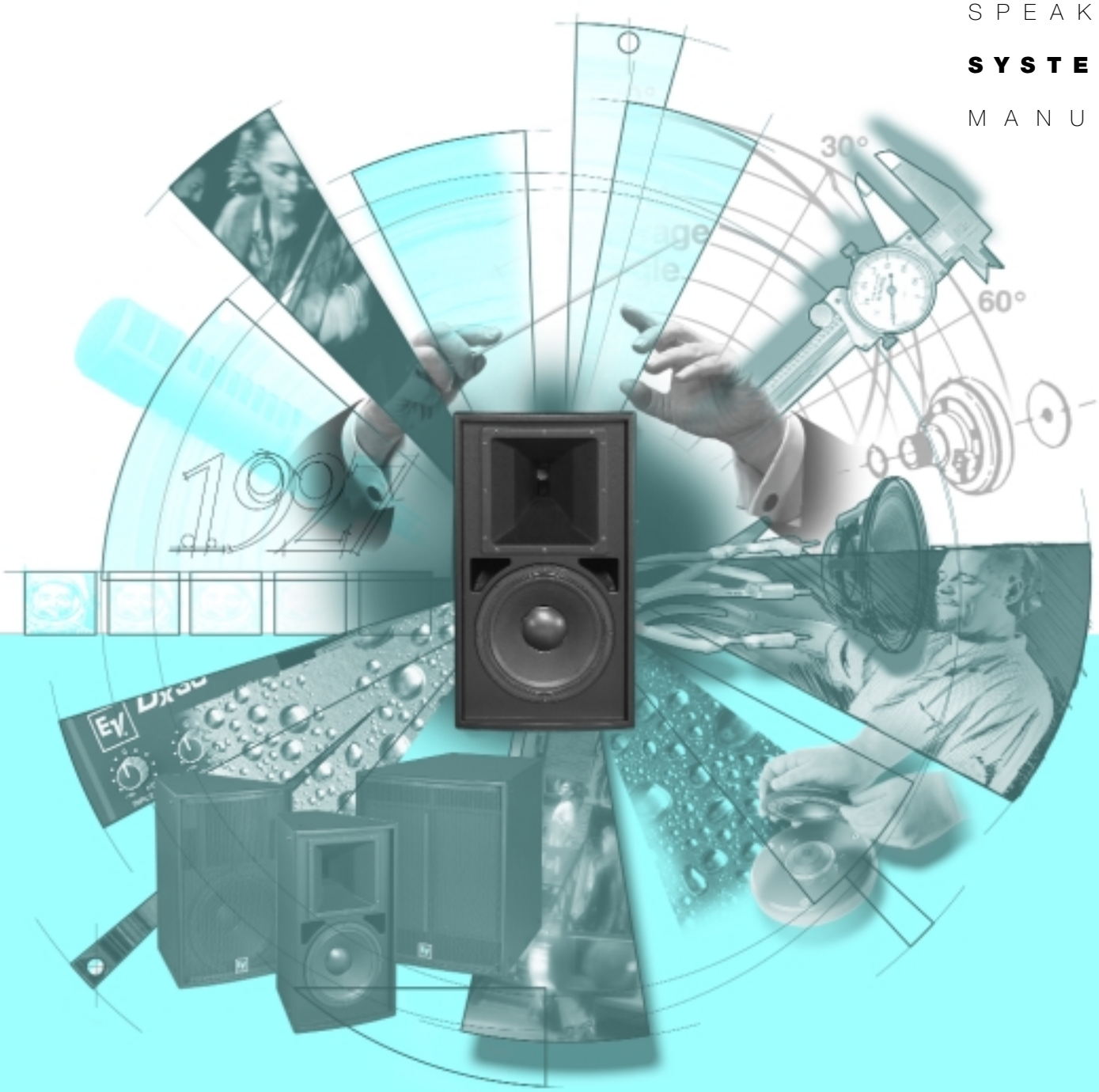
F R i

SPEAKER

SYSTEMS

MANUAL



EVERYWHERE℠

Welcome

Dear Sound Professional:

Thank you for choosing EV products. For more than 70 years, we have persevered to design, engineer, and manufacture the most innovative and highest quality audio products for indoor and outdoor spaces, including offices, houses of worship, live music venues, auditoriums and stadiums. This perseverance has led to our pioneering new technologies that have become industry standards: constant directivity horns, manifold technology, Variable-D® microphones, hum-bucking coils for microphones, and the inclusion of ultra-light weight neodymium in magnet structures (previously only utilized by the auto industry) for microphones and loudspeakers, to name just a few.

It is our pleasure to provide you with the audio solution best suited for your critical sound reinforcement needs. Congratulations on your FRi-Series purchase!

To get the most out of your FRi-Series investment, please read carefully through this entire FRi-Series guide. Inside you will find information that will help you achieve maximum product life, optimum performance, and a safe, successful installation.

If you need more information, call your EV dealer or contact EV directly:

Electro-Voice
12000 Portland Avenue
Burnsville, MN 55337
U.S.A.

Customer Service
1-800-392-3497
Hours: 8:00 a.m. to 5:00 p.m. CST

Web site: www.electrovoice.com

Warning! Only fully licensed, qualified professionals following safe rigging standards should suspend any Electro-Voice system.

Contents

The purpose of this guide is to familiarize you with the Electro-Voice FRi-Series of installation loudspeakers. Main system features are identified along with unique characteristics found in specific models.

FRi Series Overview

The Electro-Voice FRi-Series of fixed installation, sound reinforcement loudspeakers deliver a broad range of performance options to accommodate the acoustic requirements of most environments. All full range FRi models employ EV's renowned DH2t two-inch diaphragm compression driver to deliver sound reproduction that is smooth and linear.

In addition to the superior performance of the FRi Series, flexibility, ease of suspension and array configuration all merit the series suitable for most environments. The FRi 12-inch, 15-inch full range and 18-inch sub models all measure 28 inches in the vertical dimension, allowing neat, concise, and visually appealing arrays in either vertical or horizontal arrays. The fully rotatable horn allows the installer to construct the array to meet their coverage needs while maintaining the most aesthetically pleasing cabinet configuration. The structural integrity of all full range FRi cabinets allow for vertical arrays up to a four cabinet hang. In addition, the FRi-122/64 and FRi-152/64 two-way speakers contain 12 suspension points that enable a wide variety of flying configurations. All are constructed in a trapezoidal design of 13 ply Baltic Birch plywood with a detachable steel grille. The grilles may be easily covered with acoustically transparent cloth. The FRi-181S is supplied with 16 suspension points for the ultimate in flexibility.

The FRi Series is specifically designed for use in stadiums, houses of worship, live music clubs/discos, arenas and gymnasiums. All systems employ EV's exclusive Ring Mode Decoupling (RMD™) and high-performance DL series woofers to ensure maximum speech intelligibility and musical clarity. Coupled with a fully rotatable high frequency horn, all FRi models provide maximum flexibility.

Product Descriptions

FRi-152/64

The FRi-152/64 features a 60 x 40-degree rotatable horn pattern, which is ideal for far-field, long-throw applications. The FRi-152/64 serves well as a "stand alone" loudspeaker in small-to-medium sized rooms requiring only moderate levels but good bass response as a two-way, direct-radiating loudspeaker system as well. The FRi-152/64 has a 15-inch woofer and a 30-degree (15-degree angle per side) trapezoidal enclosure. The loudspeaker can be operated in passive or bi-amp mode.

