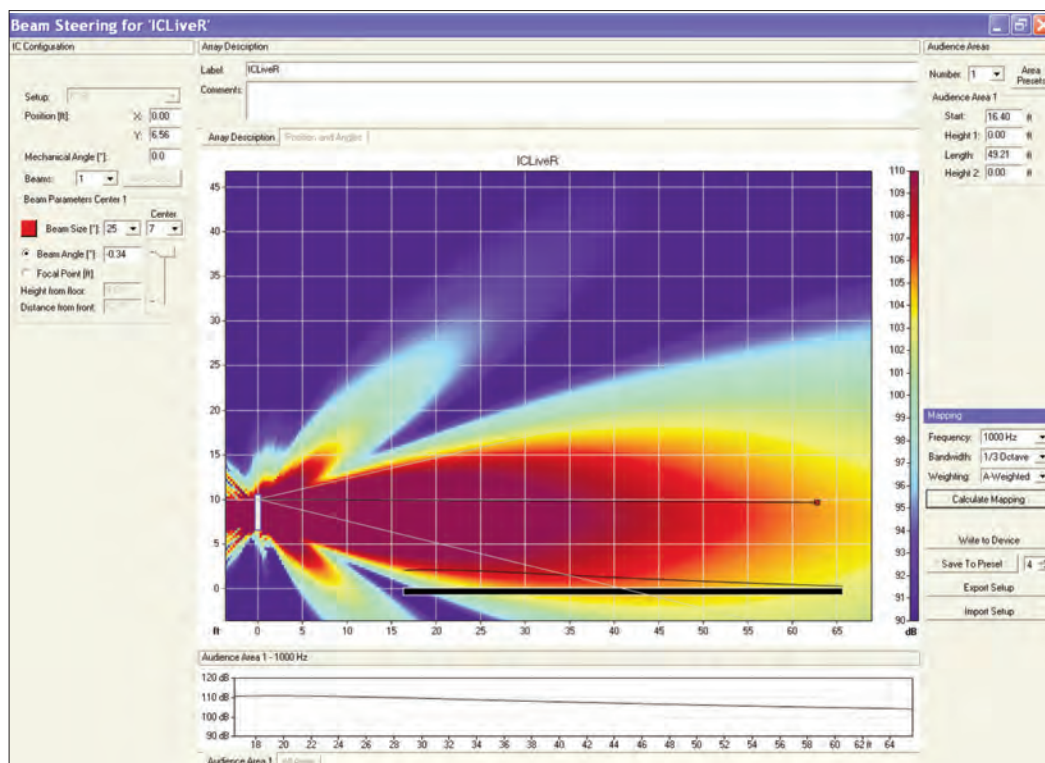
Auto-Focus will also warn you if the location you have chosen for the steerable array isn't ideal.

You can override this warning if you want and the program will still attempt to properly focus all the beams. You may, however, want to try moving the array up or down to see if you can find a better location for the Iconyx array or use more or fewer beams to see if you can eliminate this warning prompt.

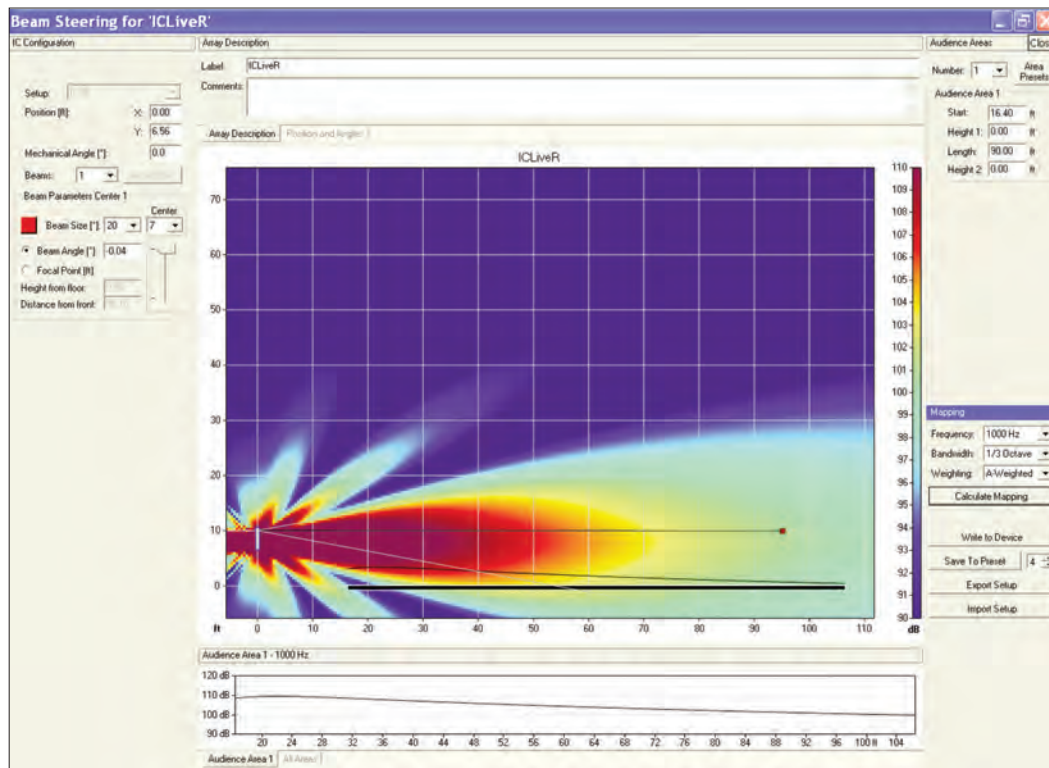


So far we have been exploring the capabilities of Beam Steering and not focusing on practical applications. The graphic below shows a typical setup for a small room (50 feet deep) with the bottom of the array placed 6.46 feet above floor level, approximately the height of an array mounted on a subwoofer sitting on a stage or at altar level. Note that a single ICL-F array was selected and an opening angle of  $25^\circ$  chosen.

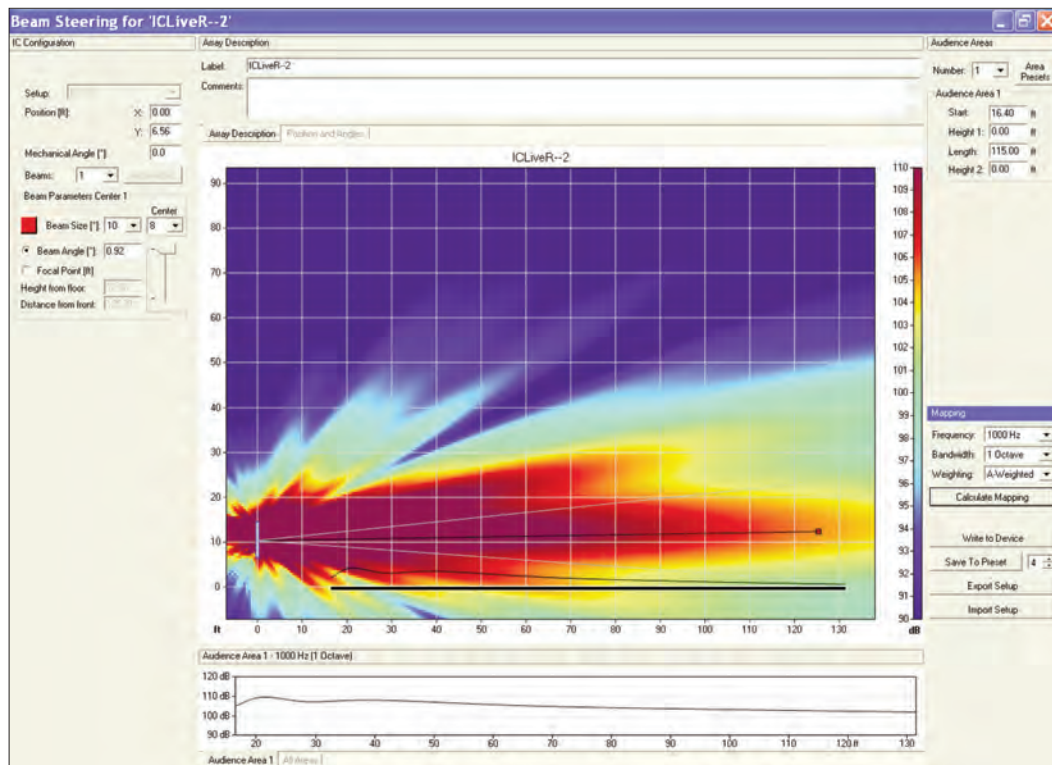
A center frequency of 1000 Hz was selected for a 1/3 octave, A-weighted simulation.



The next graphic shows a much larger room, 100 feet deep instead of 50 feet. Note that the beam opening was narrowed to  $20^\circ$  to obtain a longer throw. Still the level is starting to fall off at the rear of the room. It might be wise to consider using a "Dual" module ICL-F-DUAL array.



The next graphic shows an even larger room, one with a 125 foot throw. Note that the more powerful ICL-FR-DUAL array was chosen and the opening angle reduced to  $10^\circ$ .

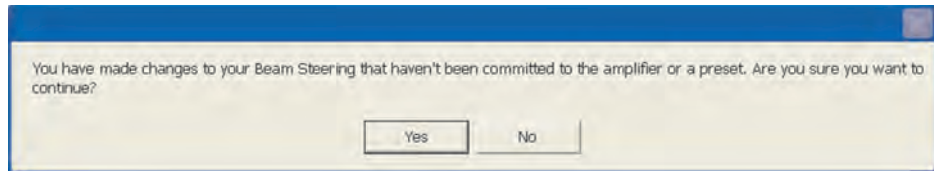


At this point the changes you have made in beam steering have not been sent to the associated array or stored as a Preset.

ICL-FR arrays can store up to 10 different configurations as Presets in the array's DSP memory. For example, you might optimize one configuration for small events on the main audience area and another for larger occasions when a balcony is used. The Presets include the beam steering data, as well as gain, EQ, compression, etc. settings. Switching between the preset configurations is easy. They can be changed from either the rear of the array, from the controlling computer or, if one is provided a wall mounted remote control. Third party controllers can also be used to configure the array and select presets using the RS485 connection..

A digital readout on the rear of the array displays the selected Preset. They are labeled 10 to 19. Preset 10 is claimed by the factory for field test purposes and is permanently locked. It sends an equal signal to all the transducers making it easy to check them by ear for proper operation. Preset 04 is installed by quality control as a final proof of performance test before shipping. It may be over-written in the field.

If you attempt to leave Beam Steering without saving the setup information, a prompt will remind you that you need to save the settings if you want to keep them.



Note that presets can not be saved to an array in the virtual world. The following applies only when an array is connected to the network.

In the beam steering window, select either Write to Device or Save as Preset. The two commands are in the lower right of the beam steering window. Write to Device will send the beam steering settings direct to the array's DSP and write over any previous settings. Save to Preset will store the beam settings in the designated Preset. Note that the Beam Steering Presets control only the beam steering data; EQ, compression, etc. configuration settings are controlled in the Control Mode.

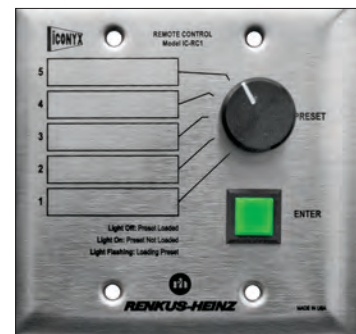
Selection of the desired Preset is controlled on the Array's control panel by three push buttons located directly below the digital readout. The Preset Up and Preset Down buttons are used to select the desired Preset and the Enter button used to enter the selection into the DSP.

The readout display will flash while the selected Preset's configuration settings are being entered into the DSP and return to a steady glow when the procedure is complete. If by accident you select an empty Preset, the dots following the numbers will flash as an indication no Preset is being loaded (is available). In multiple module arrays, the Preset Up, Preset Down and Enter buttons are disabled in the "Slave" modules (the upper modules). Note that the Digital readout will also display the array's level setting in dB when the array's Volume Up and Down buttons are being used to adjust the array's output level.



When provided, an associated IC-RC1 Remote Preset Control allows users to select and change presets from a remote location without the need for a computer. It's simple to use; select the desired Preset and then press the Green Enter button to load the Preset into the associated array. The light will flash until the Preset is fully loaded and then go out. More details on installing and operating the IC-RC1 can be found on page 50. Be aware that when the IC-RC1 is installed and connected it takes away preset control from the controls on the rear of the array and from any remotely connected computer.

Iconyx systems have an external connector available for data communication via RS485. Review the user interface panel diagram at page 51 (Appendix III). This allows users to implement control and monitoring via third party controllers such as those made by Crestron. For more information on controlling your Iconyx array using a Crestron control system refer to the Crestron website at [http://www.crestron.com/tools\\_and\\_resources/programming\\_and\\_integration\\_resources/integrated\\_partner\\_modules/default.asp?manufacturer\\_id=247](http://www.crestron.com/tools_and_resources/programming_and_integration_resources/integrated_partner_modules/default.asp?manufacturer_id=247).



IC-RC1 Remote Preset Control

For information on initializing your Iconyx systems for third party RS485 based control refer to Appendix V.

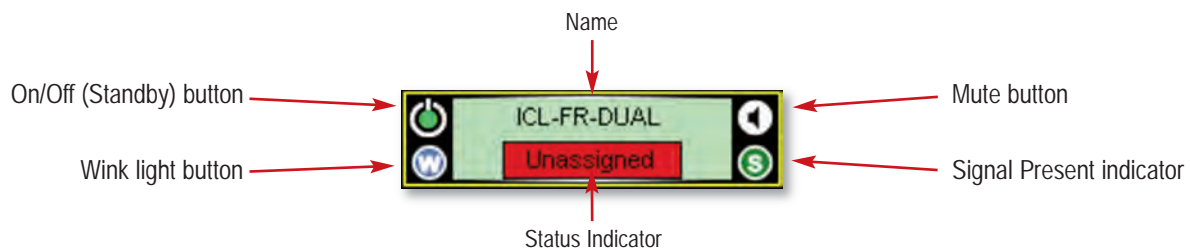
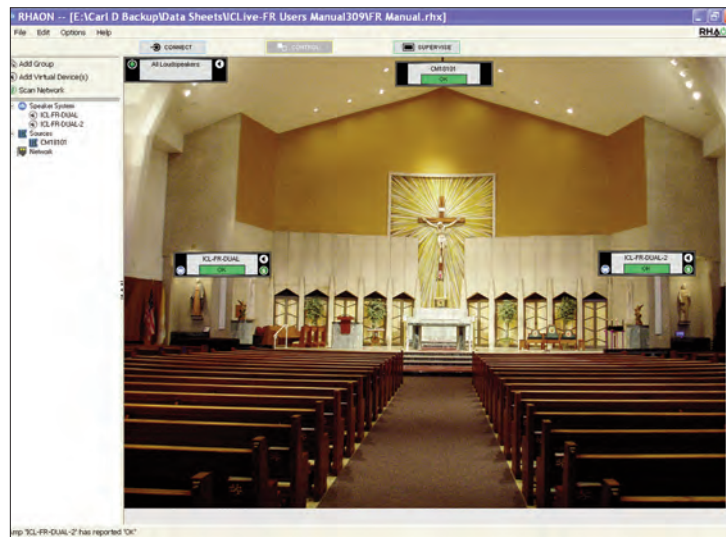


## CONTROL MODE

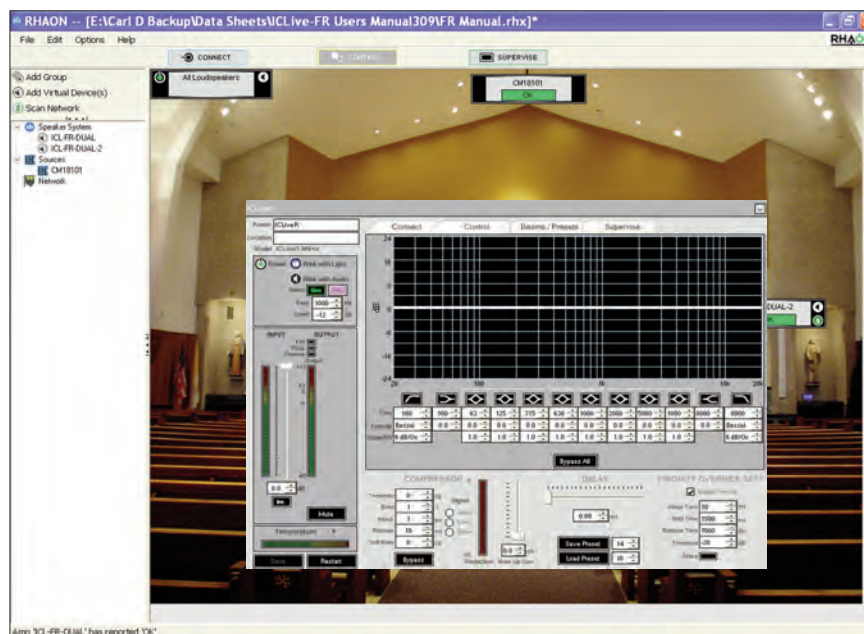
Control Mode provides access to the Loudspeaker Amplifier's internal DSP and allows you to control its settings. You can enter Control Mode by clicking on the CONTROL button at the top of the main workspace, or from within any loudspeaker's Properties window. Any or all of the Control functions can be restricted to authorized operators who have password access; more information on password authorization can be found in the Supervise Mode section of this manual.

When you enter Control mode in the main workspace, the directory tree on the left remains the same.

However, notice that the icons themselves have changed. The CobraNet Rx and Tx arrows are gone. On the left, an On/Off button allows you to switch the amplifier(s) On or select Standby (Off) mode. The Wink button is below this switch. On the right, a Mute button is labeled with a driver symbol. Below it is a Signal Present indicator.



Double-click an array icon to open its Properties window in Control mode. Notice that the left hand section of the Control Mode Properties window is the same as in Connect mode.



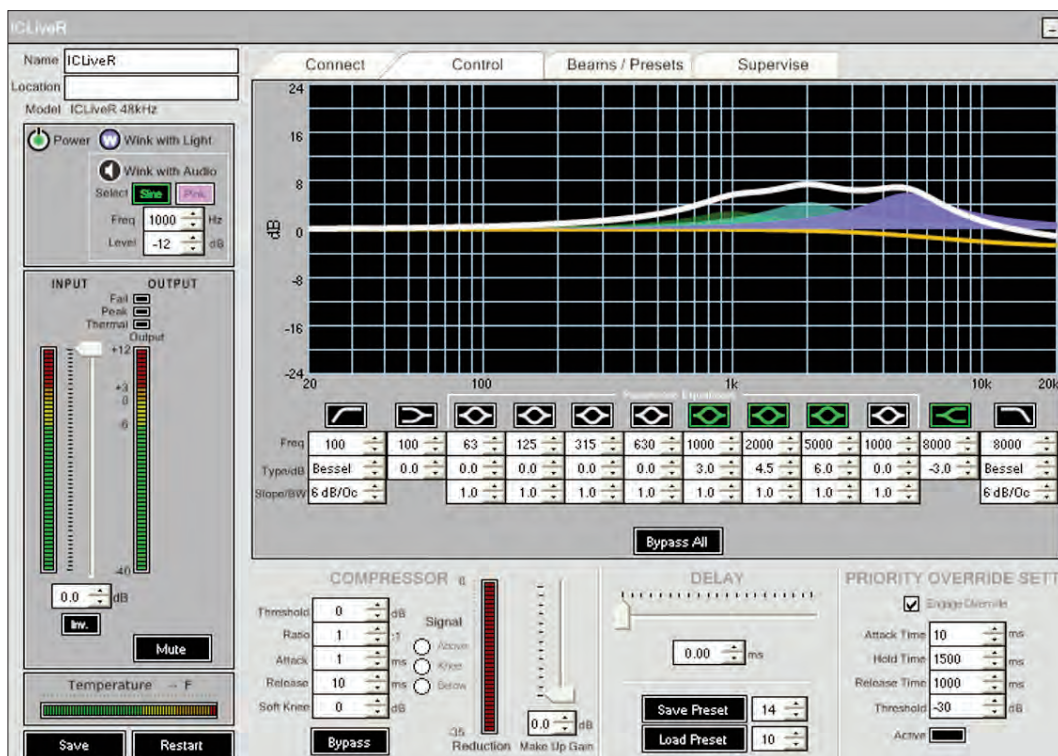


## User-Configurable DSP Functions

On the right side of the Control Properties window, in the upper dark grey section, you will see a frequency response graph. Underneath it are controls for 12 filters. To activate a filter, click the button above its white data fields; then either type in your values, use the up-down arrows or scroll with your mouse to adjust the parameters. At the far left is a highpass filter; its lowpass counterpart is at the far right. These filters have three controls: Cutoff Frequency, Type (Bessel, Butterworth, etc.), and Slope. The pair of filters to the inside are shelving filters, with controls for corner frequency and boost/cut.

The center section gives you control of 8 fully parametric filters, with controls for center frequency, boost/cut and bandwidth in octaves. When you activate a filter, its button turns green and it appears on the graph – each filter appears in a different color. A solid line shows the overall EQ curve. The Bypass All button at the bottom of this section lets you compare filtered and unfiltered signals quickly.

All filter parameters can be controlled with the scroll wheel on your mouse. Click inside the control field and scroll to set: Gain, Bandwidth, Frequency, etc.



Below the EQ section in the light grey area, you'll find controls for the Compressor on the left. The controls – Threshold, Ratio, Attack Time, Release Time and Soft Knee – are similar to the EQ controls. You can type in values, use the Up/Down buttons, or scroll with your mouse to find the values you want. Under Signal you will find buttons that set the compressor's trigger point Above, At or Below the Knee.

When the compressor is operating, the Bypass button is red and the Gain Reduction meter on the right side of this section lights up. To turn the compressor off or to compare the uncompressed output to the compressed output, click the Bypass button.

To the right of the compression Reduction Meter is the Make-Up Gain control. This control can be used to restore RMS levels of the compressed signal to those expected of the signal pre-compression. It has a range of 0 to +12 dB.

The RHAON input module's DSP has 340 milliseconds of signal delay available if you are using the 48 kHz sample rate; 170 milliseconds if you are using 96 kHz. Use either the up-down arrows or the slider control to adjust the delay time.

Priority Override is one of the unique features of RHAON. It allows you to assign signal-activated priority override capabilities to any one of the array's multiple inputs. The Priority Override controls in the lower right section of the properties window allow you to set the Attach Time, the Hold Time, the Release Time and the Threshold level.

**PRIORITY OVERRIDE SETTINGS**

☐ Engage Override

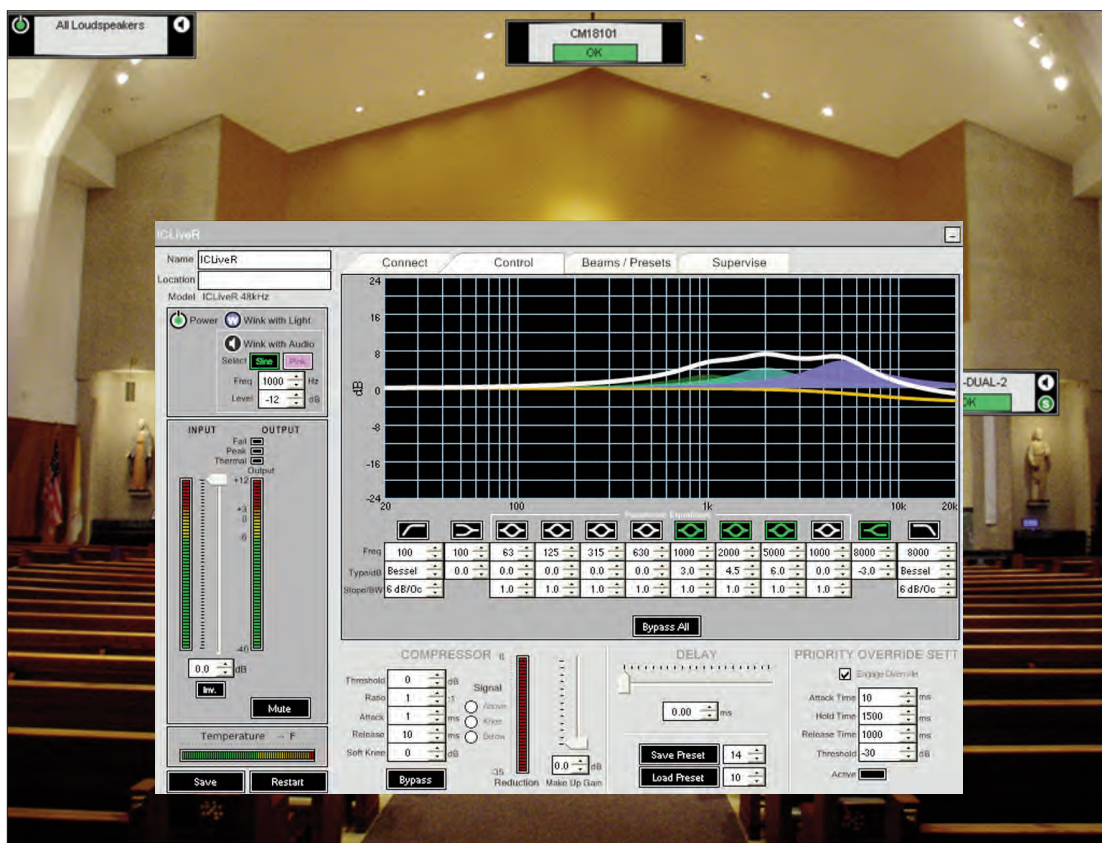
Attack Time **10** ms

Hold Time **1500** ms

Release Time **1000** ms

Threshold **-30** dB

Active ☐



At the very bottom of the window are two controls labeled Panel Display and Panel Buttons. Clicking on the Panel Display button will turn the Preset digital readout display on the rear of the array On and Off. The display is often turned off during a performance to prevent the readouts red glow from being a distraction. The button will say On in red when the readout is turned On.

The Panel Buttons padlock Icon locks all of the controls on the rear of the associated array to prevent inadvertent changing of the settings or tampering. The padlock will be closed when the controls are locked.

### Saving Changes

At the bottom left of each Properties window is a blank black bar. When you make changes to the loudspeaker's settings, the word Save will briefly appear in this space. This lets you know that your changes are automatically being sent to the loudspeaker's onboard DSP memory. You will also be prompted to Save Your Project before you exit the RHAON software.

### Saving To Presets

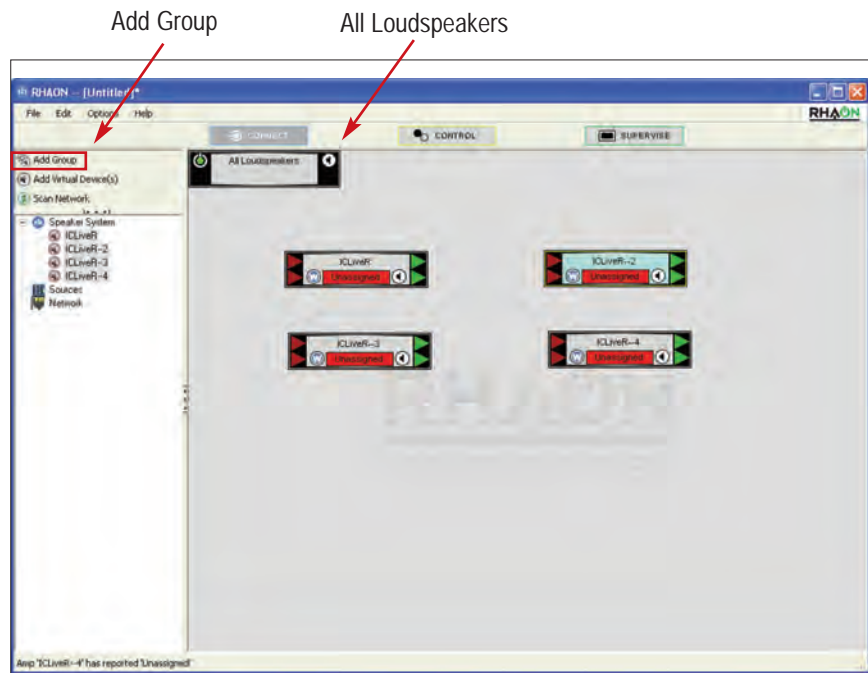
At this point none of the configuration settings have been stored in a Preset. The Save Preset and Load Preset command fields and their associated up/down arrows are used to save your configuration as a Preset and to select (load) a specific Preset into the array's DSP memory. The Preset will include the DSP settings you made in the Control mode (EQ, gain, compression, etc.) as well as the beam steering information.

## All Loudspeakers & Group Control

Now it's time to turn our attention to the All Loudspeakers icon in the upper left of the work space and to the Group feature of RHAON...

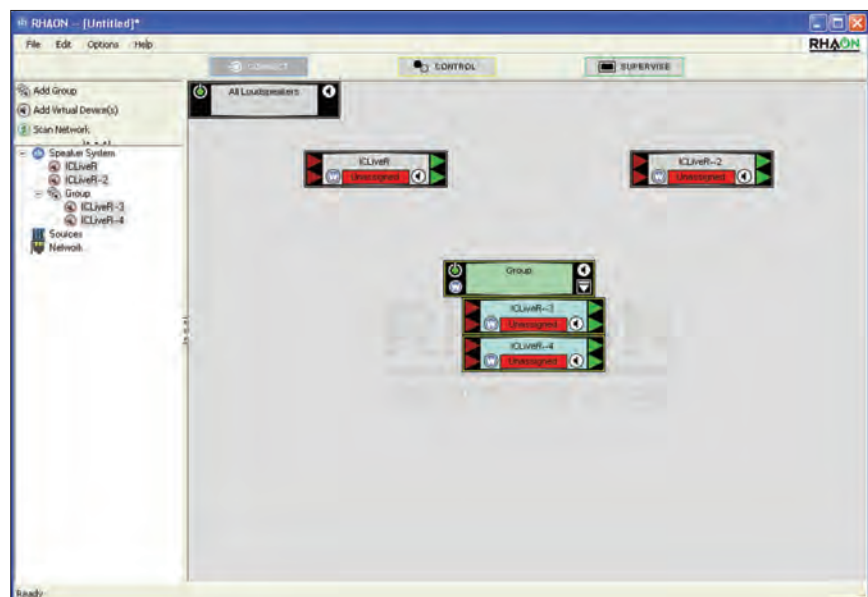
All Loudspeakers controls all the arrays in the system while Group controls only arrays included in the Group.

All Loudspeakers allows you to Mute all the arrays simultaneously or to turn them all On or Off with the push of a single button. You can also assign Input connections, EQ, Delay and Compression settings for all the loudspeakers in the system at one time or adjust their sound level with just one control



Group Control functions in the same manner only it exerts control only over the arrays included in the Group. To add a Group, select Add Group to add a Group folder to the directory tree and a Group icon to the work space. Then drag the Arrays you want included in the Group from their listing in the directory tree into the Group folder.

Notice that as you add Arrays to the Group their icons disappear from the work space into the Group icon. To view all the array icons within the group, click on the Expand/Collapse toggle in the lower right corner of the Group icon. The icons for the arrays included in the Group are linked to the Group icon and cannot be individually moved around the work space.





Double clicking on the Group icon will open the Connect Properties folder. Notice that the Group Connect window shown here is very similar to the one for individual loudspeakers except for the lack of level meters and CobraNet channel selection facilities.

In the dark grey area on the left are Power, Wink with Light and Wink with Audio buttons. These tools are similar to those in a Loudspeaker Properties window, but of course they “Wink” the front grill lights of all the loudspeakers in the Group, or send an audio signal (sine wave signal or pink noise) to them.

The Power button puts all amplifiers in the Group in Standby or turns all of them On. The Input Volume control and Mute button also affect all amplifiers in the Group. Group metering is not available.

The Input selection radio buttons in the light grey area operate in the same way these controls operate for individual loudspeakers, but control all loudspeakers in the Group.

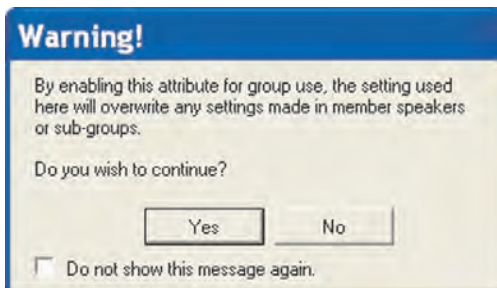
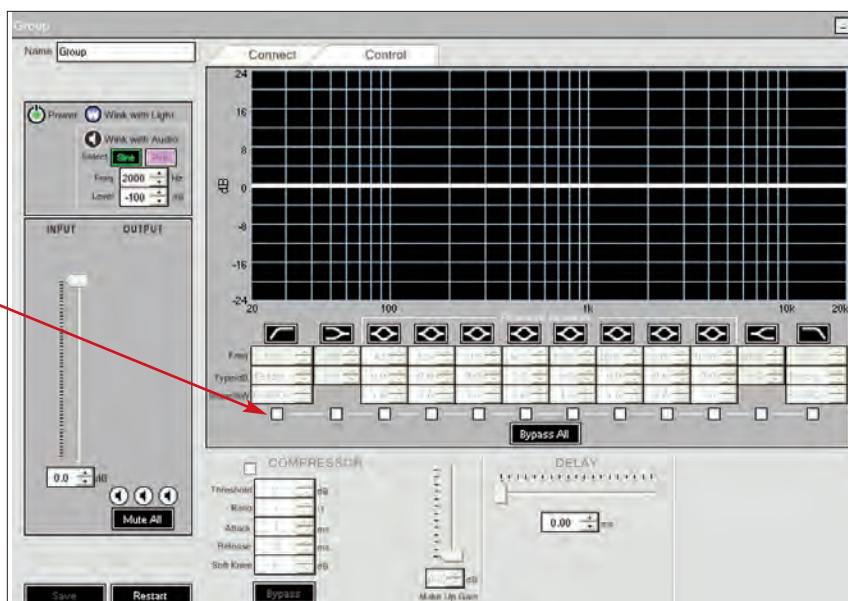
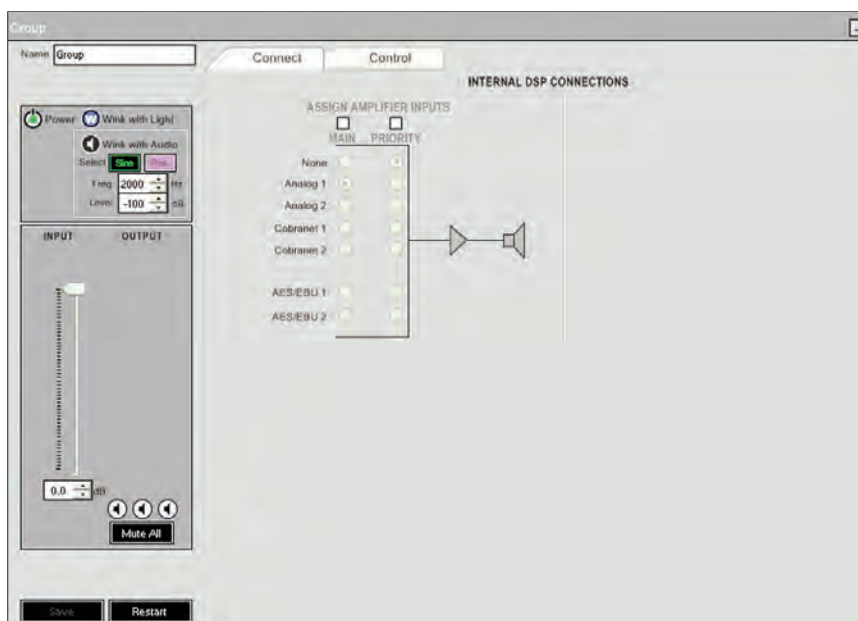
A Group Control mode window is identical to the one used for individual loudspeakers except for the lack of level meters and the addition of a row of Group Assign boxes under the EQ filters.