FRi-122/64

Similar in design, this two-way, direct-radiating loudspeaker system features a 60 x 40-degree rotatable horn pattern, which is ideal for far-field, long-throw applications. The difference, however, is the FRi-122/64's woofer size: 12 inches. As a result, the FRi-122/64 serves well as a "stand alone" loudspeaker in small-to-medium sized rooms requiring only moderate levels where mid-range vocal intelligibility is important. The FRi-122/64 is contained within a 30-degree (15-degree angle per side) trapezoidal enclosure. The loudspeaker can be operated in passive or bi-amp mode.

FRi-181S

A dedicated subwoofer loudspeaker system, the FRi-181S functions efficiently in the lowest octave. It features an 18-inch woofer designed to provide huge amounts of deep, full bodied, high-impact bass down to, and below, the low open "E" on a bass guitar (approx. 41.7 Hz) with little or no extra equalization required. The FRi-181S is contained within a 15-degree (7.5-degree angle per side) trapezoidal enclosure. This subwoofer can be operated in passive or bi-amp mode.

Architects' and Engineers' Specifications

FRi-152/64

The two-way full range loudspeaker system shall incorporate a 15-in. LF transducer and a 2-in./50mm voice coil HF compression driver.

The LF driver shall be mounted in a vented enclosure tuned to optimum low-frequency response. The HF driver shall be loaded on a constant-directivity horn with a nominal coverage pattern of 60 x 40-degrees. An internal passive filter network shall provide for component crossover and system equalization. Input panel shall be easily changeable from passive to biamp operation via internal connector.

System frequency response shall be 70 Hz to 15 kHz (-3 dB) measured on axis. The loudspeaker shall produce a sound pressure level (SPL) of 98 dB on axis at 1 meter with a power input of 1 watt, and shall be capable of producing a full-power long-term average output of 123 dB on axis at 1 meter. It shall handle 350 watts of amplifier power long-term (EIA Standard) and shall have a nominal impedance of 8 ohms.

The loudspeaker enclosure shall be trapezoidal in shape with side draft angles of 15 degrees each. It shall be constructed of 13 ply void-free cross-grain-laminated Birch plywood and shall employ extensive wooden bracing. It shall be finished in black or white acrylic paint or available unfinished. Input connectors shall be two 2-terminal barrier strips. A total of twelve 3/8-16 threaded mounting/suspension points shall be provided, (three each on top and bottom, two per side, two on rear). The front of the loudspeaker shall have a powder-coated perforated 16 GA steel grille. Grille mounting shall allow for acoustically transparent fabric to be applied without any noticeable protrusions or fasteners.

The two-way full range loudspeaker shall be the Electro-Voice model FRi-152/64.

FRi-122/64

The two-way full range loudspeaker system shall incorporate a 12-in. LF transducer and a 2-in./50mm voice coil HF compression driver.

The LF driver shall be mounted in a vented enclosure tuned to optimum low-frequency response. The HF driver shall be loaded on a constant-directivity horn with a nominal coverage pattern of 60 X 40-degrees. An internal passive filter network shall provide component crossover and system equalization. Input panel shall be easily changeable from passive to biamp operation via internal connector.

System frequency response shall be 62 Hz to 15 kHz (-3 dB) measured on axis. The loudspeaker shall produce a sound pressure level (SPL) of 97 dB on axis at 1 meter with a power input of 1 watt, and shall be capable of producing a full-power long-term average output of 122 dB on axis at 1 meter. It shall handle 300 watts of amplifier power long-term (EIA Standard) and shall have a nominal impedance of 8 ohms.

The loudspeaker enclosure shall be trapezoidal in shape with side draft angles of 15 degrees each. It shall be constructed of 13 ply void-free cross-grain-laminated Birch plywood and shall employ extensive wooden bracing. It shall be finished in black or white acrylic paint or available unfinished. Input connectors shall be two 2-terminal barrier strips. A total of twelve 3/8-16 threaded mounting/suspension points shall be provided, (three each on top and bottom, two per side, two on rear).The front of the loudspeaker shall have a powder-coated perforated 16 GA steel grille. Grille mounting shall allow for acoustically transparent fabric to be applied without any noticeable protrusions or fasteners.

The two-way full range loudspeaker shall be the Electro-Voice model FRi-122/64.

FRi-181S

The subwoofer loudspeaker system shall incorporate one passive or biampable 18-in. LF transducer mounted in a vented, slot-loaded enclosure tuned at optimum low frequency response.

System frequency response shall be 45 Hz to 160 kHz (-3 dB) measured on axis. The loudspeaker shall produce a sound pressure level (SPL) of 97 dB (100 dB half-space) on axis at 1 meter with a power input of 1 watt, and shall be capable of producing an output of 123 dB (132 dB half-space) on axis at 1 meter. The loudspeaker shall handle 400 watts of amplifier power long-term (EIA Standard) and shall have a nominal impedance of 8 ohms.

The loudspeaker enclosure shall be trapezoidal in shape with side draft angles of 7.5 degrees each. It shall be constructed of 13 ply void-free cross-grain-laminated Birch plywood and shall employ extensive internal bracing. It shall be finished in black or white acrylic paint or available unfinished. Input connectors shall be two 2 terminal barrier strips. A total of sixteen 3/8-16 threaded mounting/suspension points (4 each top, bottom, sides) shall be provided. The front of the loudspeaker shall have a powder-coated perforated 16 GA steel grille. Grille mounting shall allow for acoustically transparent fabric to be applied without any noticeable protrusions or fasteners.

The sub bass loudspeaker shall be the Electro-Voice model FRi-181S.

Uniform Limited Warranty

Electro-Voice products are guaranteed against malfunction due to defects in materials or workmanship for a specified period, as noted in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual, beginning with the date of original purchase. If such malfunction occurs during the specified period, the product will be repaired or replaced (at our discretion) without charge. The product will be returned to the customer prepaid.

Exclusions and Limitations: The Limited Warranty does not apply to: (a) exterior finish or appearance; (b) certain specific items described in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual; (c) malfunction resulting from use or operation of the product other than as specified in the product data sheet or owner's manual; (d) malfunction resulting from misuse or abuse of the product; or, (e) malfunction occurring at any time after repairs have been made to the product by anyone other than Electro-Voice Service or any of its authorized service representatives.

Obtaining Warranty Service: To obtain warranty service, a customer must deliver the product, prepaid, to Electro-Voice Service or any of its authorized service representatives together with proof of purchase of the product in the form of a bill of sale or receipted invoice. A list of authorized service representatives is available from Electro-Voice Service at 12000 Portland Avenue, Burnsville, MN 55337. Ph: (877) 863-4166

Incidental and Consequential Damages Excluded: Product repair or replacement and return to the customer are the only remedies provided to the customer. Electro-Voice shall not be liable for any incidental or consequential damages including, without limitation, injury to persons or property or loss of use. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you.

Other rights: This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Electro-Voice Speakers and Speaker Systems are guaranteed against malfunction due to defects in materials or workmanship for a period of five (5) years from the date of original purchase. The Limited Warranty does not apply to burned voice coils or malfunctions such as cone and/or coil damage resulting from improperly designed enclosures. Electro-Voice active electronics associated with the speaker systems are guaranteed for three (3) years from the date of original purchase. Additional details are included in the Uniform Limited Warranty statement.

Interior Installation

The standard FRi cabinets are constructed for indoor installation to provide years of trouble-free service. The paint on the cabinets is textured and highly durable. Should you endeavor to paint your cabinet another color, clean and prep the cabinet as you would following standard painting practices.

The metal grille on the cabinets is designed to accommodate custom-colored, acoustically transparent fabrics which wrap neatly around the grille and is held in place by U-channels (included). This allows the flexibility to match most interior design requirements. We suggest the use of acoustically transparent fabrics as supplied by Stevenson & Lawyer (Tel. 1-800-968-5535) or equivalent to ensure maximum performance and safety.