When the Group Assign boxes are checked, Group EQ and dynamics settings override individual loudspeaker settings – that is, the settings you define in the Group window will be uploaded to all loudspeakers in the Group.

Any EQ filters you do not assign to the Group will be available within each individual loudspeaker. Whenever you assign an EQ filter or the Compressor to Group-level control, a Warning prompt pops up to remind you that you will be overwriting individual loudspeaker settings.

These controls will be “grayed out” in the individual loudspeaker Properties windows to show that they are under Group control and unavailable.

All Loudspeakers functions in the same fashion as Group control, except all of the loudspeakers are included within the group.



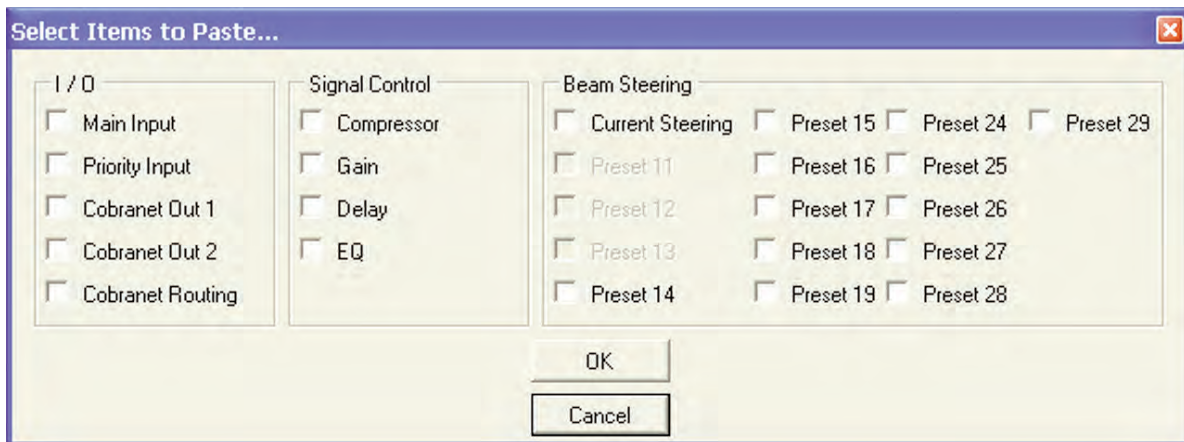


## Copy Settings / Copy Presets

Copy Settings / Copy Presets is a useful RHAON feature that can save you significant time on many projects.

Right clicking on any of the Array Icons while in either the Connect or Control mode introduces a pop up menu that includes a Copy Settings command line. Selecting Copy Settings copies all that array's DSP settings, including Presets and allows you to copy these settings to another array by selecting its Icon and using Paste Settings.

Right clicking on another loudspeaker and pressing Paste Settings introduces the window shown below which allows you to select what Settings and Presets you want to Paste (transfer) into that array.



Note that Copy Settings functions on Presets and Beam Steering data only between network connected arrays; it operates only on DSP settings in the virtual mode. It also functions only between like units. You cannot, for example, copy Presets or beam steering information from an IC8-R to an IC32-R or from an IC8-R to an ICLive ICL-R. If you try, a warning prompt will alert you to the oversight.



## Reset

Reset is a RHAON feature that allows you to restore an array's DSP and beam steering settings to their original default settings quickly and easily. Reset can be initiated from either the controls on the rear of the array or from the associated computer.

On the array's rear control panel simultaneously pressing the Volume Up and Volume Down buttons for several seconds initiates Reset even when the panel controls have been locked. It provides a means of gaining control of the array when a RHAON equipped computer isn't available.

In RHAON on your computer pressing Ctrl + Load Preset while in either the array's Connect or Control Properties window also enables the Reset feature. A prompt will ask if you want to restore the array's default settings. Answering Yes will initiate the change and restore all the default setting. It's a good way to return to "ground zero" if the array starts behaving strangely.

## SUPERVISE MODE

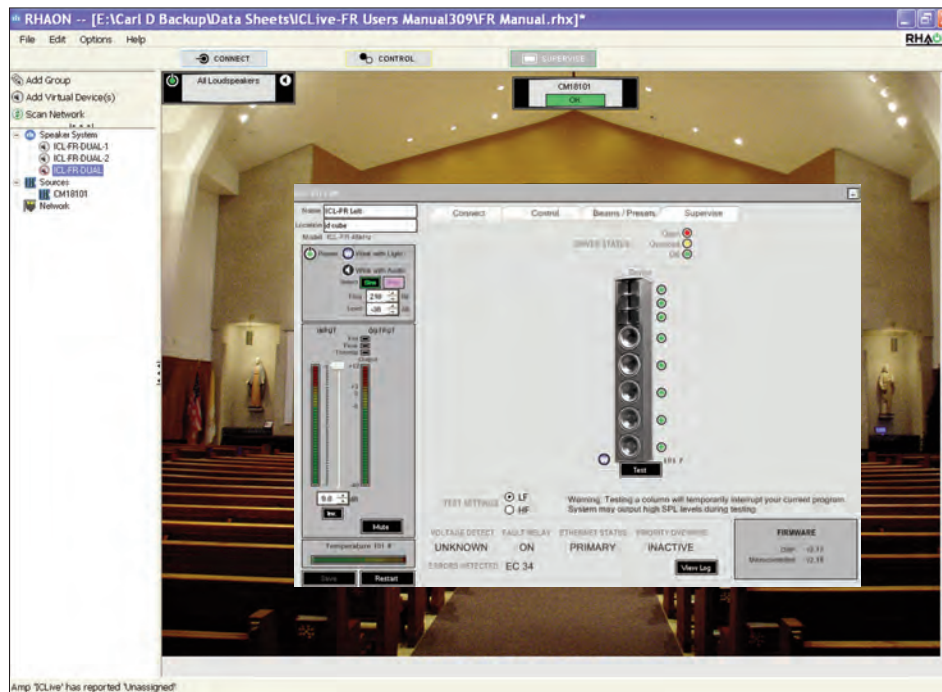
RHAON's Supervise mode is the one you will use most while your system is in operation (i.e., making sound). It is designed to empower system operators with a comprehensive set of monitoring and loudspeaker/amplifier management tools. In Supervise mode, you can quickly detect a problem anywhere in the system and (if you have access to the appropriate Control mode functions) take corrective action. To switch from Control Mode to Supervise Mode, click on the Supervise tab in either the main workspace, or in a Group or Loudspeaker Properties window.

The main Supervise screen is similar to the Connect screen. It shows your system layout in icon form. The Status field at the bottom of each icon allows you to monitor all Loudspeakers or Groups at a glance. This field will change color and display a text message that indicates the status of the loudspeaker. If there is a problem with any loudspeaker in a Group, that Group's icon will change color and display a text alert.

In Supervise Mode, each Status Indicator will display one of the following colors and messages

COLOR	MESSAGE	STATUS
GREEN	Online	This loudspeaker is (or all loudspeakers in this Group are) connected and operating
YELLOW	Overload	Amplifier is being overdrive
RED	Unassigned	Virtual loudspeaker has not been assigned to a physical loudspeaker
RED	Offline	Loudspeaker has lost power or been disconnected from the network
RED	Driver Open	One of the loudspeaker's drivers has failed
RED	Hot	An amplifier's over temperature circuitry is engaged
RED	Limiting	An amplifier is malfunctioning
RED	Amp Fail	An amplifier has failed

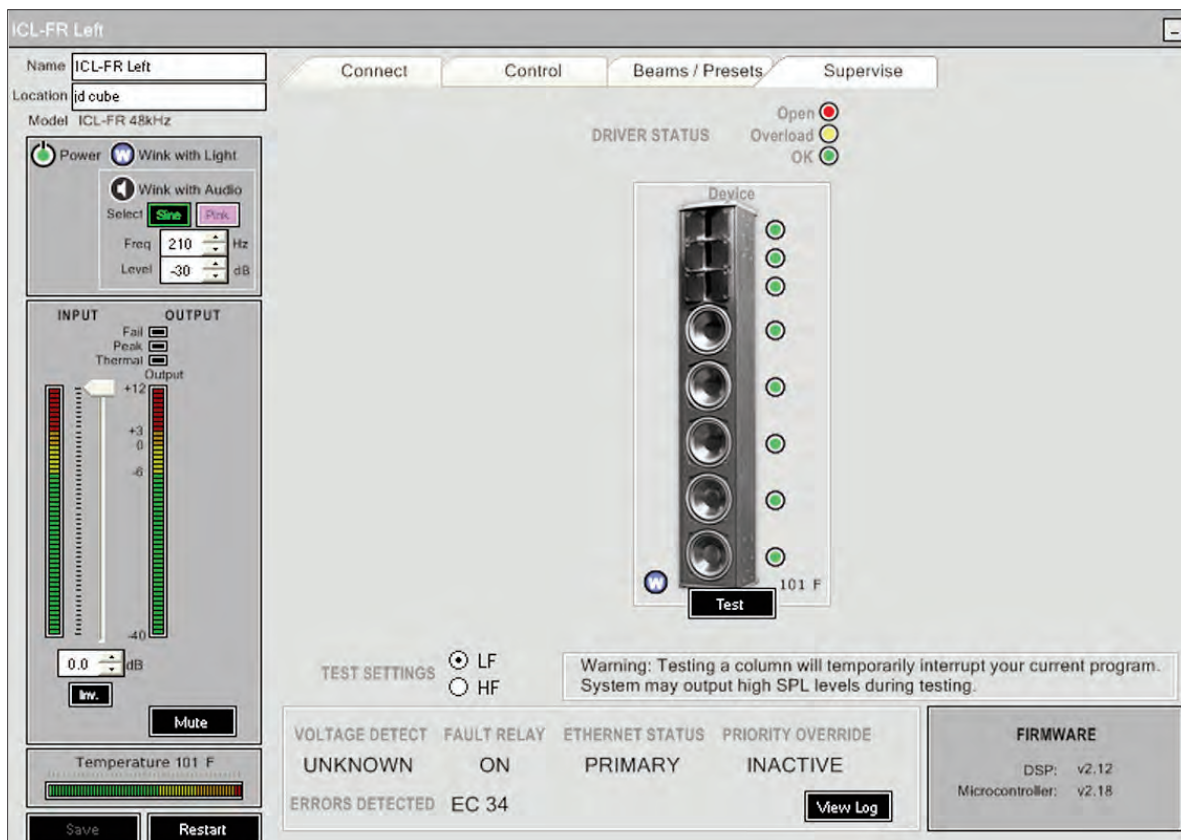
If a Group icon displays an alert (yellow or red bar with text), double-click it to Expand it and show all of its Loudspeaker icons. One of more of these icons will display the same alert: double-click it to open the loudspeaker's Properties window in Supervise mode, as illustrated below..



The dark grey section on the left is identical to Control Mode. It includes the loudspeaker's input and output monitoring facilities, identification fields, and basic operating controls: Power On/Standby, the Wink Light toggle, Wink with Audio, Input Gain, Polarity Invert, and Mute. Any or all of these controls may be restricted to authorized operators and subject to password-protected access.

The loudspeaker icons on the right each have "traffic light" status indicators; Green for all OK and red for driver failure. Yellow indicates the driver has repeatedly been driven far enough into limiting that its normal life span may have been reduced. The traffic light conditions are mirrored in the status field of the supervise icons. Driver conditions are dynamically supervised with program material but an additional test button can confirm coil status. The use of these manual test buttons is required in case the program material either lacks specific frequencies or is too weak.

Notice that all of the drivers in the array are being monitored and that each module has its own Wink light button. This allow you to easily identify each module and verify that its address number switches are properly set.



The loudspeaker's RHAON Microcontroller and DSP Firmware version and MAC (Machine Access Control) address are shown in a darker grey panel at the bottom right of this window.

The panel at the bottom shows alerts for Voltage Detect, Fault Relay, Ethernet and Priority Override status.

The Priority Override indicator will change from showing "Inactive" to "Active" when the override circuit is in use (has been activated).

The Fault Relay status line will change from "Off" to "On" when an amplifier fault has been detected or the Ethernet carrier signal is lost.

The Voltage Detect will read "High" when it senses a voltage on the Sense input line and "Unknown" when no voltage is present.

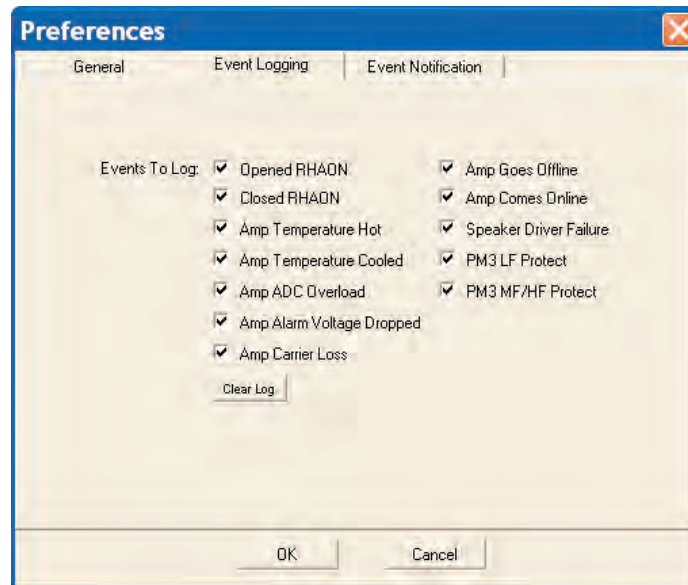
The Ethernet Status will show "Primary" when an Ethernet Carrier signal is detected at the Primary Ethernet input and "Off Line" if the carrier signal is lost, except in "Redundant" systems having a secondary Ethernet source. In these systems, the amplifier will be switched over to the secondary input as soon as the primary signal is lost; the status line will then change to Secondary".

## Event Logging & Notification

RHAON's Event Logging function can record events of the types you select in a .log file. This allows the system's operating status to be reviewed at any time. Audio evacuation and life safety systems are often required to provide this type of logging.

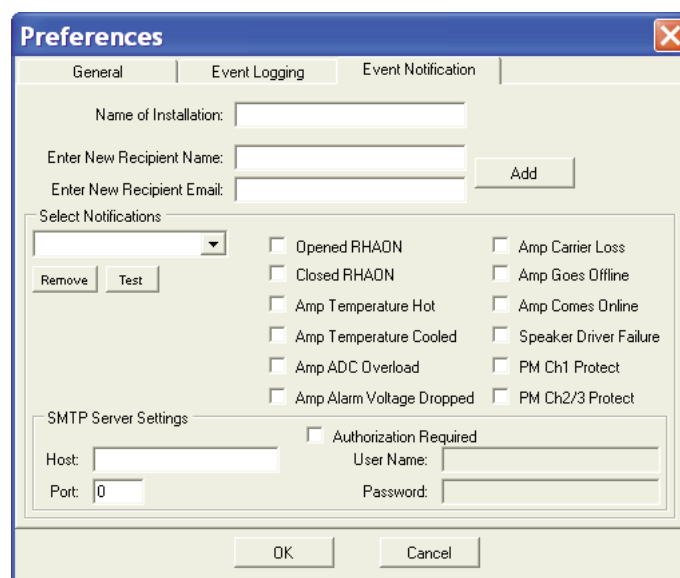
To activate this feature, go to Options in RHAON's main tool bar and select Preferences; then open the Event Logging folder. Select the event types you want to log using the check boxes next to each type of event.

Click on OK to activate Event Logging. The log file will be written to the computer's hard drive in a RHAON.log file in the Program Files/Renkus-Heinz directory.



RHAON can also automatically e-mail events to another computer or cellular phone. You configure this function in the Event Notification folder next to Event Logging. As with logging, you can choose the types of events for which you want RHAON to send e-mail notifications.

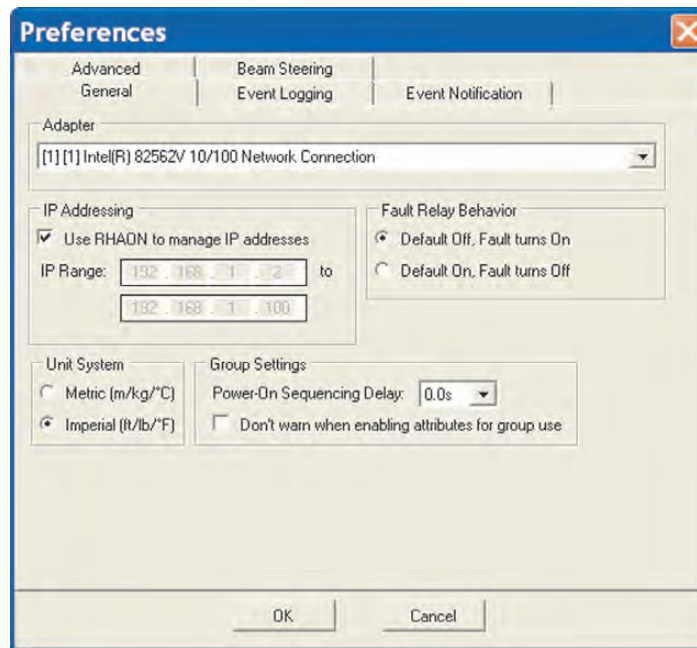
Because RHAON connects to a NIC (Network Interface Card) with a local IP address, you will need a second NIC in your computer to connect to the Internet. You will also have to specify the SMTP (Simple Mail Transfer Protocol) host and a valid e-mail account in order for RHAON to send e-mail. An IT professional may be able to assist you with these tasks if you need help.





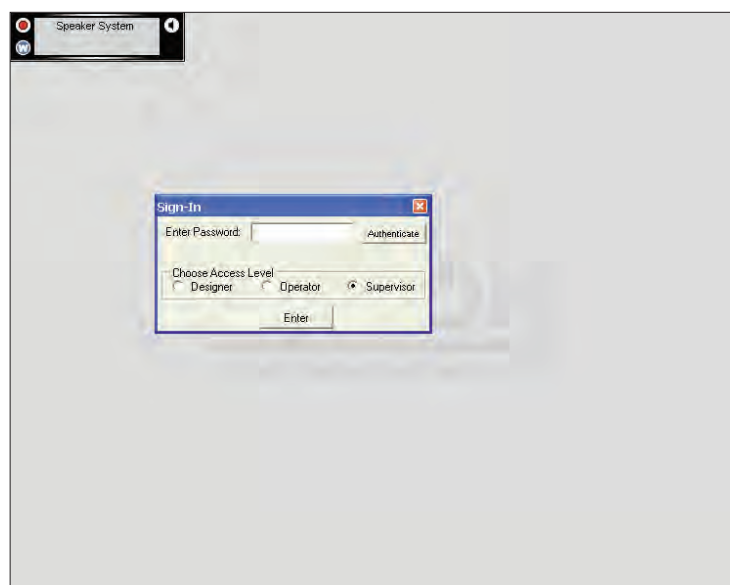
## General Preferences

While you are setting up RHAON's Preference, you can click on the General tab to review the program's default settings and change them if necessary. We already discussed the selection of a Networking Adapter (aka NIC) in the Connect section of this manual. Unless you are a networking expert you should leave the default settings under SNMP (Simple Network Management Protocol) Variable Retrieval alone: SNMP is not as simple as its name implies. IP Addressing is also covered in the Connect section of this manual. After your network is set up and operating there should be no reason to change these settings.



Change the units of temperature (Fahrenheit or Centigrade) to ones that are most useful to you and your fellow operators.

Under Group Settings, you can set up a Power On Sequencing Delay for all grouped loudspeakers. This will help avoid a voltage surge that can trip building circuit breakers. Depending on the delay interval you select, there will be a .5, 1.0, 1.5 or 2.0 millisecond turn-on delay between each amplifier in the Group.



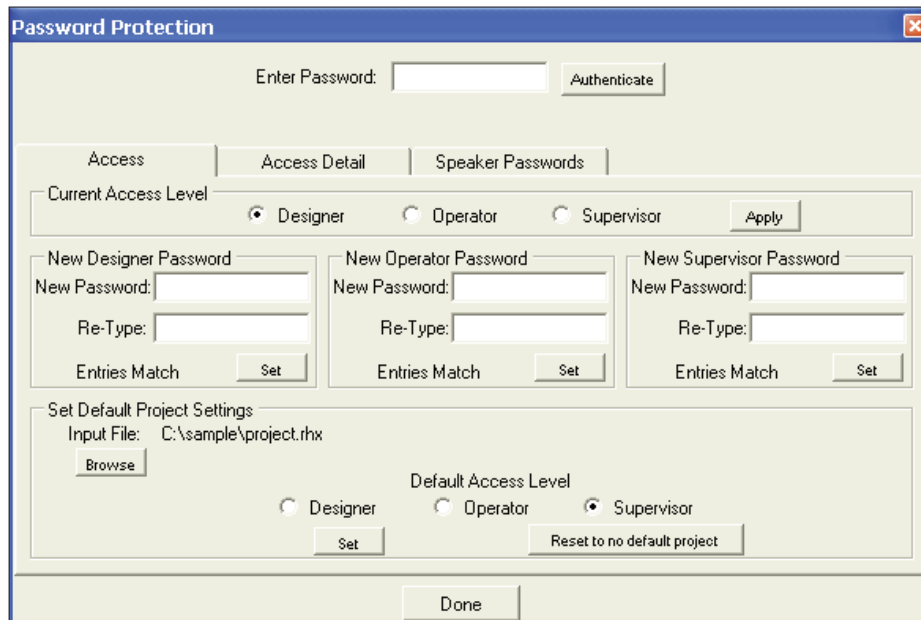
Start Up options allow you to always open RHAON in Full Screen mode and to require Sign-In. When the Sign-In option is checked, the program will ask for your password whenever it is opened. There is more on password protection later in this manual.

## Password Protection

RHAON software includes three levels of password protection. This features is designed to prevent inadvertent changes of Connect and Control Mode settings by anyone who is unauthorized or unfamiliar with the system.

To open the Password Protection setup window shown below, hit Control-Alt-p.

You can set up three levels of control access. They are called Designer, Operator and Supervisor. Each access level should have its own password.



The Designer has the highest level of access. This person should set up the access control system and passwords before turning a RHAON system over to its owners and operators.

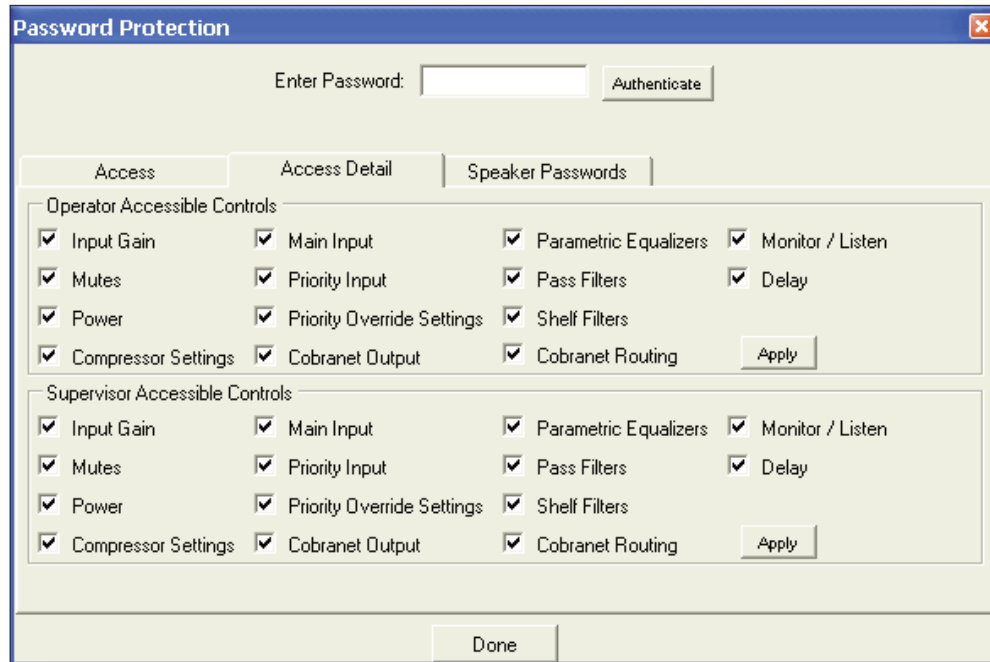
The Operator has the next highest level of access. We suggest giving an Operator access to all Control Mode functions that would normally be used while running a show or operating the system. In a fixed installation, Operator level personnel would probably not be granted access to the Compressor, EQ, Delay, Shelving and rolloff controls, but they would be able to adjust Input Gain if necessary to respond to clipping and/or over temperature alerts.

The Supervisor access level is intended for those who are only monitoring (supervising) the system for faults and failures. Supervisors would normally be given access to few, if any, of the functions in Control Mode.

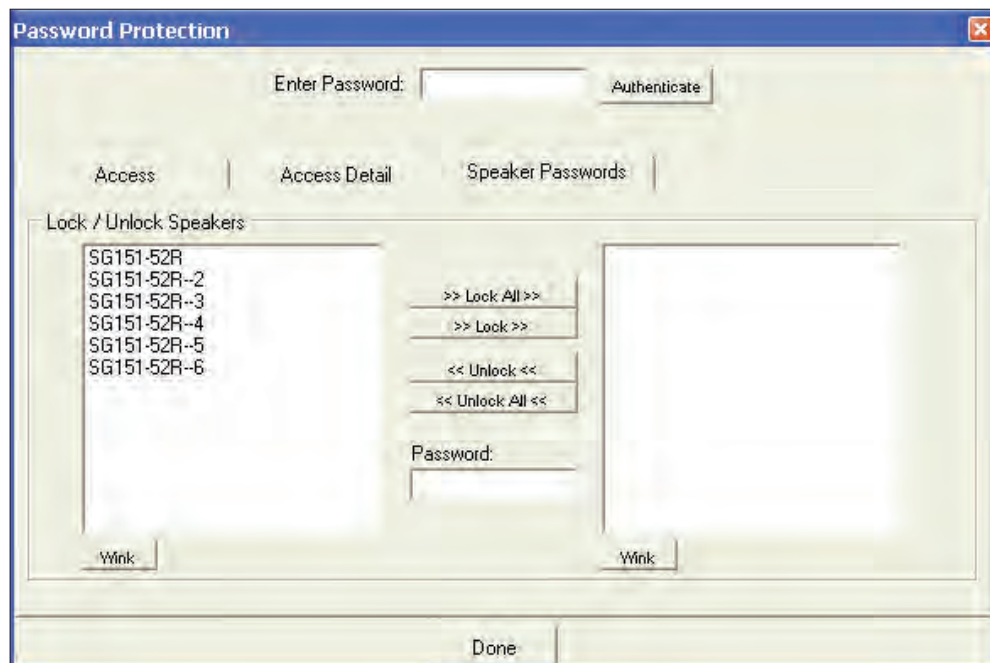
RHAON passwords are case sensitive. Once the password access system has been set up it will be impossible to operate RHAON without entering a password. The Password Prompt shown below will appear each time the program is opened and a proper password must be entered before proceeding.



Clicking on the Access Detail tab opens the window shown below. Its settings determine what control features will be available to "Operators" and "Supervisors". These settings are themselves password protected and can only be changed by a Designer.



The Speaker Protection window provides an additional level of protection, as it allows the settings for individual loudspeakers to be locked to positively prevent their being changed by anyone having a RHAON equipped computer that is not password protected.. It locks the settings to prevent anyone who doesn't know the passwords from changing the settings



## INSTALLATION

### GENERAL INFORMATION

Your Iconyx IC Live column array was designed to be easy to install on either a flat surface, such as a wall, or suspended from a ceiling. Note that it was not designed to be mounted in the wall or in an alcove. The amplifiers are convection cooled and their heat sinks require at least an inch of separation from the nearest surface.

Optional hinge kits allow wall mounted column arrays to be rotated 90 degrees away from the wall to provide easy access to the rear access ports during installation and for routine testing and service. They also provide the separation needed for cooling.

The actual installation should be made either by or under the close supervision of someone experienced in installation techniques and rigging.

### WALL MOUNTING

The following instructions assume that the column array(s) will be mounted using Renkus-Heinz HK series hinge kits.

If you ordered HK series hinge kits with your array, they will be packed in one of the cartons. Each mounting plate has hinges on both the right and left sides of the plate to provide for either "right" or "left" swing away from the wall. ICL-FR columns will have two hinge sections; ICL-FR-DUAL columns will have three hinge sections.

The female hinges should be attached to the column and the male hinges to the wall. The photos below show the male mounting plates.



Notice that one of the wall mounting hinge plates has a metal strap attached to it. This is the hinge plate that goes on the bottom. The metal strap attaches to the bottom of the array after it is hung and is used to lock the column array in place.

For more details on assembling and mounting hinges, please go to the Iconyx Live/Fixed section of our website, [www.renkus-heinz.com](http://www.renkus-heinz.com) and download the ICL-FR 2-D drawings.

Hint: To simplify the mounting many installers will first cut a "backing plate" the size of the column out of heavy plywood and mount the hinge plates on it. It's a lot easier to align the hinge sections on a piece of plywood than it is on the wall. Then, when the alignment is perfect they mount the "backing plate" to the wall. After that, it's usually a comparatively easy task to hang the column array on the backing plate.

After the column array is hung on the wall, remove the machine screw from the bottom end cap and use it to attach the restraining strap



## SUSPENSION MOUNTING (FLYING)

The end caps of the column array are attached to the main frame with four metric M6 machine screws. Removing these screws and replacing them with eye bolts provides up to four attachment points for flying. We recommend using all four. If only 2 are used the column will not hang straight. It will either tilt up or down.

## SERVICING

### GENERAL INFORMATION

Your Iconyx steerable column array contains no user-serviceable parts and all service should be referred to qualified service personnel.

Great care was taken in its design, however, to allow it to be serviced in the field without being removed from its mounting position. The transducers can be replaced from the front of the column by removing the grille to expose the transducers and their mounting screws.

The 8-channel digital amplifier/DSP and associated power supply that is the heart of each 8-channel module is one single assembly that can easily be taken out and replaced from the rear.

### TROUBLE SHOOTING HINTS

#### HUM

The most common sources of system hum are the program source or an improper or poor ground on an audio signal line. Check the program source to make sure the hum isn't originating there. Carefully check all the audio connections to make sure they are properly made.

#### NOISE

Most noise problems are the result of improper grounding or of noise being induced into the audio signal line from adjacent noise sources, such as fluorescent lights, and close proximity of the audio signal lines to lines radiating noise. Carefully review all the audio connections and turn off all the lights and any other suspected noise sources.

### SUSPECTED TRANSDUCER FAILURE

Defective transducers are hard to locate in steerable column arrays because the transducers are so close together. If one is bad, it's hard to tell which one it is. The digital steering also reduces the drive to some of the transducers making it difficult to determine if a certain transducer has failed or is just being driven at a much lower level than other transducers. No movement of the cone of a transducer is not positive proof that the transducer is bad. It could be that beam steering is limiting the drive to the transducer or restricting its use to a narrow frequency band.

Because of this, in IC Live arrays Presets 10 and 20 are set to send an equal signal to all transducers. To check for a defective transducer, select Preset 10 (20 in a DUAL system), remove the grille from the module(s) and use your fingertips to feel for cone vibrations while music is being played through the system.

## APPENDIX I: Audio Evacuation & Life Safety Functions

Although not certified as a "Life Safety" system, RHAON has been designed to meet the stringent requirements of most Audio Evacuation / Life Safety system specifications.

Since "Life Safety" requirements vary widely from country to country and from one locality to another, we strongly recommend you contact your local authorities for an opinion before proposing a RHAON system for any Life Safety application. They know best what's required in your area to meet code requirements.

A summary of RHAON's life safety features follows.

### Redundant CobraNet Inputs

All RHAON Empowered amplifiers have a secondary Ethernet input that can be used to provide a "redundant" control and distribution system. Such systems, of course, also require a redundant Ethernet system. Changeover to the secondary or redundant system is automatic in the event the primary system fails.

### Continuous Performance Monitoring

The performance of all RHAON Empowered Amplifiers and Loudspeakers is constantly monitored for faults and abnormalities.

### Event Logging and Notification

Pre-selected events are recorded in a Log file for later review and analysis; may be automatically forwarded via e-mail to another location.

### Fault Monitoring

An opto-isolated input monitors the integrity of an external wiring loop by detecting the presence of a "sense" voltage and reporting its absence via the Ethernet network.