Outdoor Installation

Should your application call for outdoor installation, locate the cabinet to provide protection from direct exposure to sunlight, rain and other weather conditions.

Rigging

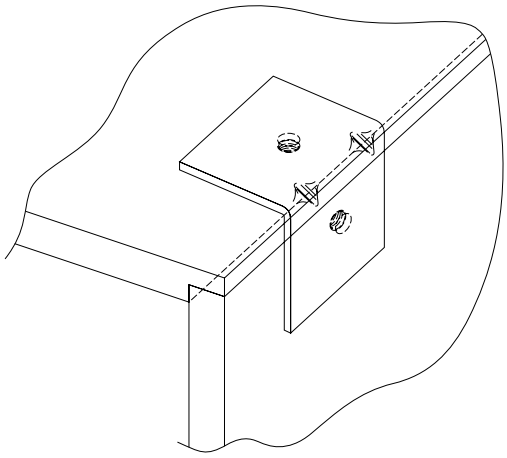
Installation of the Shoulder Eye Bolts

Rigging of the FRi-Series is done with readily available 3/8-16 forged shoulder eye bolts. To install the eye bolts, follow these steps:

1. Determine the intended location for the eyebolts on the cabinet.
2. Remove and replace the 3/8-16 Phillips head screws ONE AT A TIME. Replace screws with eye bolt, using a washer (supplied) under each one.
3. Tighten each eye bolt "hand tight" and then torque an additional $^1/_2$ to $^3/_4$ turn to accomplish proper alignment.

WARNING: NEVER REMOVE MORE THAN ONE 3/8-16 PHILLIPS HEAD SCREW AT A TIME!

Removing two adjacent screws may cause the heavy steel bracket to fall into the box, requiring disassembly of the enclosure to put it back in place.



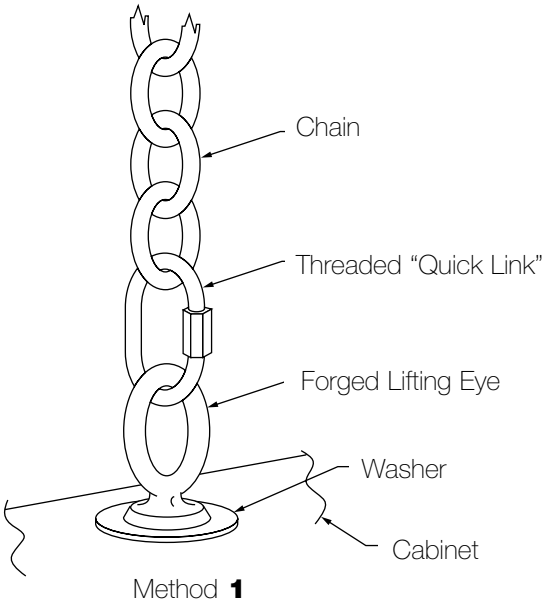
The FRi Series features internal heavy gauge steel reinforcing brackets that are not only designed to provide high safety factor support for the 3/8-16 forged eyebolt rigging, but also to unitize the internal panels for each enclosure. These corner braces are required to maintain the structural integrity of the cabinet to performance levels listed in this manual.

Basic Principles for Suspending FRi Loudspeakers

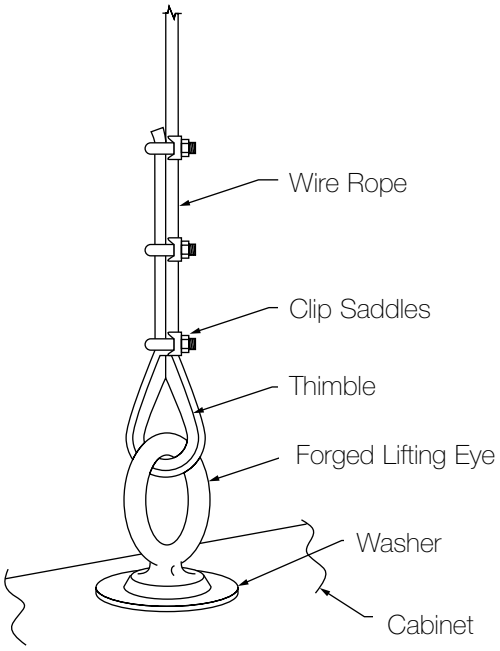
Many "suspendible" loudspeaker designs offer "t-nut" style mounting without using top and side enclosure panel braces, thus producing lower safety factors. Therefore, each FRi full range loudspeaker enclosure is furnished with 12 fully supported mounting points to provide maximum vertical or horizontal suspension. All systems have been structurally certified to a minimum of 8 to 1 safety factor loading. Each input panel provides safety information and maximum safe multi-cabinet rigging data. Maximum safe rigging configurations should never be exceeded.

Rigging to the 3/8 Forged Eyebolts

Recommended rigging to the 3/8 forged eyebolts (4 supplied) with each system is as follows and is dependent upon following all recommended loading requirements for safety.