### Fault Relay

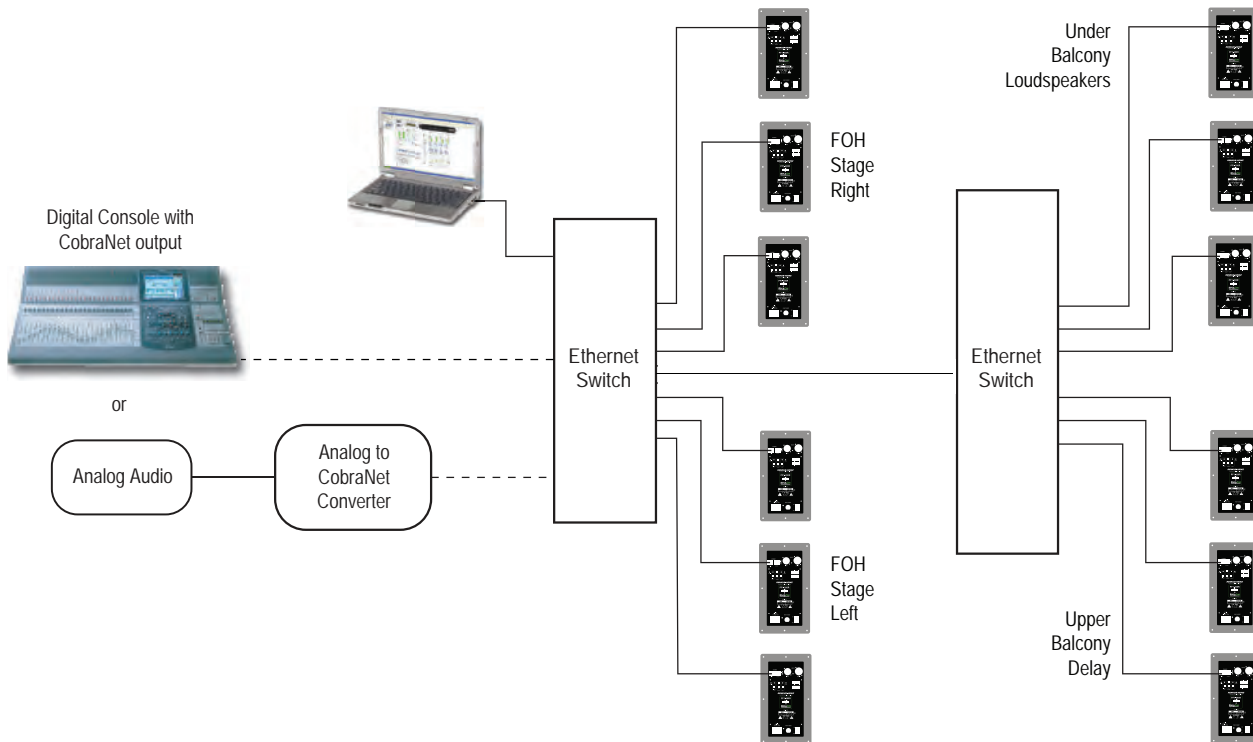
An isolated relay uses external wiring to report any amplifier fault, including the loss of the Ethernet carrier. Normally Open & Normally Closed contacts handle up to .5 Amp @ 28 Volts AC or DC.

## APPENDIX II: RHAON Block Diagrams

### CobraNet

The drawing below shows the signal paths for a RHAON system using CobraNet digital audio distribution.

Except for the analog audio input line to the CobraNet Converter, all audio signal runs are standard UTP cable meeting at least CAT5e Standards. The network is a standard Ethernet star topology. CobraNet does not permit looping or "daisy chaining" from amplifier to amplifier. The maximum CAT5e cable length between devices is 100 Meters (approximately 325 feet) using CAT5e cable and 1000 meters with fiber optic cable.



Wiring diagram for a system using CobraNet for multi-channel digital audio distribution, loudspeaker control and monitoring.

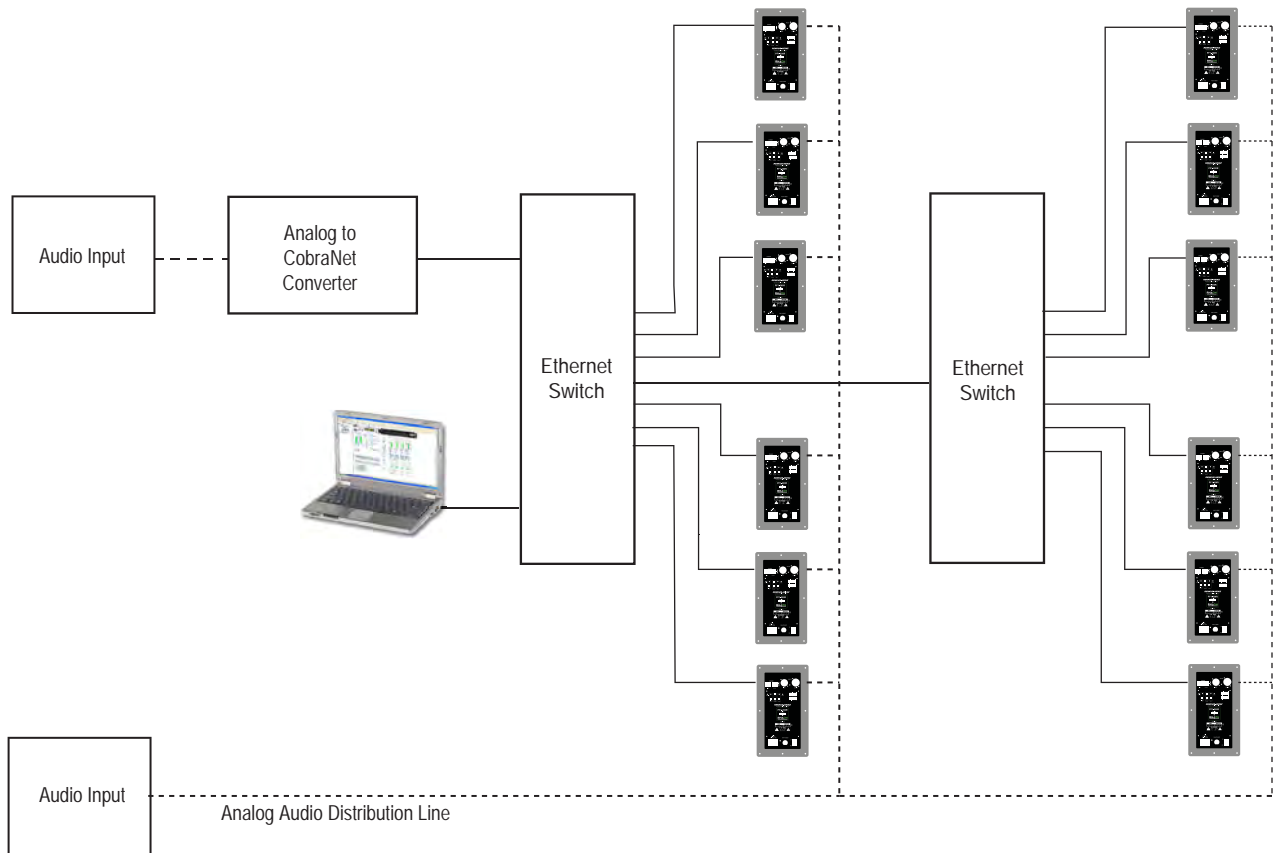
### Notes

1. Satisfactory Ethernet switches of many sizes (output ports) are widely available from many sources. Managed switches are recommended over unmanaged switches; 100 BaseT minimum, Gigabit (1000 BaseT) recommended.
2. The number of loudspeakers is determined by the number of output ports provided by the switches. The computer(s) can be connected to any Port on the Ethernet network.
3. Systems with CobraNet digital audio distribution require either a suitable Analog to CobraNet converter or a mixing console with a CobraNet output. Suitable analog to CobraNet converters are available from a number of sources, such as Bi-Amp, Peavey and others.
4. The RHAON network can easily be made redundant by connecting a duplicate of this network to the Secondary Ethernet Inputs on each loudspeaker. Additional switches, analog-to-CobraNet converters, etc. would be required.

## APPENDIX II: RHAON Block Diagrams

### CobraNet With Analog Backup

The block diagram below shows a combination system combining CobraNet with analog audio distribution and RHAON loudspeaker control and monitoring. Notice that the analog audio wiring loops (is daisy chained) from loudspeaker to loudspeaker.



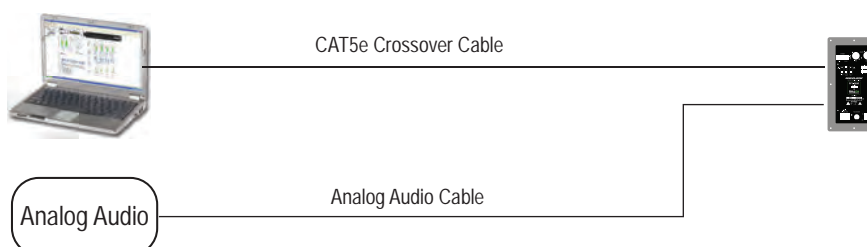
Typical wiring diagram for a system having both analog and CobraNet audio distribution plus loudspeaker control and monitoring.

#### Notes

1. Combination systems such often use the multi-channel audio distribution capabilities of CobraNet for normal program distribution and the analog audio circuit for other functions. The analog audio circuit need not connect all the loudspeakers together. It could, for example, be broken into several separate analog circuits for zone paging applications, for monitors, fills, etc.
2. The analog to CobraNet converter would not be needed for a system using only analog audio along with RHAON Control and Supervision. The Analog to CobraNet converter is needed only if CobraNet digital audio distribution will be used.
3. The Ethernet network is required for control and supervision even if only analog is being used.

### Basic Analog System

1. Simple single array systems using analog audio do not require an Ethernet switch. All that is needed is a CAT5e Crossover cable.

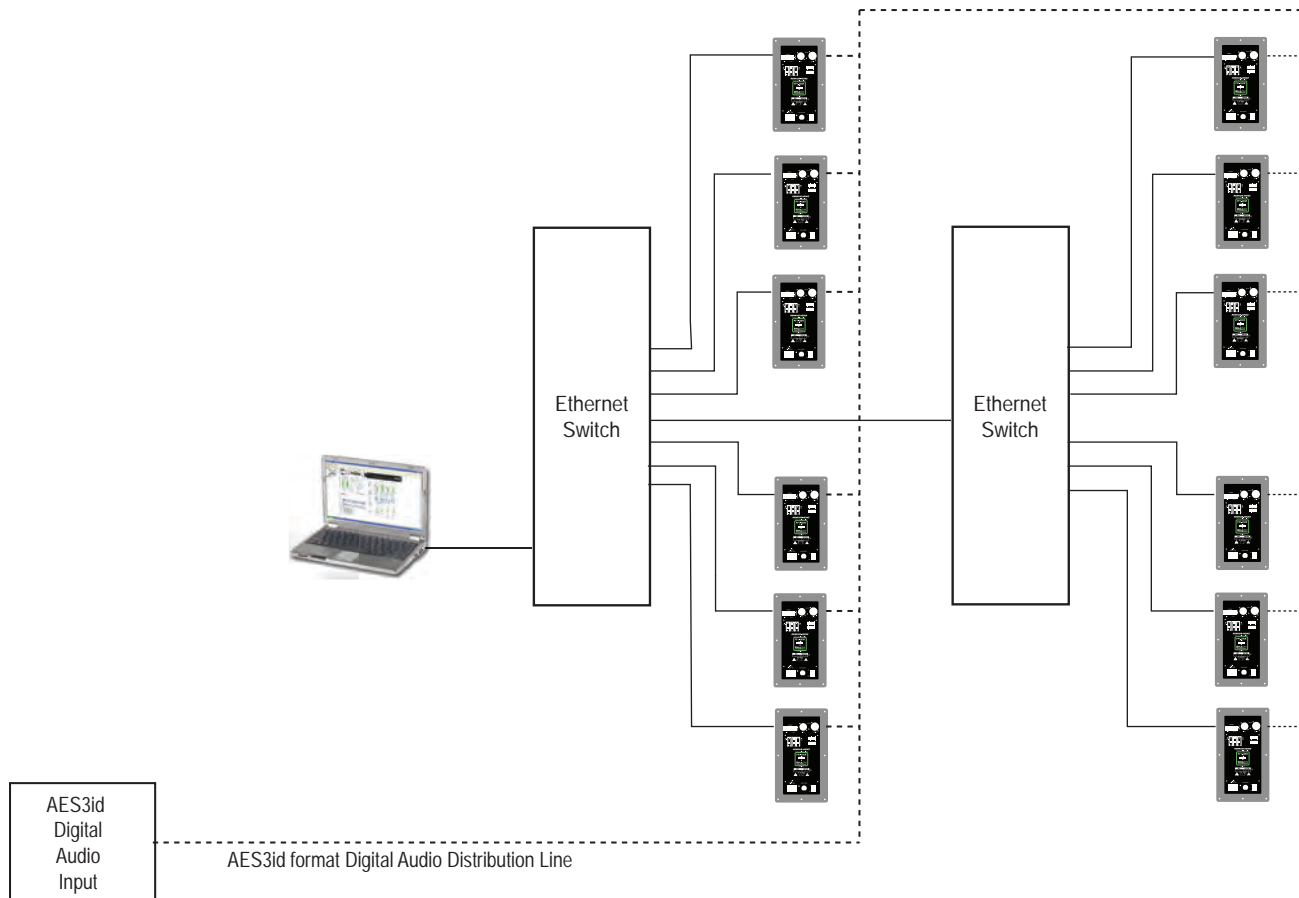




## APPENDIX II: RHAON Block Diagrams

## Serial Digital (AES3id aka AES/EBU)

The block diagram below shows a RHAON system using digital audio distribution in the AES3id format along with RHAON loudspeaker control and monitoring. Notice that the wiring loops from loudspeaker to loudspeaker just as it does in analog distribution.

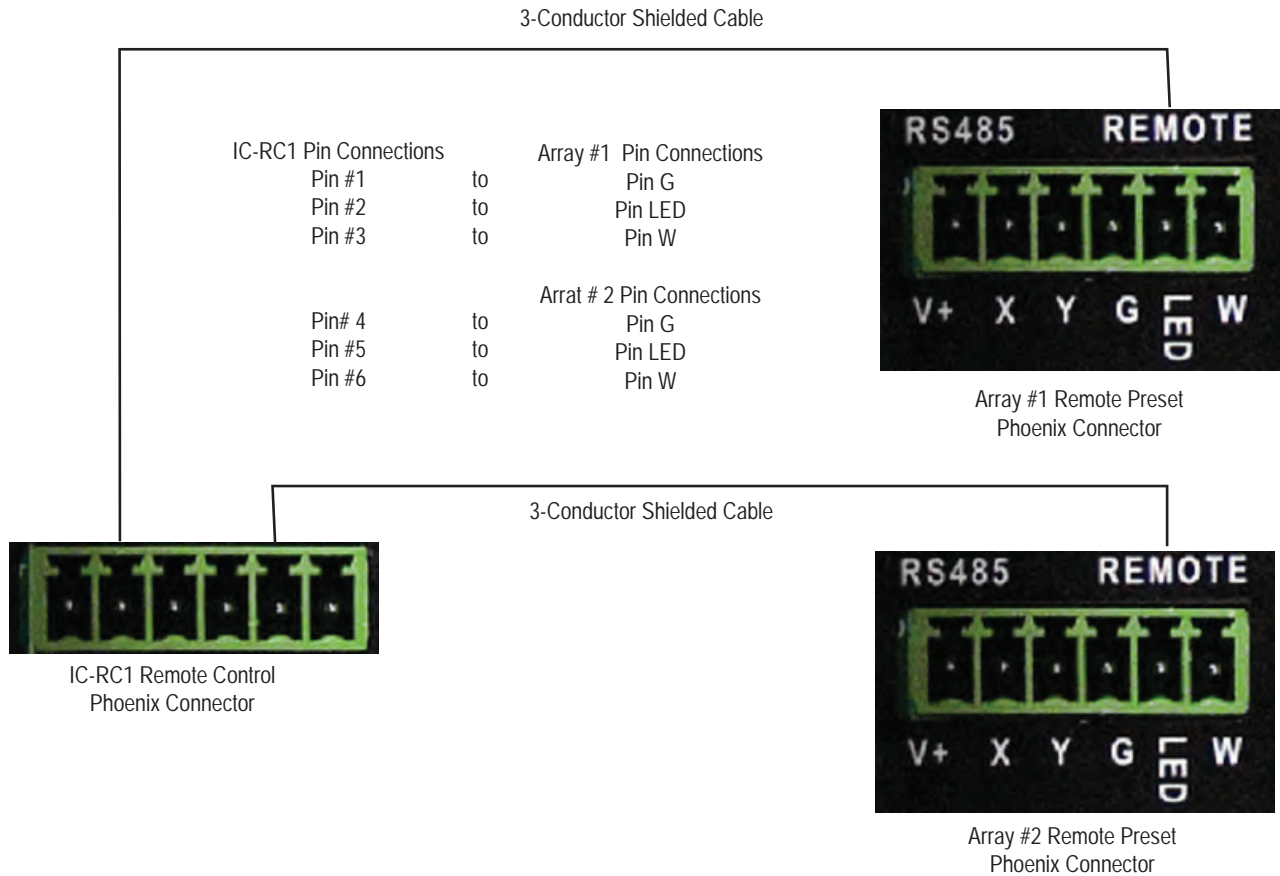


## Notes

1. In this system, RHAON and the Ethernet network are being used only for loudspeaker control and monitoring.
2. Neither CobraNet digital audio distribution nor analog audio distribution are available when AES3id (AES/EBU) format digital audio distribution is being used; the AES3id format audio channels occupy the amplifier's analog input channels.
3. The AES/EBU inputs on Iconyx amplifiers are fully balanced 110 Ohm inputs and are equipped with a balanced buffered loop through to the next array.
4. The AES/EBU interface provided in Iconyx-R amplifiers automatically detects the source sampling frequency, locks onto that sample rate whether it is 44.1 kHz, 48 kHz or 96 kHz. and converts it to 48 kHz. As a result it is not necessary to re-initialize the system when running from AES/EBU sources having different sample rates.