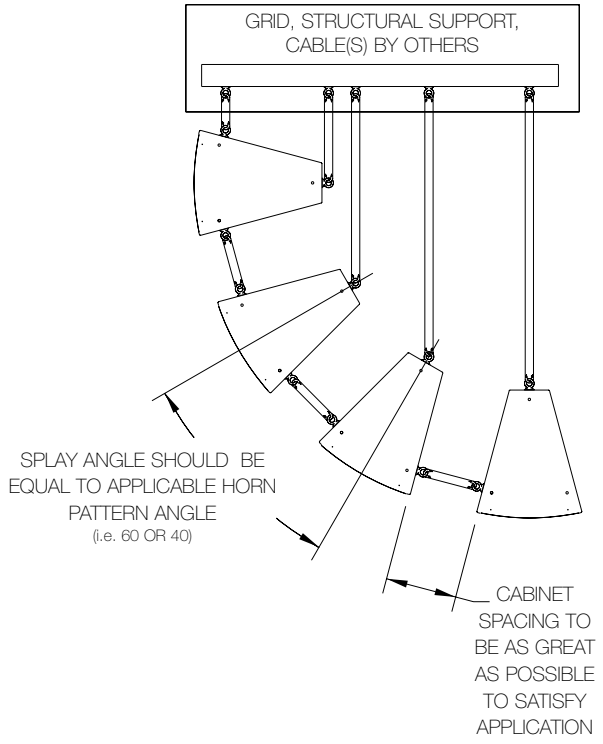
Method **1**

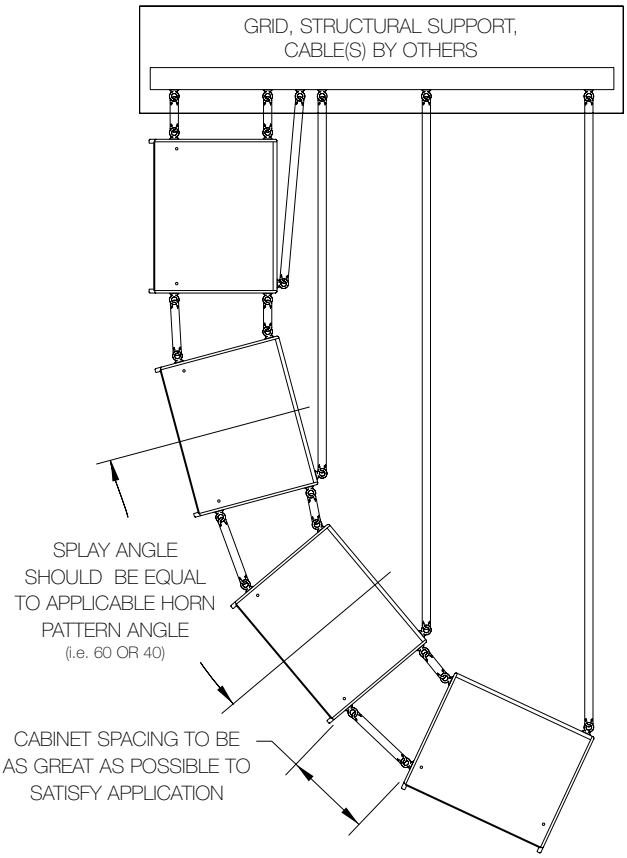


Method **2**

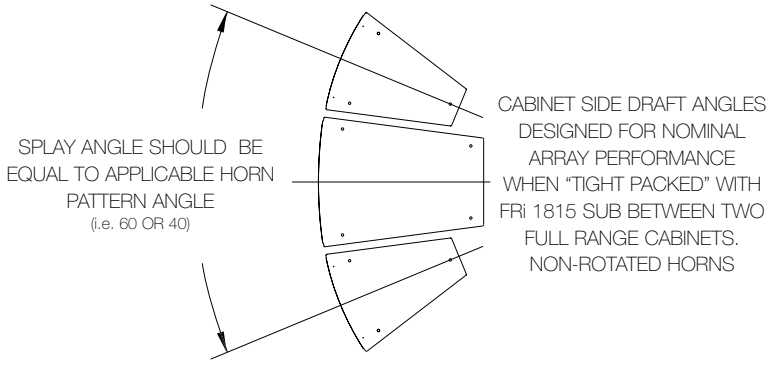
Rigging Options

VERTICAL HANG
(Side Views)

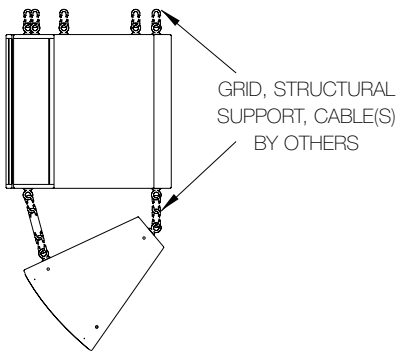




HORIZONTAL HANG
(Top View)



HORIZONTAL HANG
(Side View)



Rigging Options

EV has coordinated with ATM Flyware and Polar Focus in developing pre-designed flying hardware to support the most common array configurations of one sub flanked by two full-range loudspeakers. To receive additional information, please contact either of these fine companies.

ATM Flyware

In the United States:
21000 S. Wilmington Ave.
Carson, CA 90810
Tel: 310-834-5914
Fax: 310-834-3042

In Europe:
102 Grafton Road
London NW5 4 BA UK
Tel: (44) 0171-482-3300
Fax: (44) 0171-482-4484

Polar Focus, Inc.
P.O. Box 3, 217 Russell Street
Hadley, MA 01035
U.S.A
Tel: 413-586-4444
Fax: 509-357-5657

Amplifier Recommendations

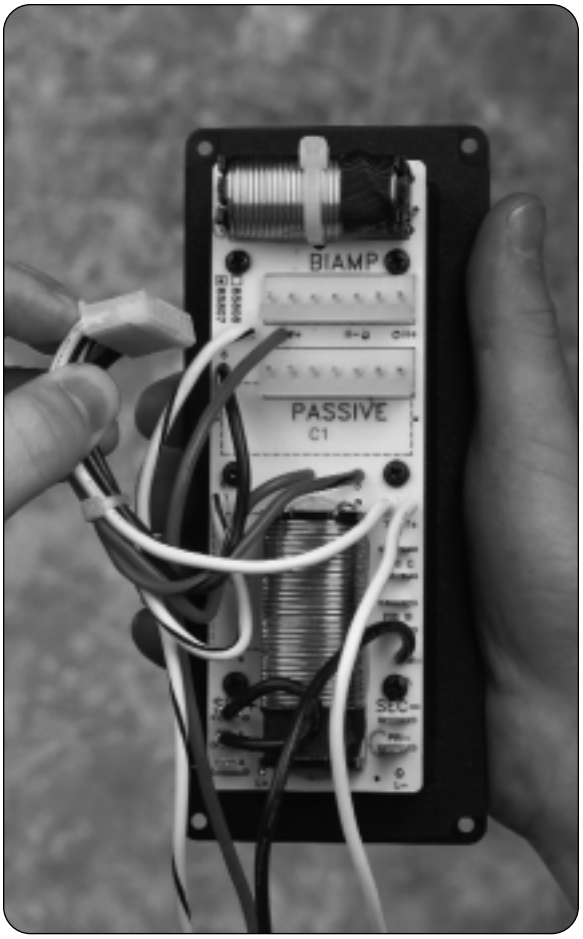
The EV CPS-2, two-channel power amplifier is recommended for use with all FRi series loudspeakers, whether running in passive or active crossover mode. This amplifier is sufficient to operate up to two paralleled FRi series cabinets per channel, supplying the necessary headroom to provide appropriate long term program and instantaneous peak power for most program materials. If array configurations are designed as such to run in all passive mode with more than two cabinets, an amplifier sufficient to drive the total load requirements of the configuration must be selected taking into consideration the individual cabinet power requirements. For example, a 3 box array containing two full range and one sub can be operated in bi-amp mode with one channel of the CPS2 handling the high frequency output of the crossover and feeding the two full range cabinets and the other channel handling the low frequency output of the crossover and feeding the sub(s).

Biamp Operation

Changing the "BIAMP Mode"

All FRi-Series units are shipped from the factory in "PASSIVE" mode operation. To change to the "BIAMP" mode, follow these steps:

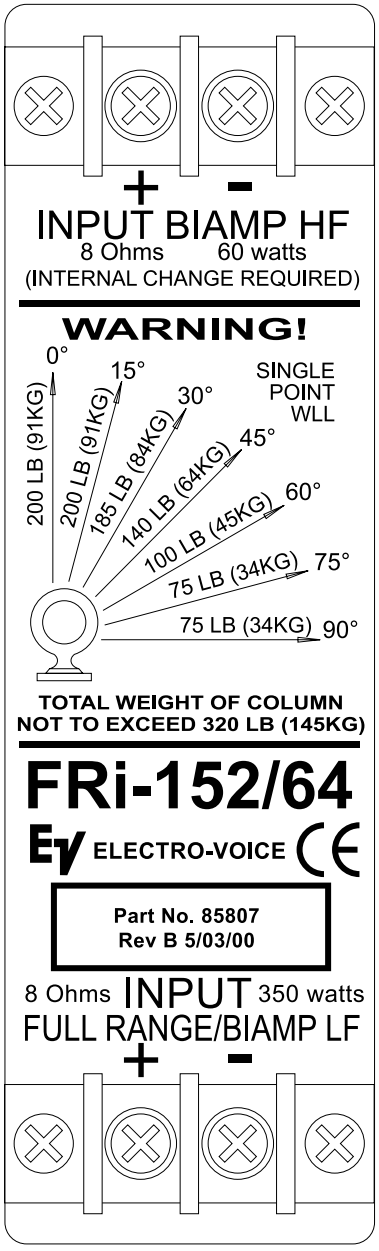
1. Remove the screws holding the input terminal cup to the cabinet.
2. Carefully remove the assembly far enough to get a good look at the back of the circuit board (about six to eight inches).
3. Locate the seven-pin in-line connector, which will be plugged onto the row of pins marked "PASSIVE" on the circuit board.
4. Gently push the locking tab away from the connector body and pull the connector body straight off the pins.
5. Locate the row of pins immediately above marked "BIAMP" and press connector body onto them.
6. Check to be sure all seven pins are engaged and that the connector body is securely seated all the way down in the receptacle.
7. Carefully re-install the assembly in the enclosure and replace the mounting screws, making them snug enough to compress the gasket for a secure air-tight seal, but DO NOT OVER TIGHTEN!
8. Connect the high-frequency drive line to the upper terminals (marked "INPUT BIAMP HF") and the low-frequency drive line to the lower set of terminals (marked FULL RANGE/BIAMP LF).
9. **Double-check for correct line assignment and polarity on each input strip.**



Setting the Electronic Crossover

The active crossover centerpoint is 1600 Hz with a crossover type of 4th-order (24 dB/oct) Linkwitz-Riley, recommended.