## Appendix II: Block Diagrams

### IC-RC1 Remote Preset Control



#### Notes

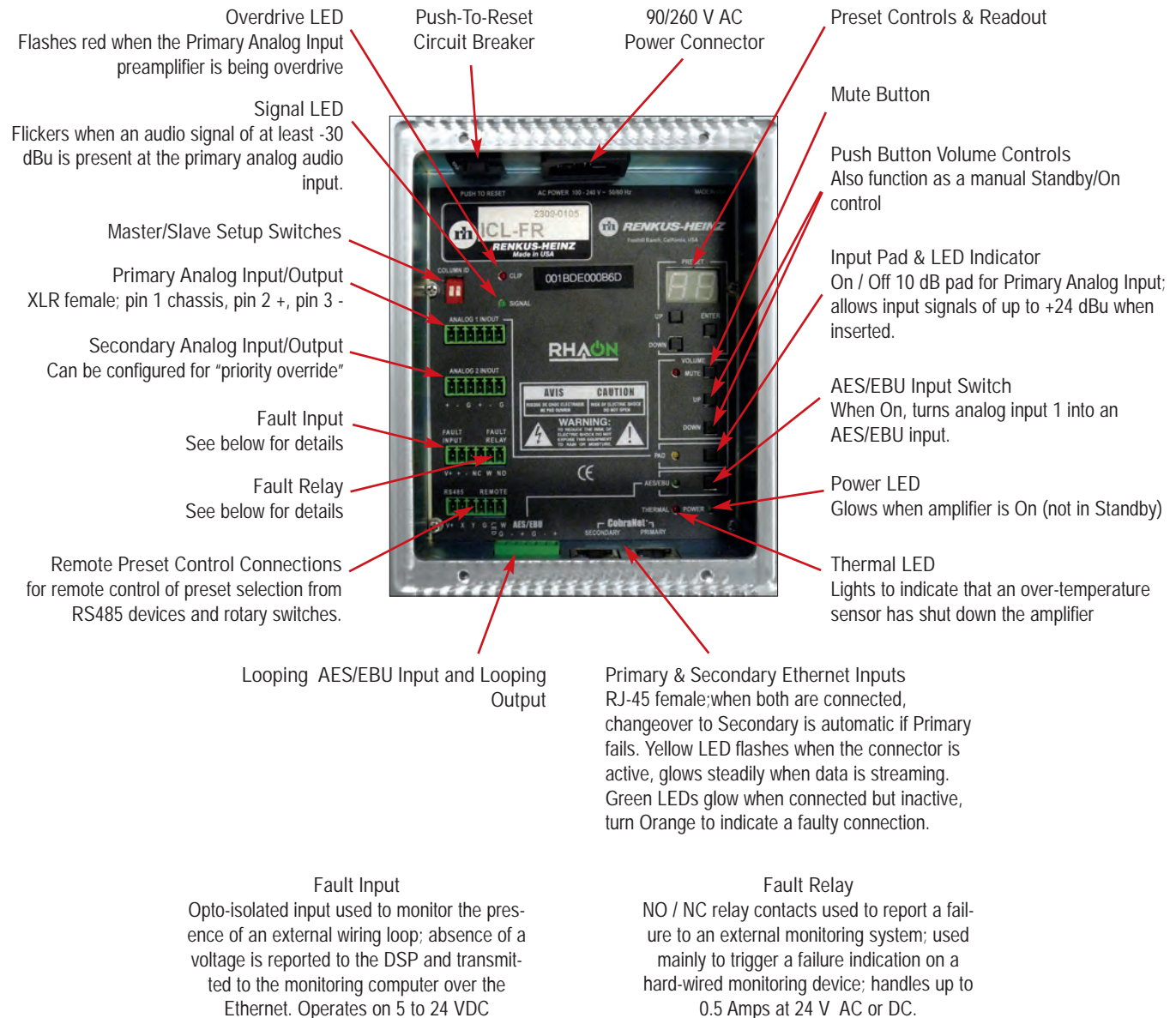
1. The IC-RC1 provides preset control for either 1 or 2 ICL-FR arrays. When used to control only one array, the array should be connect- to pins 1,2 & 3 on the IC-RC1.
2. The remote preset control mounts on any standard 2-gang electrical outlet box and operates on low voltage DC. The maximum cable length is 500 feet.
3. Before connecting the IC-RC1 to the array(s) make sure the correct preset information has been installed into the array(s) and if two arrays are involved, that both are set to the same preset. Connecting the IC-RC1 to the array(s) disables both the array and the computer preset controls.

#### Additional Information

1. The green push button is both an Enter (load) control and a status indicator. A glowing green light indicates there is a mismatch between the preset selected and the preset loaded into the column. An unlit or dark push button shows that the preset selected is the one that is loaded into the array. To determine which preset is loaded, rotate the rotary switch until the green light goes off.
2. A small green LED on the rear of the control allows you to verify, before you mount the control into the wall, that both arrays have the same presets loaded. The on/off condition of the small LED and the status light should be the same for both indicators when the selector switch is rotated.
3. To load a preset, select the desired preset and press the green Enter push button. The light will flash until the preset is fully loaded and then go out. Don't be surprised if it takes 10 or 15 seconds for the preset to load. If the light does not flash, you have selected an empty preset or in the case of controlling two arrays, one of the presets is empty.

### Appendix III: ICONYX-FR Hardware Inputs, Outputs & Indicators, Dimensions

To connect an ICL-FR array to the RHAON network, you first make the hardware connections, and then (if you are using CobraNet for digital audio distribution) assign signal routing using RHAON software. Since all Ethernet connections are made using RJ45 connectors and Cat 5e cable, the network infrastructure is cost-effective and easy to install. You can also connect Serial Digital (AES3id aka AES/EBU) and analog audio to an ICL-FR, as well as Fault Detect and Fault Relay lines.



#### NOTE:

1. To prevent inadvertent operation the Mute, Volume Up & Volume Down, Input Pad and AES/EBU push buttons need to be pressed and held down for several seconds before they activate.

2. Be sure your power source is adequate to handle the power load. Each ICL-FR module will draw up to 13 Amps. In ICL-FR-DUAL arrays, AC power should be brought into each module separately, signal cables must terminate in the input port of the designated "Master" module.

## APPENDIX IV: KEEPING YOUR RHAON PROGRAM UP-TO-DATE

### Software Updates

As soon as a new program version of RHAON is created, Renkus-Heinz posts it on the Renkus-Heinz website, [www.renkus-heinz.com](http://www.renkus-heinz.com), to make it accessible to all RHAON users. Updates to the RHAON firmware are posted in the same location.

ou, of course, will need to know what version of RHAON is installed on your computer to determine if a later version is available. If you don't know what version is installed on your computer, there are two easy ways to find out. The first is to simply open RHAON and observe the opening splash screen. The program version number is displayed there as the program is opening.



The second method is to open RHAON and select the Help drop down menu and click on About RHAON. This will bring up a dialog box with the current RHAON information.

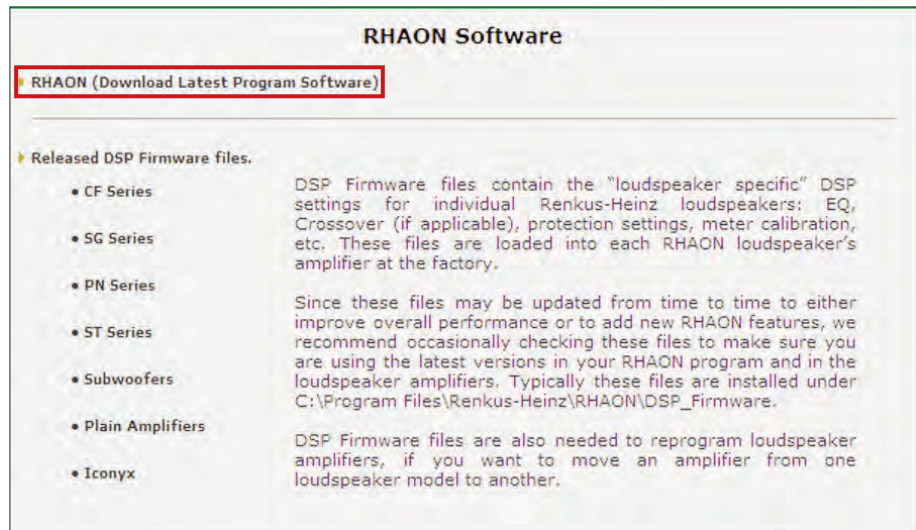
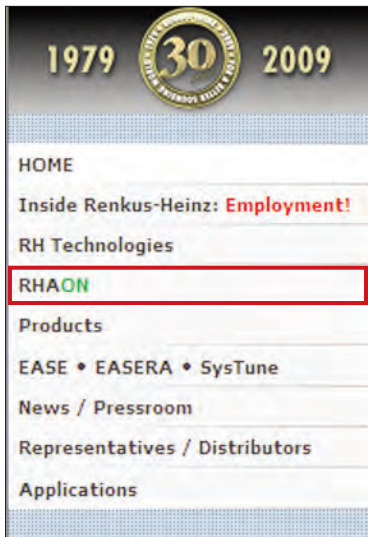




## APPENDIX III: KEEPING YOUR RHAON PROGRAM UP-TO-DATE

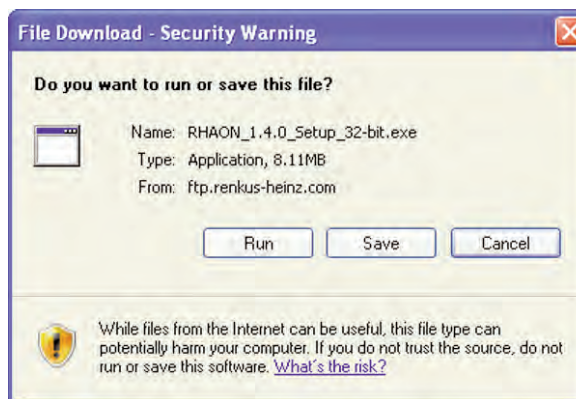
### Software Updates (continued)

To check out the download site, go to [www.renkus-heinz.com](http://www.renkus-heinz.com) and click on RHAON in the left hand menu. You'll see the link to the latest RHAON program version at the top of the RHAON page; see below.



### Updating Your Current Installation of RHAON

Select(Download Latest Program Software) from the top of the RHAON page,open Official Releases and then select the appropriate Rhaon 1.4\_32-bit or \_64-bit .exe file and download the RHAON Installer (higher version numbers indicate newer releases).



Click on Run or Save the file to your computer and then double click on the .exe file to begin the installation routine.

RHAON 1.4 is downwards compatible with earlier versions of RHAON Microcontroller and DSP firmware so you do not need to uninstall a previous version of RHAON before installing program version 1.4.. However, new program features may not function in loudspeakers running earlier versions of firmware.

The installation program will install RHAON in a Renkus-Heinz/Rhaon folder on your hard drive. It will not uninstall earlier versions of RHAON. Use Settings/Control Panel and Add/Remove to uninstall an earlier version if you want to.

## Updating Microcontroller Firmware

The latest microcontroller firmware files (.hex files) were installed in your loudspeaker before it was shipped to you. These files contain the programming that runs the DSP microcontroller in RHAON Empowered amplifiers and are updated from time to time as the firmware is improved.

If you are having problems with your system, we may ask you to update the firmware as part of troubleshooting. You'll find the firmware files on the RHAON download page below the Program and Bin File downloads. They need to be placed in the "MicroC\_Firmware" sub folder of your RHAON installation (typically "C:/Renkus-Heinz/RHAON/MicroC\_Firmware").

**Important:** When upgrading earlier versions of Microcontroller and DSP firmware to version 1.4, it is critical that the Microcontroller firmware be installed first.

Step 1: Open RHAON, scan the network and then switch to either the Control or Supervise mode. Then right click on one of the loudspeaker listings in the directory tree view or on the loudspeaker's icon in the main display area to open a pop up menu.

The pop up menu will vary depending on which method you choose.

If you choose the loudspeaker's listing under the Network sub directory, the menu shown in figure 1 will pop up. Note that it also includes commands for turning on the loudspeakers Wink light and for sending pink noise to the loudspeaker to help you identify which loudspeaker you have selected.

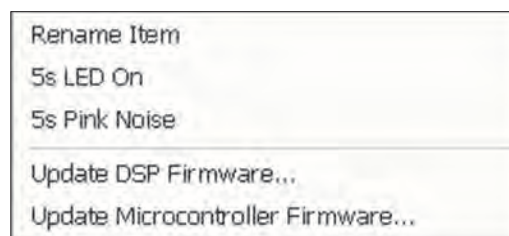


Figure 1

The menu in Figure 2 will appear if you opened the menu through listing in the All Loudspeakers section of the directory tree. Notice that it also allows you to set up an interface with SysTune. The interface allows SysTune users to access the loudspeaker's Control Properties window and make final tuning adjustment while observing the results in SysTune.

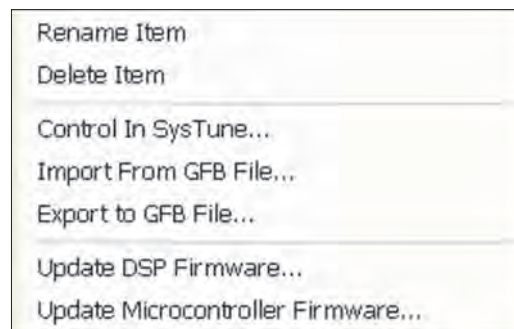


Figure 2

The Import and Export GFB files allow you to exchange data with the EASE SpeakerLab program.

Accessing the pop up menu by right clicking on the Loudspeaker's icon produces the window shown in Figure 3. It is similar to the previous menu, except for not allowing you to Rename the loudspeaker.

Be aware that on amplifiers having firmware versions prior to version 1.28 you will need to make sure the Loudspeaker is in the "Power On" mode. Check the Power LED on the back of the amplifier to see if it is lit or if the center of the Power indicator in the RHAON screen is Green.

If not, either click the Power button in RHAON or use the Volume Up and Volume Down buttons on the amplifier (press and hold down both buttons at the same time for 3 seconds) to turn the power On.

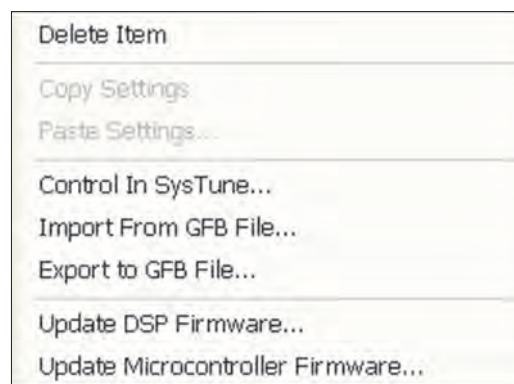
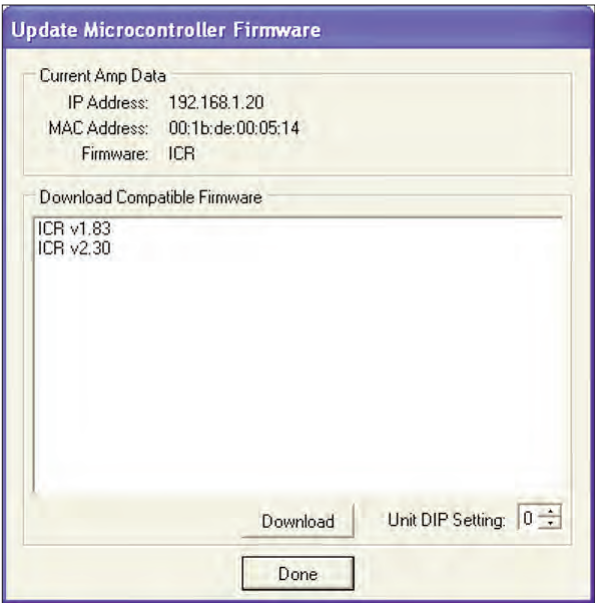


Figure 3

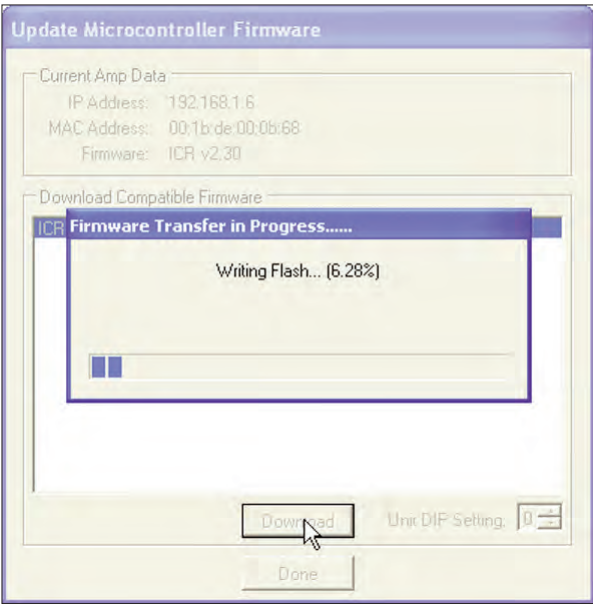
Updating Microcontroller Firmware (Continued)

Step 2: Select Update Microcontroller Firmware and when the window shown below opens select the appropriate firmware file and press Download. Notice that the window tells you what Microcontroller Firmware version is installed in the loudspeaker. Selecting Download will install the new firmware in the loudspeaker.

If you are updating a Dual array you will need to separately download the Microcontroller firmware to both the Master (0) module and to the Slave (1) module. Use the Unit DIP Setting arrows to select the correct module.



Step 3: Wait for the Firmware transfer to complete. When finished, control will be returned to the dialog window. Select "Done".



Please be aware that the Mutes and the Analog Input Pad will be On after the update completes and may need to be reset.

## Updating DSP Firmware

The latest 48 kHz DSP firmware files (.bin files) were installed in your array before it was shipped to you. These files contain the loudspeaker specific EQ, crossover and protection settings for the loudspeaker and are updated from time to time as the firmware is improved.

If you wish to operate your system at 96 kHz, you will need to download and install the 96 kHz .bin files for your loudspeaker(s).

We may ask you to update the .bin files as part of troubleshooting, if you are having problems with your system. Be aware that .bin files names which start with RH4... are 48 kHz files; 96 kHz files start with RH9... You'll find the .bin files on the RHAON download page below the Program download.

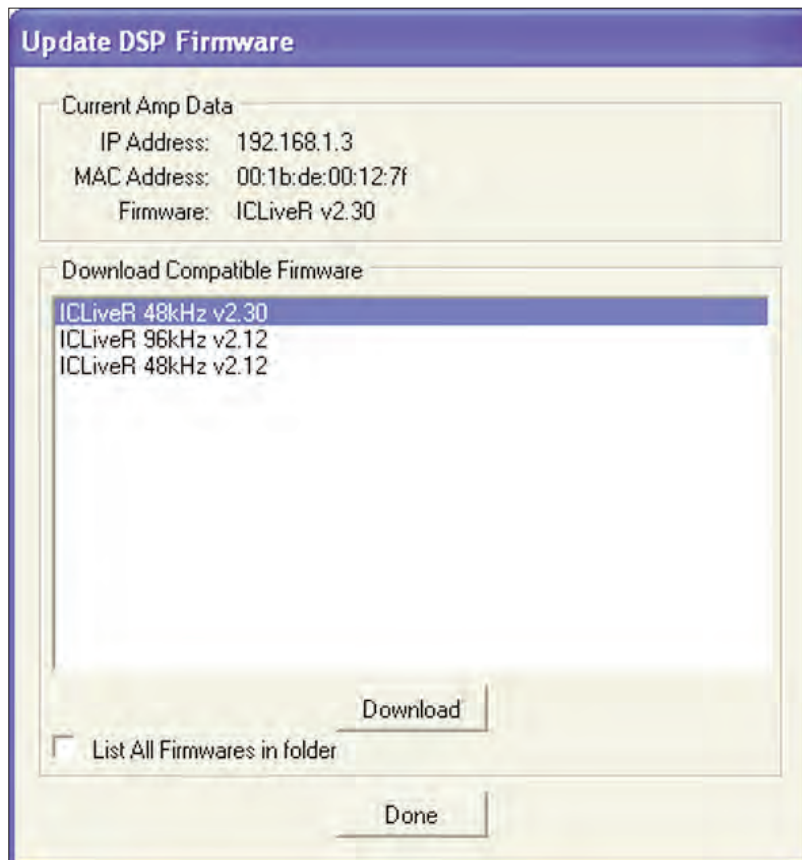
**Important:** When upgrading earlier versions of Microcontroller and DSP firmware to version 1.4, it is critical that the Microcontroller firmware be installed first.

These files need to be placed in the "DSP\_Firmware" sub folder of your RHAON installation (typically "C:\Renkus-Heinz\RHAON\DSP\_Firmware").

Step 1: In RHAON, select either the Control or Supervise mode and then right-click on the one of the loudspeaker listings in the directory tree view or on the loudspeakers icon in the main display area and select "Update DSP Firmware...". The pop up menus are the same ones we explored on page 54 under Updating Microcontroller Firmware.

Selecting Update DSP Firmware will open the window shown below. Notice that the program lets you know what firmware is installed in the loudspeaker.

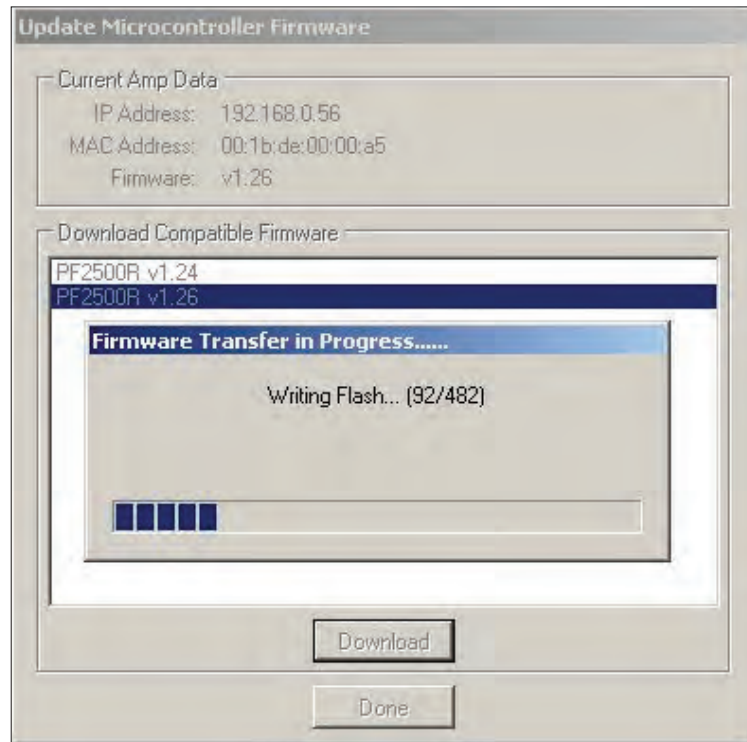
Step 2: Select the appropriate firmware to download and press "Download". If no listings appear in the white field, it's a sign that you have not downloaded any .bin files for that loudspeaker from the web and placed them in the DSP\_Firmware folder.





## Updating DSP Firmware (Continued)

Step 3: Wait for the Firmware transfer to complete. When finished, control will be returned to the dialog window. Select "Done".



Note: If you are installing the DSP Firmware into a Dual Array (Stacked Array), disconnect the signal cable from its normal connection to the Master (lower) Module and insert it into the Primary Ethernet input on the Slave (upper) Module and reset the Dip Switches on the Slave Module to designate it as a Master (set to 00). Then proceed to update the DSP Firmware just as you did for the lower module.

When the DSP Firmware transfer is complete, select Done. Then disconnect the signal cable from the upper module and reconnect it to the lower module. Finally, reset the upper modules dip switches to Slave (set to 01).

Please be aware that the Mutes and the Analog Input Pad will be On after the update completes and may need to be reset.

## GENERAL INFORMATION

Your Renkus-Heinz loudspeaker contains no user-serviceable parts and all service should be referred to qualified service personnel.

### Hum and Noise Problems

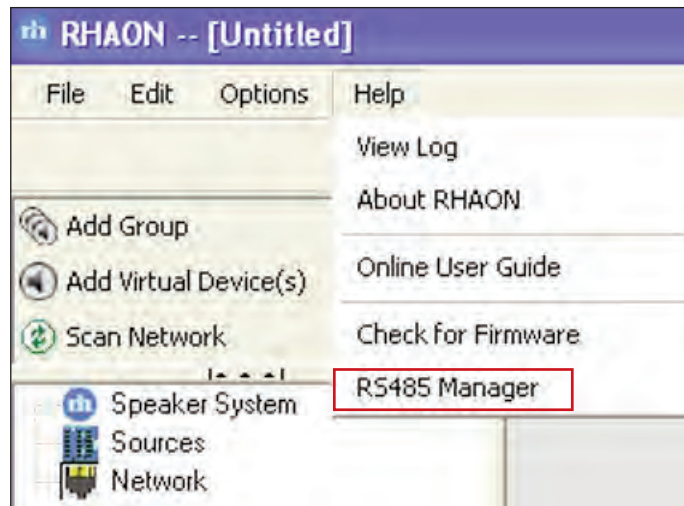
If you encounter hum or noise problems in your system, please refer to the Loudspeaker User's Manual that came with your loudspeaker, Renkus-Heinz form RH508 Rev B. It includes detailed instructions for locating the source of these problems and solving them.

## APPENDIX V: USING THIRD PARTY CONTROLLERS

### Operating ICL-FR and ICL-FR-DUAL Arrays with External Controllers

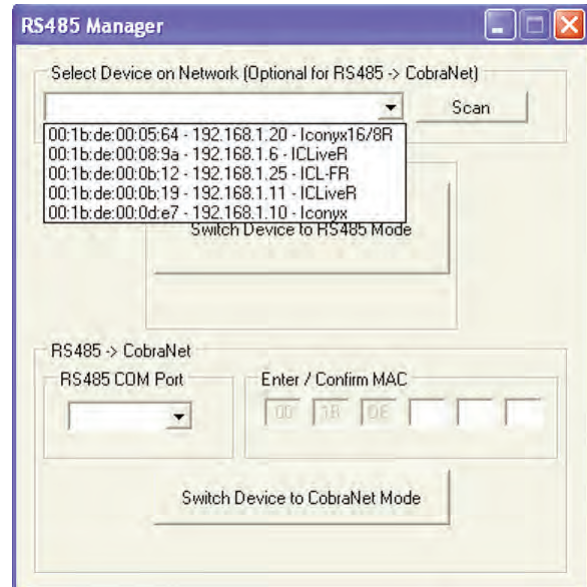
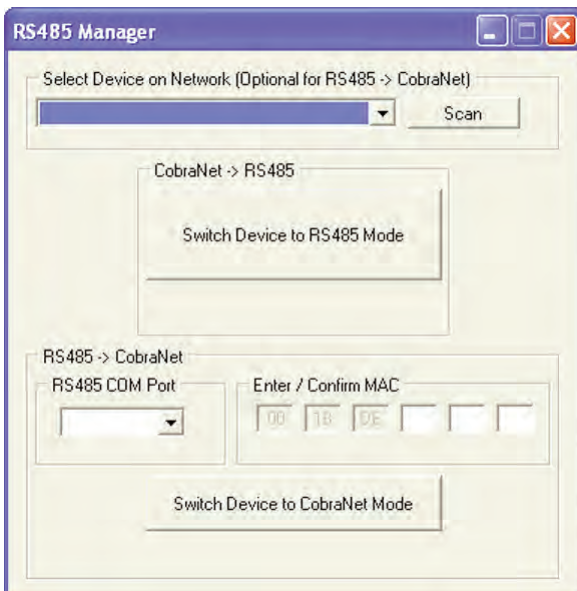
IC-FR and ICL-FR-DUAL digitally steerable arrays include an RS485 port for communication to and from external third party control devices, such as those made by Crestron. This allows these third party devices to control IC-FR and IC-FR-DUAL arrays just as you control them from your computer., Functions that can be controlled from these devices include system monitoring, preset selection, power and level control. The RHAON software contains a RS485 Manager module for enabling and disabling the RS485-control mode on these arrays.

To open the RS485 Manager control window, select RS485 Manager from the Help pull down menu in RHAON. See below.



When the RS485 Manager dialog window opens, click on Scan to scan the Ethernet network for ICL -FR and ICL-FR-DUAL arrays. Then use the drop down arrow to open a list of the arrays found on the network and select the array you want to switch over to RS485 control mode..

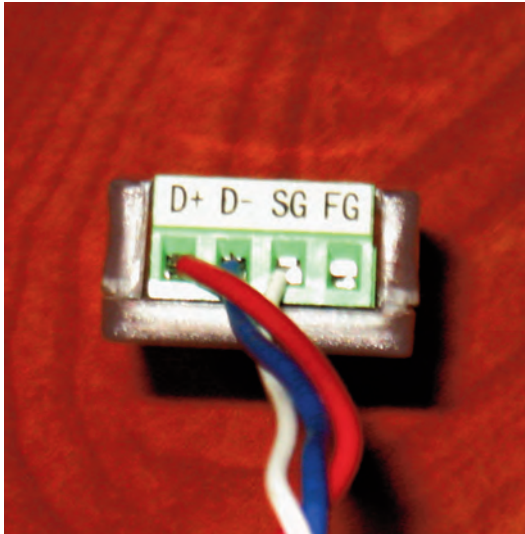
To switch the selected array to RS485 mode, click on the Switch Device to RS485 Mode button.. This will transfer control of the array from your comput-



er to the RS485 control device. . Be aware that once switched, the RS485 device is now in control of the array and not your computer. While some basic commands can still be accomplished using your computer and RHAON, most commands and system monitoring are now unavailable to your computer unless and until the remote device transfers control back to your computer or you use your computer to disable the RS485 mode on the array.

Note that in multi-module arrays, such as the ICL-FR-DUAL, both modules are now under control of the RS485 device.

Transferring control of the array back to your computer can only be done from the external control device or from your computer using RHAON.. To do so from RHAON, you will need a USB-to-RS485 adapter such as the Renkus-Heinz model RS485-ADAPT. . Once you have set up the adapter on your PC, connect the D+, D-, and SG pins on the adapter to the X, Y, and G pins respectively on the array: Note that first you will have to disconnect (unplug) the cable connecting the remote control device to the array.



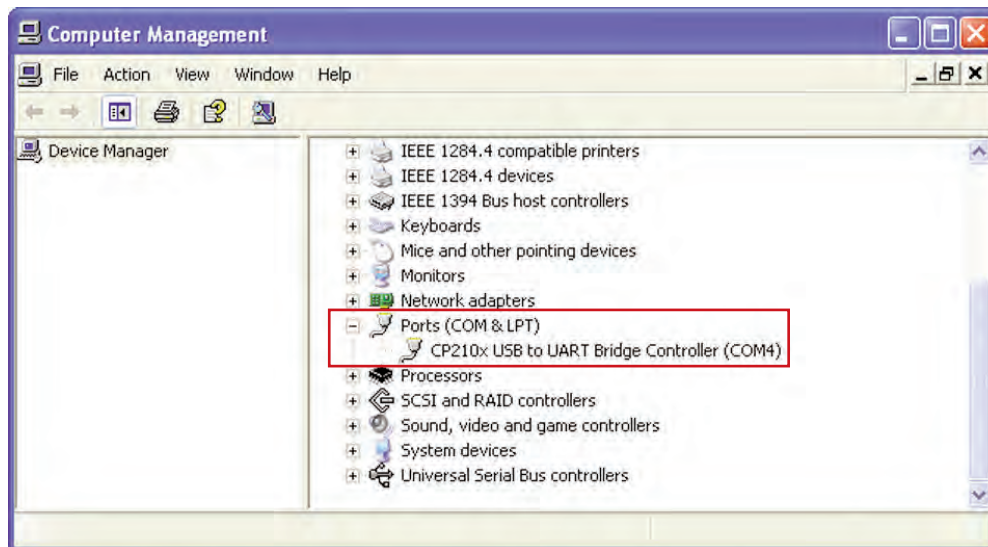
RS485 Adapter Connections



Array Connections

If your array is on the network, you can scan-and-select the array just as you did when you were switching control of the array to the RS485 mode. Notice that the MAC address of the array will fill in the Enter / Confirm MAC text boxes. Alternatively, you can manually enter in the MAC address of the array into the text boxes.

Select the COM Port of your adapter from the drop-down menu. If you are unsure of the correct port, this can be found in Device Manager on your PC:



Once everything is set, clicking 'Switch Device to CobraNet Mode' will send the command to disable the RS485 mode and return control back to your computer.

This process must be repeated for each individual module in the array, for instance for both ICL-FR modules in an ICL-R-DUAL array.

## Networking and RHAON Systems

### Lesson 1: Switched Networks

The Ethernet protocol is a frame-based computer networking technology for local area networks (LANs). This means it is a system for sending uniquely addressed packets of information from a source to a destination, similar to how one sends a letter through the postal service. When you mail a letter to Aunt Gertrude across town, the letter doesn't just go straight from your mailbox to your Aunt's. It goes to the post office, where it is sorted and sent along with Gertie's local mailman. The same holds true for networks, only replace "post office" with "network switch".

Switched networks are laid out in a "star" configuration, in that the topology has the switch at the center with links fanning out to all devices and/or other stars. Typical transport media are CAT5e cable (up to 100m) or optical fiber (up to more than 2km). Communication is handled in a "Point-to-Point" fashion, in that each node communicates solely with the next node attached to it. Using our previous example, the letter starts in your mailbox and is picked up by your mailman, who then transports your letter to the post office, where it is sorted and given to Gertrude's mailman, who then drops it off in her mailbox. How do the switches know where to send the packets? By remembering, of course! Just as the letter to Aunt Gertrude includes a "To" and "From" address, so does a packet. The switch remembers which "From" addresses come from which port in order to speed up future traffic.

Two of the main distinguishing characteristics between switches are speed and management. The two main speed standards that comprise the majority of RHAON installations are 100Base-T (Fast Ethernet) and 1000Base-T (Gigabit Ethernet). While RHAON device connections are Fast Ethernet, either speed may be used as higher speed switches are backwards compatible with those of lower speeds. The advantage to using Gigabit switches with a RHAON network is that while the individual connections are 100Base-T, the switching times (the time it takes between packet ingress and egress) are much shorter. This becomes especially important from both a hop and total nodes standpoint as the size of a network grows. We recommend Gigabit switches for large networks.