The full range active crossover should be set for 1600 Hz; however, if adjustments are made or variations are implemented do not use frequencies below 1480 Hz! Crossover slope should be 24 dB/octave. Should budget allowances permit, limiters may prove a useful and an appropriate addition to the signal path, especially for the high frequency section. For more rudimentary clusters we recommend the EV EX23 Active Crossover which contains a 4th-order (24 dB/oct) Linkwitz-Riley and a stereo two-way section with continuously variable crossover frequencies from 80 - 8000 Hz. Each of the two outputs per channel has separate mute switches and level controls. For bi-amping the FRi Series in more complex array configurations with delays and a greater need for equalization, we recommend the EV Dx38 Digital Sound System Controller, which incorporates all necessary crossover, parametric EQ, shelving EQ, low- and high-pass filters, alignment (delay), compressor and limiter functions. (Settings for the Dx38 are available on the EV Web site: www.electrovoice.com.)



Typical FRi Input Panel

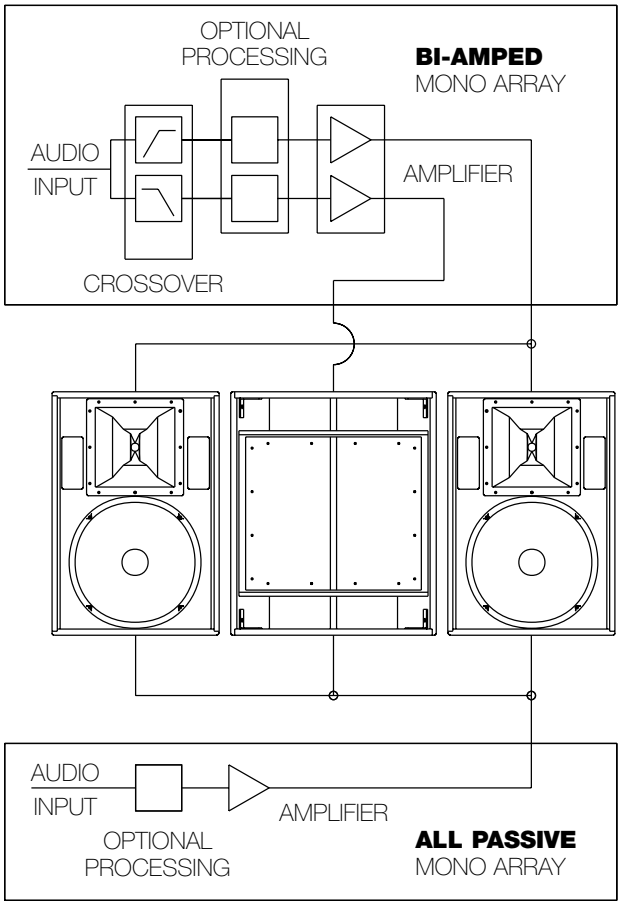
All FRi full range enclosures feature very high quality barrier strip input terminations for ease of installation and secure connections.

Basic Configurations

Recommended Configurations for FRi Systems

- Bi-amp Operation **BEST**
- All Passive Operation **BETTER**
- Tri-amp Operation **NOT RECOMMENDED**

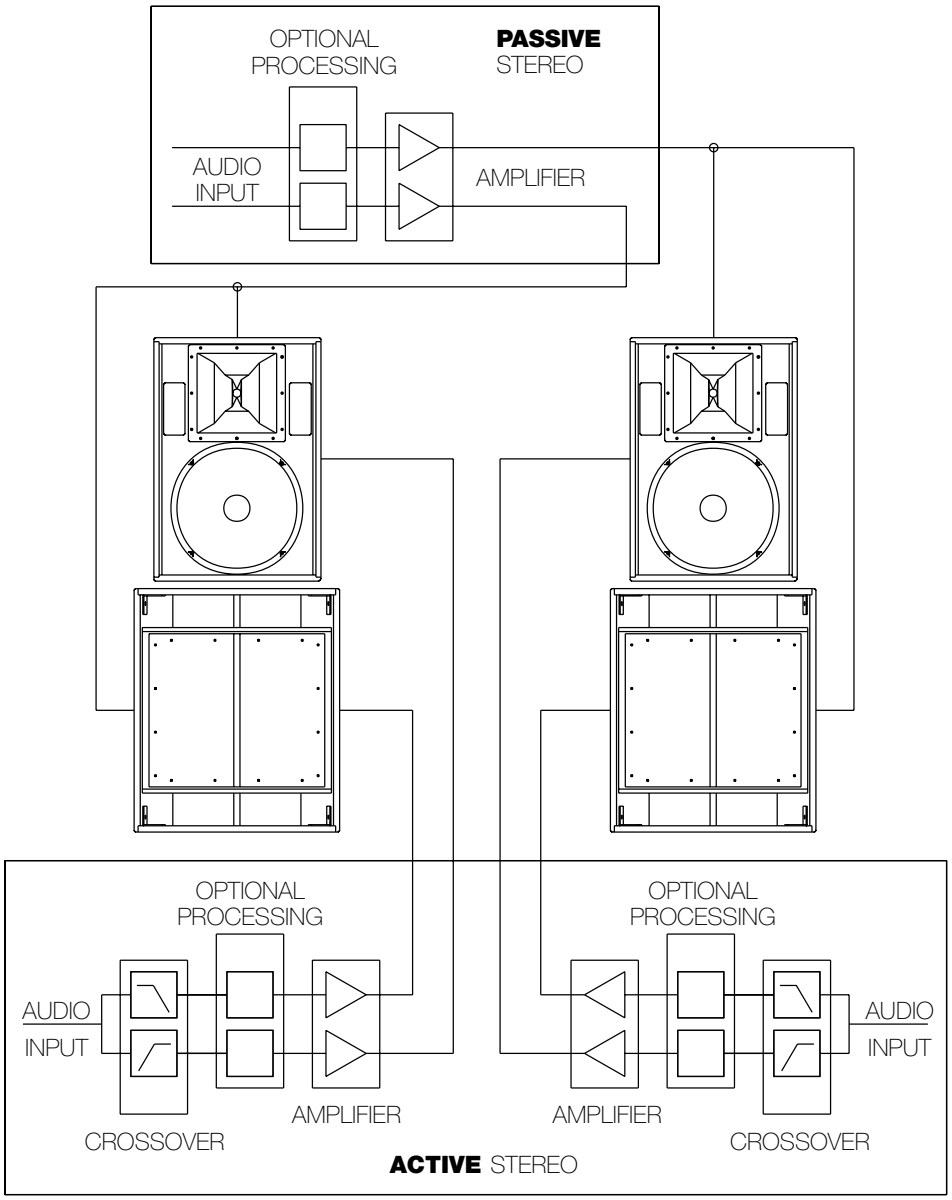
Due to the inherent designs and efficiencies of the FRi systems, there is no cost effective reason to utilize all active operation in either mono or stereo mode. Actual cost of electronics and amplification will be determined by the total number of FRi cabinets configured within the array. Due to load requisites some array configurations may not be feasibly powered in all passive mode with typical amplifiers available.