Aside from speed, switches come in two flavors: Managed and Unmanaged. An unmanaged switch is essentially a "dumb" black box that takes packets in and sends them where they need to go. A managed switch, however, allows you much more control. With a managed switch, one can designate subsets of ports as separate networks, control which types of packets are allowed in or out of certain ports, monitor current network traffic conditions, port status, etc. For a great number of installations, an unmanaged switch will suffice. However, for larger or more complex setups, a managed switch becomes critical, though a decent level of networking expertise is required for proper setup.

### Lesson 2: Packet Addressing

On a Local Area Network (LAN), packets are addressed by the Media Access Control (MAC) address of the network device. MAC addresses are "burnt-in" by the manufacturer of your network device (computer network card, RHAON loudspeaker, etc.) and are globally unique. This is like the VIN on your car. No matter where you register your car, the VIN stays the same and is unlike that for any other vehicle worldwide.

Not all communication happens on a LAN, however. In order to address different devices on different networks, Internet Protocol (IP) addresses were introduced. They allow for easier routing for a vast array of interconnected networks. Similar to this is the license plate on a car. Rather than attempting to search for the car by going through the VINs for every car in the world, one could narrow things down by first selecting the country in which it was registered and then by license plate number within that country. RHAON acts as the license plate authority, if a CobraNet device (RHAON speaker, mixer, etc.) doesn't yet have a "license plate", it asks RHAON for one and the software kindly obliges.

Packets addressed by MAC address are known as "Ethernet packets". In addition to information about the source and destination and the payload, there is a marker for what type of Ethernet packet is being sent. IP packets (ones that can be sent within or out of the LAN) have one identifier and CobraNet packets have another. Because CobraNet packets don't contain IP information in their payload, CobraNet is limited to being LAN-only. The structure of an IP packet is very similar, in that it contains - among other information - a source address, a destination address, and protocol type. For RHAON, the protocol types of UDP and TCP are the ones in heavy use. Building upon the UDP protocol is the Simple Network Management Protocol (SNMP), which is what RHAON uses to monitor or manipulate exposed variables (EQ, Bundle Assignments, etc.) on a RHAON loudspeaker or other CobraNet device. At each stage in the process of handling a packet, the previous layer is left behind. Once a payload type is determined, just that payload is handed off to the appropriate handler.



## Networking and RHAON Systems

### Lesson 2: Packet Addressing (Continued)

To better understand what takes place when RHAON tells a loudspeaker "Set Gain to -10dB", think of Russian nested dolls. Your computer will send out the whole doll, which contains an IP doll, which contains a UDP doll, which contains an SNMP doll, which contains the message "Set Gain to -10dB". When a device sends out a piece of CobraNet audio, it sends out a whole doll, which contains a CobraNet doll, which contains the piece of audio.

With CobraNet, since both devices have a 'burnt-in' MAC address, communication can happen right away. For SNMP communication between the computer and RHAON loudspeaker to happen, both devices must have a valid IP address. In most home or office networks, there is a device called a 'router' that not only contains a network switch, but can also handle the assignment of IP addresses within its network through a protocol called DHCP. CobraNet (and, by extension, RHAON) uses a different protocol for requesting / assigning IP addresses, but the end result is still the same. Your router has a static IP address assigned to it, devices ask it for an IP, and the router obliges. For this same reason you must assign a static IP address to your computer.

## FAQ and RHAON Network Troubleshooting Tips

RHAON relies on standard networking communication and CobraNet, so general networking and CobraNet troubleshooting documents can be consulted in addition to this guide. Keep all documentation related to your network switches handy.

Before getting into in-depth troubleshooting, verify the correctness of all wiring and the network topology.

- Verify that no network cables are defective and that they are all properly inserted into their connectors.

Hint: The orange LED associated with the Primary Ethernet connector will be flashing orange when it senses a connection to an Ethernet device. On an array, if both orange LEDs flash, it means there is no signal on the Primary input and the DSP is connected to the Secondary input.

The green LEDs flash to indicate a connection, glow when data is flowing.

## Connectivity Issues

Problem: I click "Scan Network" and no devices show up.

Solution: • Verify you have selected the correct network adapter in the RHAON preferences.

- Verify the IP address for that network adapter is static.
- Verify the IP range you have selected for RHAON to hand out is in the same subnet as the IP address of your network adapter (i.e. that the first 3 [of 4] numbers of the addresses are the same).
- Verify the Windows Firewall for the selected network adapter is turned OFF.
- Open CobraNet Discovery -- using the same settings you use in RHAON -- to see if your loudspeaker shows up.

CobraNet Discovery is a Cirrus Logic software tool that identifies and displays all CobraNet devices on a network. It is helpful in diagnosing and correcting any misconfigured equipment. CobraNet Discovery was included on your RHAON CD and can easily be installed from it. It can also be downloaded free of charge from:

<ftp://ftp.renkus-heinz.com/Software/CNDisco342.exe>

or

<http://www.cirrus.com/dispatch/forms/sup/boardreg/breg/agree.jsp?agid=TB237&fp=/en/pubs/software/CNDisco345.exe>

Problem: I am attempting to do anything RHAON-related over a Wireless Access Point, or I am attempting to either control a RHAON network or pass audio over a WiFi link with no results

Solution: Because of CobraNet bandwidth and latency concerns, RHAON (and CobraNet) will not work effectively over an 802.11a/b/g/n WiFi link.

## FAQ and RHAON Network Troubleshooting Tips (Continued)

**Problem:** Some of my RHAON features are not working even though they worked previously. For example, when I try to change Presets the new Preset won't load and I can change my EQ settings but can't save them to the loudspeaker(s).

**Solution:** This indicates your CobraNet components are not functioning properly and communications between your computer and the loudspeakers on the network have been disrupted, a problem caused by your computer having gone into Sleep mode or by some other Windows event. To correct, close RHAON (and, if running, CobraNet Discovery) and bring up the Windows Task Manager (Ctrl-Alt-Delete). Under the "Processes" tab, look for 'PACNDISCO.EXE' and 'PASSBRIDGE.EXE' (Windows may shorten the names and add '~1'). Select them and click "End Process". Proceed to re-open RHAON and/or CobraNet Discovery.

An alternate method of correcting the problem is to Restart the computer. To prevent this from reoccurring set your laptop's Hibernation / Sleep settings to "Never".

Note that this CobraNet malfunction does not affect normal operation and your system will continue to operate normally until you try to change some of the settings.

### Switch-Related Issues

Note that unmanaged switches have no configuration. If you believe an error is related to your unmanaged switch, consult your switch's documentation.

**Problem:** I placed my RHAON devices on the same network as other devices (venue PCs, lighting, etc.) and now either RHAON or the other devices are acting abnormally.

**Solution:** It is recommended that your RHAON network is placed on a network separate to that of anything else. If it is absolutely necessary to have them running through the same switch, it is recommended to use a managed switch and set up separate Virtual Local Area Networks (VLANs), grouping the ports you wish to use for RHAON in one VLAN and the ports for other devices in another.

**Problem:** I have set up my VLANs but now I cannot connect to / scan for the RHAON loudspeakers on my network.

**Solution:** • Verify the physical ports that both your RHAON loudspeakers and your computer are connected to are all on the same VLAN.

- Verify that SNMP traffic (UDP ports 161 and 162) and CobraNet traffic (Ethernet protocol identifier 0x8819) are allowed on your VLAN. Consult your switch documentation for how to configure VLANs.

**Problem:** I have to wait 10-20s in order for my device to be "connected" and the flurry of traffic to begin when connecting my loudspeaker to the switch.

**Solution:** Your switch may have Spanning Tree Protocol (STP) turned on. STP prevents accidental looping in your network topology, but unfortunately needs to run an analysis on any new connection before it is deemed OK to be "on". If you do not desire the delay and don't need any services STP provides, turn off STP on your switch. Consult your switch documentation for instructions.

### Notification Email Related Issues

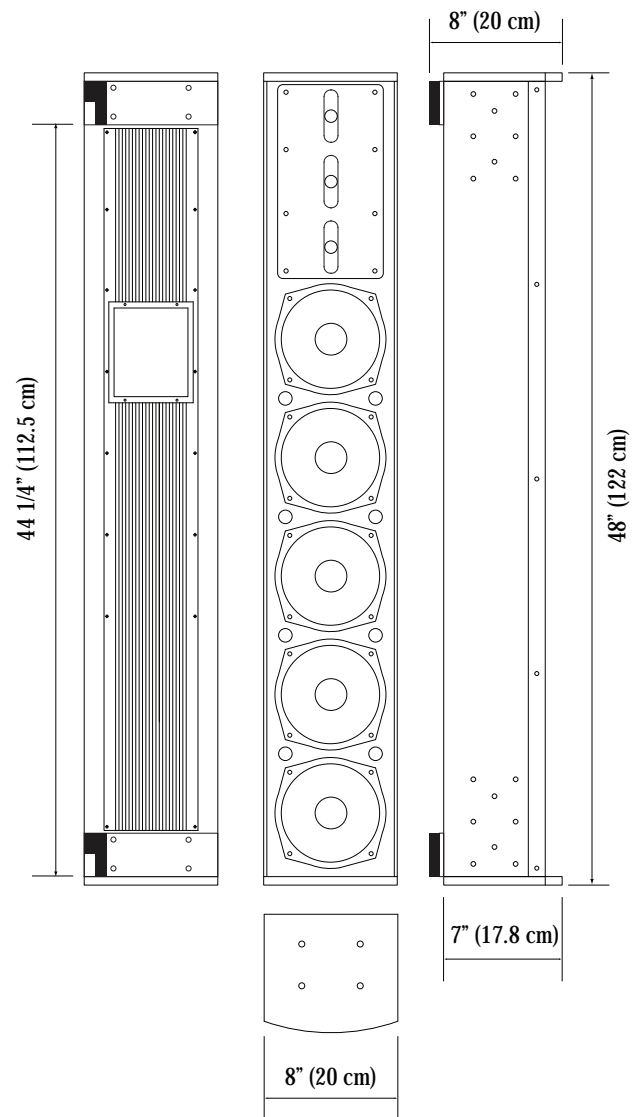
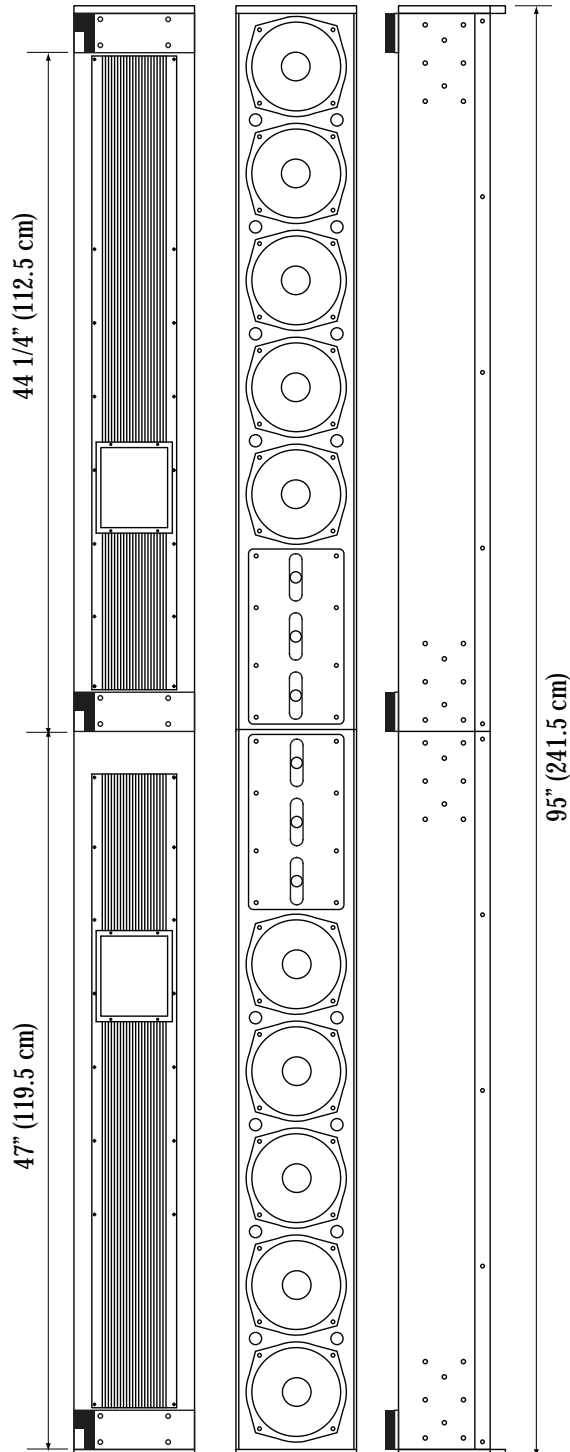
Be aware that for Email notifications or using Remote Desktop-type software to control the RHAON computer, a second network interface connected to a separate network is required.

You will need to contact the network administrator at the installation for details on connecting to their Simple Mail Transport Protocol (SMTP) server, also known simply as 'the outgoing email server'.

**Problem:** I am receiving errors attempting to send emails with an Error Message of "The specified string is not in the form required for an e-mail address."

**Solution:** Be aware that what you enter in the "Name of Installation:" field is used as part of a spoofed "From:" field in the notification email. Use of non-US-ASCII characters in an email address is invalid. For example, use of Greek letters, symbols not on a US keyboard, or the '@' symbol are not allowed. For more information, please visit: [http://en.wikipedia.org/wiki/e-mail\\_address](http://en.wikipedia.org/wiki/e-mail_address).

## Dimensional Drawings



## TECHNICAL SPECIFICATIONS

<b>Sensitivity:</b>	1.0 V (for rated power output)
<b>Freq. Range:</b>	80 Hz to 20 kHz
<b>Max SPL:</b>	ICL-FR: 102 dB pgm, 105 dB peak @ 100 Ft. (30.5 m), ICL-FR-DUAL: 105 dB pgm, 108 dB peak (3-octave bandwidth centered at 2 kHz)
<b>Horiz. Dispersion:</b>	150° up to 3 kHz; 120° above 3 kHz
<b>Vert. Opening Angles:</b>	ICL-FR: 20°, 25° and 30° ICL-FR-DUAL: 5°, 10°, 15° and 20°
<b>Aiming Angle:</b>	Adjustable from -30° to +30°
<b>Typical Throw:</b>	ICL-FR: 80 Ft. (25 meters) ICL-FR-DUAL: 160 Ft. (50 meters)
<b>Beam Control:</b>	ICL-FR: Effective down to 800 Hz ICL-FR-DUAL: Effective down to 400 Hz
<b>No. Transducers -Each Module:</b>	Five 6.5-inch cone transducers with neodymium magnets Three 1-inch HF titanium nitride compression drivers
<b>No. Amp. Channels:</b>	8 per module
<b>Dimensions:</b>	ICL-FR: 48" H x 8" W x 7" D (121.5 cm x 20. cm x 17.8 cm) ICL-FR-DUAL: 95" H x 8" W x 7" D (2431.5cm x 20. cm x 17.8 cm)
<b>Weight:</b>	ICL-FR: 61 Lbs (27.7 Kg) ICL-FR-DUAL: 122 Lbs (55.4 Kg)
<b>Hardware:</b>	Metric M10 attachment points and hinge kits
<b>Enclosure:</b>	Finnish Birch with perforated steel grille
<b>Inputs:</b>	Analog Audio: 2 inputs (primary & secondary), Phoenix 3-pin connectors (looping 3-in, 3-out) CobraNet: Dual RJ45 connectors (for CAT 5 copper cable) AES/EBU: Phoenix connector
<b>Controls (Rear Mounted):</b>	Mute button; Up & Down Output Level buttons; 10 dB pad (on Analog 1 input); Push-To-Reset circuit breaker; Preset Configuration Selector (10 con- figurations)
<b>Computer Controls:</b>	Gain; Mute; On/Standby; Input Selection; Compression; 9-Band Parametric EQ; Shelving & rolloff Filters; Delay; Preset Configuration Selection
<b>Status Indicators:</b>	Power, Signal, Overdrive, Thermal, Mute, Input Pad, Preset Configuration Readout
<b>Power Connector:</b>	IEC power connector
<b>Finish:</b>	Standard finish: white paint Optional finishes: black and custom color paint, weather resistant
<b>Network Digital Format:</b>	16 or 24 bit PCM; 48 or 96 kHz sample rate; selectable network latency.
<b>DSP/AMPLIFIER Type:</b>	8-channel, Class D amplifier/DSP processor
<b>Power Rating:</b>	100 Watts RMS per channel, 150 Watts Burst
<b>Freq. Range:</b>	+ 3, - 3 dB, 80 Hz to 20 kHz
<b>THD Distortion:</b>	< 0.05% typical
<b>Hum &amp; Noise:</b>	<100 dB (A weighted)
<b>Power Required: (per module)</b>	Universal 90/260 VAC, 50/60Hz. 24 VA Idle; 500 VA @ rated output per module (250 ma Idle, 4.2 Amps @ RPO at 120 V)

Note: All analog inputs and outputs comply with AES Standard 48-2005 on interconnecting, grounding and shielding.



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