Cost Effective Fidelity for the FRi System

Based on cost effectiveness of the entire system (loudspeakers, processors, amplifiers), bi-amp operation combines the overall best frequency response and value. In simpler stereo applications with one full range and one sub per side, we would recommend a bi-amped mode of operation for performance; however, all passive configurations will typically supply adequate fidelity at an extremely cost effective means. If multi-box arrays are used in a stereo configuration, the recommendations for mono program configurations apply to each side.

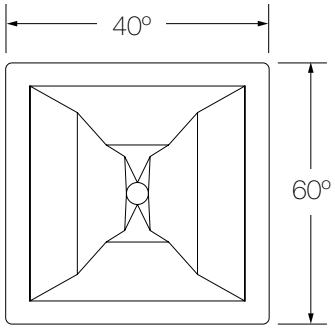
To increase low frequency response, consider a hard-surface coupled mounting surface of the sub(s). These may be floors, walls or ceilings. Acoustically coupling low-frequency cabinets to architectural structures provide an extremely cost effective means of providing more low-frequency energy in your system without additional loudspeakers or electronics.

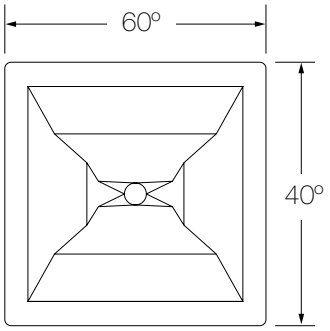

OPTIONAL
PROCESSING
PASSIVE
STEREO
AUDIO
INPUT
AMPLIFIER
OPTIONAL
PROCESSING
OPTIONAL
PROCESSING
AUDIO
INPUT
AUDIO
INPUT
AMPLIFIER
AMPLIFIER
CROSSOVER
CROSSOVER
ACTIVE STEREO

Appendix A: Mechanical Adjustments

Rotatable Horn Information

All FRi-Series full-range speakers come with a high-frequency, constant-directivity horn that is fully rotatable. Depending on the model, the horn may be rotated up to 90 degrees to maintain the speaker's same horizontal coverage angle with the cabinet on its side. This is especially useful in low-ceilinged rooms and in the construction of vertical line source arrays.

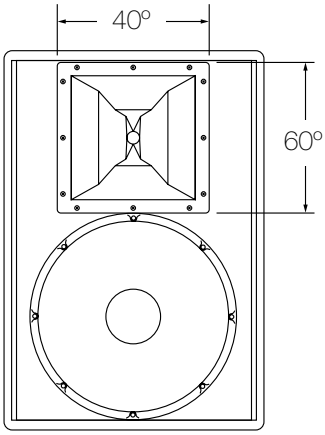


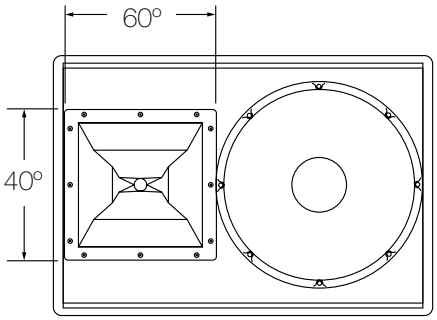


How to Rotate the Horns

Follow these six simple steps to rotate the horn:

1. Remove the grille assembly (as outlined in Appendix B).
2. Stuff a clean, lint-free rag in the horn throat to prevent debris and dropped screws from falling in and possibly damaging the driver.
3. Remove the Philips head screws securing the horn to the baffle.
4. Carefully lift the horn off the baffle, taking care not to disturb the gasket, and rotate the horn one-quarter turn.
5. Align the mounting holes and replace the screws. Tighten the screws enough to compress the gasket and provide a solid, air-tight seal, but DO NOT OVER-TIGHTEN.
6. Carefully remove the rag and replace the grille assembly.

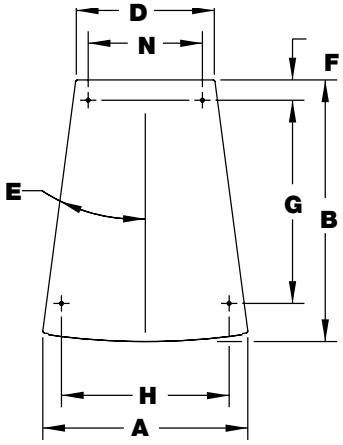




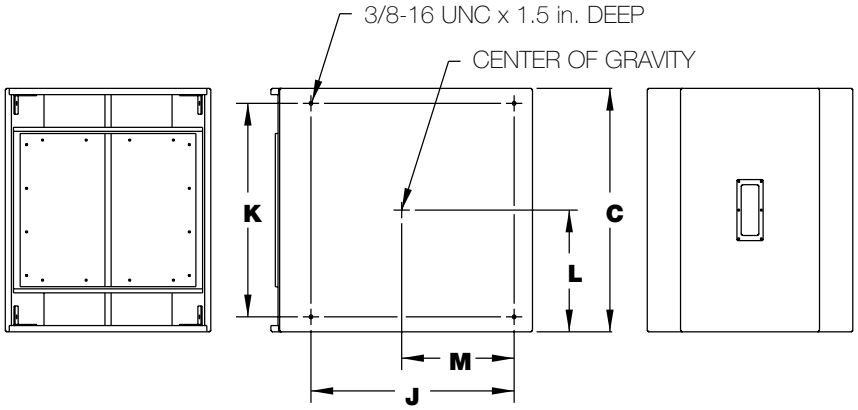
F R i
SPEAKER
SYSTEMS

FRi-181S

A: 23.51 in.
B: 30.00 in.
C: 27.92 in.
D: 15.93 in.
E: 7.5 degrees per side
F: 2.33 in.
G: 23.30 in.
H: 19.23 in.
J: 23.30 in.
K: 24.48 in.
L: 13.25 in.
M: 15.75 in.

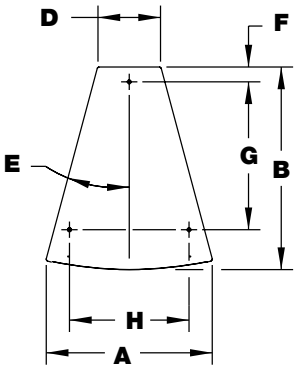


FRi-181S
Dimensional Specifications



FRi-152/64

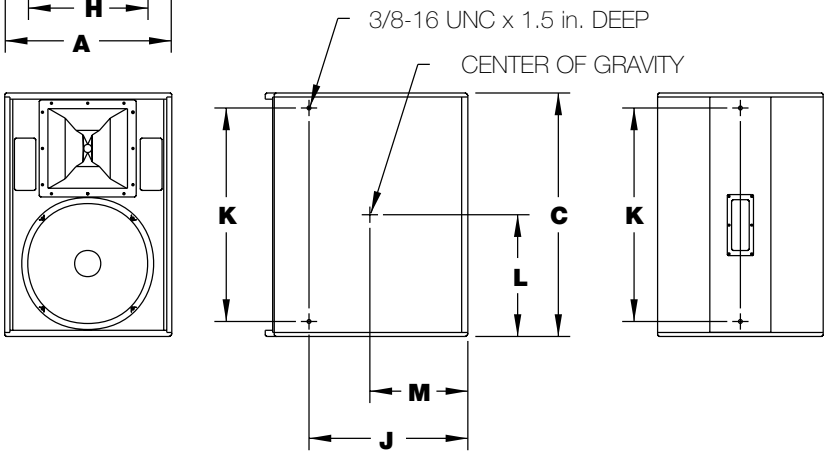
A: 19.03 in.
B 23.23 in.
C: 27.92 in.
D: 7.25 in.
E: 15 degrees per side
F: 1.70 in.
G: 16.96 in.
H: 13.71 in.
J: 24.48 in.
K: 18.21 in.
L: 14.00 in.
M: 13.50 in.



FRi-152/64 and FRi-122/64
Dimensional Specifications

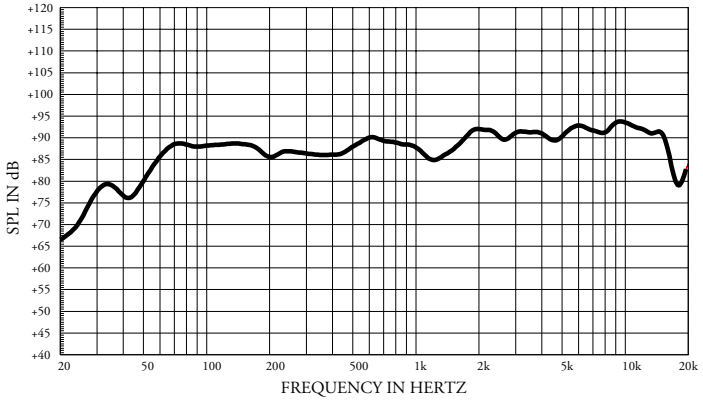
FRi-122/64

A. 15.83 in.
B. 17.54 in.
C: 27.92 in.
D: 7.00 in.
E: 15 degrees per side
F: 1.75 in.
G: 11.62 in.
H: 10.54 in.
J: 13.37 in.
K: 24.50 in.
L: 13.63 in.
M: 9.13 in.

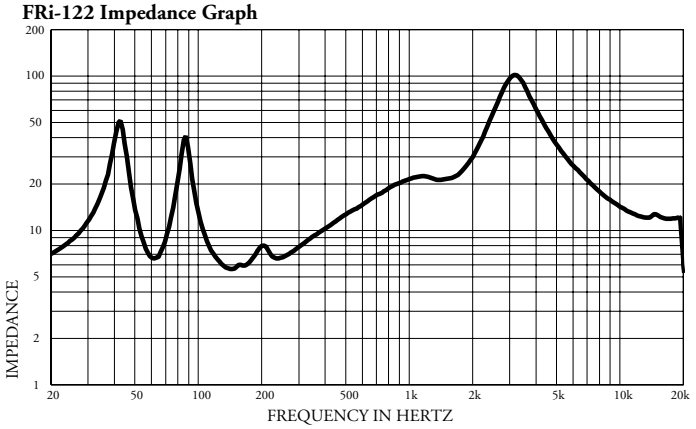


Appendix C: Frequency Curve

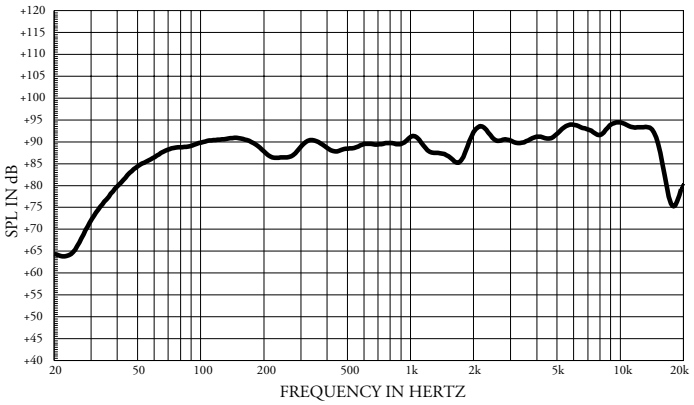
FRi-122 Frequency Response



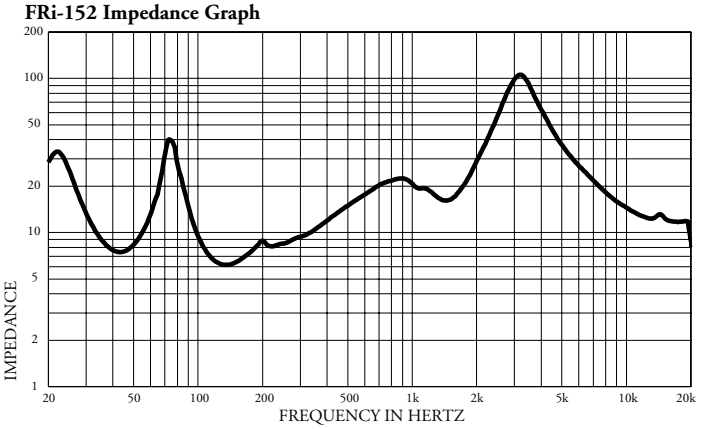
FRi-122 Impedance Graph



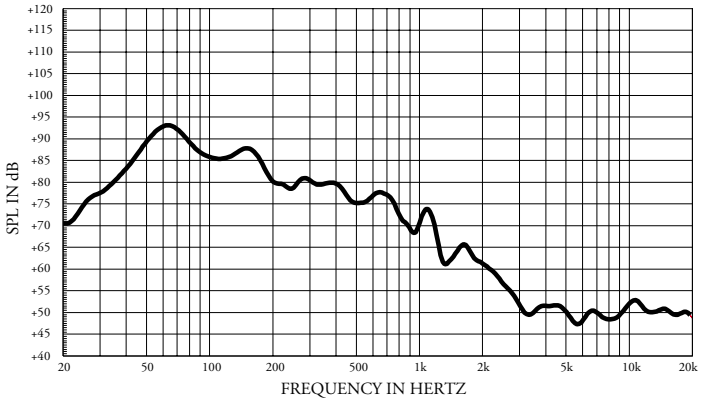
FRi-152 Frequency Response



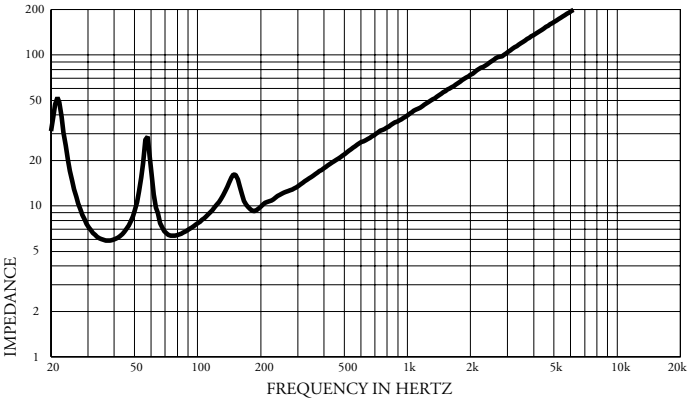
FRi-152 Impedance Graph



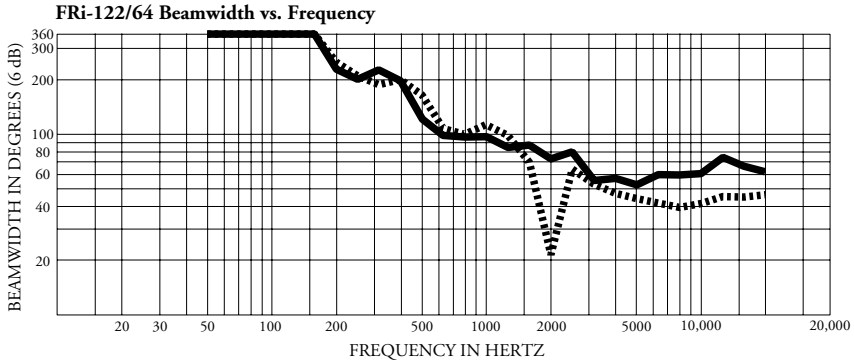
FRi-181s Frequency Response



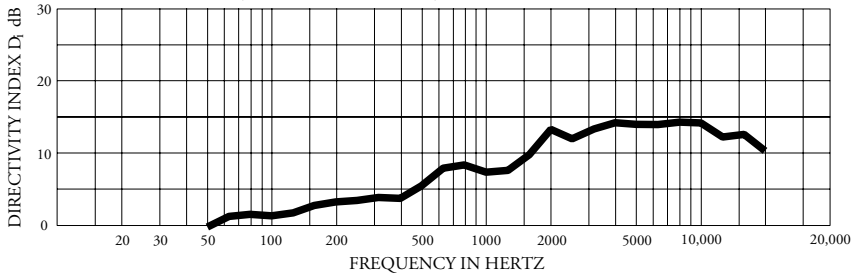
FRi-181s Impedance Graph



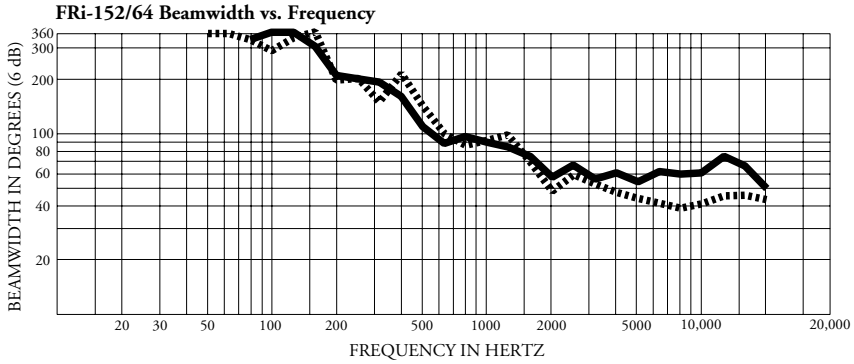
FRi-122/64 Beamwidth vs. Frequency



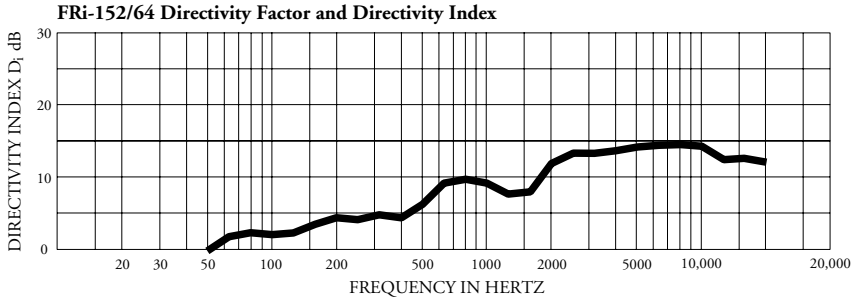
FRi-122/64 Directivity Factor and Directivity Index



FRi-152/64 Beamwidth vs. Frequency



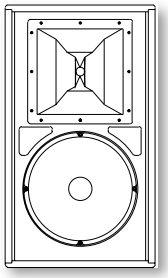
FRi-152/64 Directivity Factor and Directivity Index

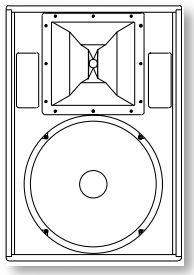


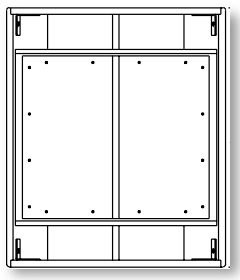
F R i
SPEAKER
SYSTEMS

Appendix E Product Specifications

Product Specifications







Model	FRi-122/64	FRi-152/64	FRi-181S
Configuration	Two-way Full-range	Two-way Full-range	Sub
Frequency Range (Passive)			
- 3 dB	62 Hz-15 kHz	70 Hz-15 kHz	45 Hz-160 Hz
-10 dB	50 Hz-16 kHz	50 Hz-16 kHz	36 Hz-250 Hz
Coverage (H° x V°)			
Normal	60° x 40°	60° x 40°	N/A
Rotated	40° x 60°	40° x 60°	
LF Cone	12-inch	15-inch	18-inch
Normal Impedance (Ohms)			
Passive	8	8	8
Biamp (LF/HF)	8/8	8/8	8
Sensitivity (1W @ 1m/ dB SPL)	97 dB	98 dB	97 dB
Power Handling (Passive)			
Long-term (EIA)	300 watts	350 watts	400 watts
Short-term peak	1200 watts	1400 watts	1600 watts
Dimensions inches (mm)			
Height	28.0 (711)	28.0 (711)	28.0 (711)
Width in front	15.9 (404)	19.0 (483)	23.5 (597)
Width in back	7.0 (178)	7.3 (185)	16.0 (406)
Depth	17.6 (447)	23.2 (589)	30.0 (762)
Trapezoid Angle	15° per side	15° per side	7.5° per side
Weight (lbs/kg)			
Net Weight	60/27.3	70/31.8	100/45.5
Shipping Weight	72/32.7	82/37.3	110/50.0

EV EVERYWHERE℠

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Switzerland Keltenstrasse 11, CH-2563 IPSACH, Switzerland, Phone: 41/32-331-6833, FAX: 41/32-331-1221
Germany Hirschberger Ring 45, D94315, Straubing, Germany, Phone: 49 9421-706 0, Fax: 49 9421-706 287
France Parc de Courcerin, Allee Lech Walesa, Lognes, 77185 Marne La Vallee, France, Phone: 33/1-6480-0090, FAX: 33/1-6480-4538
Australia Unit 23, Block C, Slough Business Park, Slough Avenue, Silverwater, N.S.W. 2128, Australia, Phone: 61/2-9648-3455, FAX: 61/2-9648-5585
Hong Kong Unit E & F, 21/F, Luk Hop Industrial Bldg., 8 Luk Hop St., San PO Kong, Kowloon, Hong Kong, Phone: 852-2351-3628, FAX: 852-2351-3329
Japan 2-5-60 Izumi, Suginami-ku, Tokyo, Japan 168, Phone: 81-3-3325-7900, FAX: 81-3-3325-7789
Singapore 3015A Ubi Rd 1, 05-10, Kampong Ubi Industrial Estate, Singapore 408705, Phone: 65-746-8760, FAX: 65-746-1206
Mexico Av. Parque Chapultepec #66-201, Col. El. Parque Edo. Mex. 53390, Phone: (52) 5358-5434, FAX: (52) 5358-5588
UK 4, The Willows Centre, Willow Lane, Mitcham, Surrey CR4 4NX, UK, Phone: 44 181 640 9600, FAX: 44 181 646 7084
Africa, Mid-East 12000 Portland Ave South, Burnsville, MN 55337, Phone: 952-887-7424, FAX: 952-887-9212
Latin America 12000 Portland Ave South, Burnsville, MN 55337, Phone: 952-887-7491, FAX: 952-887-9212

U.S.A. and Canada only.
For customer orders, contact the Customer Service department at 800/392-3497 Fax: 800/955-6831
For warranty repair or service information, contact the Service Repair department at 800/685-2606
For technical assistance, contact Technical Support at 800/392-3497
Please refer to the Engineering Data Sheet for warranty information.
Specifications subject to change without notice.

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