Ray-On
manual
for column models
R60, R100, R200
Active Audio
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14
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EN 54-24:2008
Type B

Loudspeaker for voice alarm systems
for fire detection systems and fire alarm
in buildings

RayOn models
R60TC-w, R60TC-b, R100TC-w,
R100TC-b, R200TC-w, R200TC-b

Details in RayOn Manual available on
www.activeaudio.fr
Contents

1 General Presentation 4
2 Positioning 4
3 CAD Modeling 6
4 Equalization and tuning 6
5 Installation and Wiring 7
6 Characteristics and Technical Drawings 10
1 General Presentation

The Ray-On column loudspeakers are passive, and based on the DGRC principle. The range includes three column models, and a proximity speaker:

- R60, height 60cm;
- R100, height 1m;
- R200, height 2m;
- Ray-On Mini, a proximity speaker.

This technical manual is for column speakers R60, R100 and R200. A specific technical manual is devoted to the Ray-On Mini.

Using the DGRC principle ensures an optimal sound coverage and intelligibility on the listening zone; it is illustrated in figure 1. For every model, the range depends on the installation height (see section 2).

Figure 1 – DGRC principle illustration

Ray-On loudspeakers are ideal for speech reinforcement in small to large spaces where the listening zone is horizontal (slope < 5°). Made of aluminum, Ray-On loudspeakers can be installed outdoor. They are suited for airports, railway stations, churches, conference rooms, shopping malls, amusement parks, etc.

Models R60TC, R100TC, and R200TC are compliant with standard EN5424 type B. They can be used in PA systems for safety announcements.

2 Positioning

The most important parameter for the installation of Ray-On loudspeaker is its mounting height because the range of the column directly depends on it.

Figure 2 on the facing page shows the ±5dB range\(^1\) versus to the mounting height, for the direct field\(^2\) at mid-frequencies (300Hz-3kHz).

\(^1\) Range for a standing audience shown. For a seating audience, take off 40cm to the column height.
\(^2\) Taking the reverberated field into account minimizes the influence of the floor’s material.
Figure 2 – ±5dB range (m) according to mounting height (from floor to bottom of column, in m).

Table 1 on the next page gives the minimum, maximum, and nominal values for Ray-On mounting height.\(^3\)

\(^3\)Ears are at 1.15m from floor for a seated audience, 1.55m for a standing audience.
### CAD Modeling

There are powerful CAD software tools that can predict the acoustics of a room and accurately model the radiation of loudspeaker arrays. These tools can calculate various acoustic indices, such as reverberation time, sound pressure level, STI, etc.

The sound radiation of the Ray-On loudspeakers can be predicted directly using CATT-Acoustic or EASE softwares.

A simple direct sound simulation tool is directly accessible on [www.activeaudio.fr](http://www.activeaudio.fr).

Direct sound prediction is also given in the technical characteristics section 6 on page 10.

### Equalization and tuning

Ray-On loudspeakers may be used without any equalization, but using one is advised. Equalization flattens the column's frequency response and protects the loudspeakers by filtering low frequencies.

The recommended equalization is the same for the 3 different models, which allow many columns to be put together on the same 100V line.

Two equalizations are specified:

- one for speech, which uses 4 cells (n°2-5);
- the other for music, which uses 6 cells (n°1-6).

The table 2 on the next page gives detailed information about these equalizations. The corresponding frequency curves are presented in figure 3 on the facing page.
<table>
<thead>
<tr>
<th>Type</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parametric Freq = 100 Hz ; Gain = +6dB ; Width = 1.5 oct (Q=0.92)</td>
</tr>
<tr>
<td>2</td>
<td>2nd order high-pass Fcut = 130 Hz ; Gain = -3 dB @ Fcut (Butterworth)</td>
</tr>
<tr>
<td>3</td>
<td>Parametric Freq = 280 Hz ; Gain = -3.0 dB ; Width = 1.0 oct (Q=1.4)</td>
</tr>
<tr>
<td>4</td>
<td>Parametric Freq = 5 000 Hz ; Gain = +6 dB ; Width = 1.0 oct (Q=1.3)</td>
</tr>
<tr>
<td>5</td>
<td>Parametric Freq = 10 700 Hz ; Gain = -7.0 dB ; Width = 0.25 oct (Q=4.0)</td>
</tr>
<tr>
<td>6</td>
<td>Parametric Freq = 15 500 Hz ; Gain = +6.0 dB ; Width = 0.5 oct (Q=1.2)</td>
</tr>
</tbody>
</table>

Table 2 – Recommended equalization

If a subwoofer is used, it is advised not to activate the cell 1, frequencies under 180Hz being rendered by the sub.
This allows the columns to not be driven with important levels of low frequencies.

![Recommended equalization curve with (red) and without (blue) cells n°1 and n°6.](image)

Figure 3 – Recommended equalization curve with (red) and without (blue) cells n°1 and n°6.

5 Installation and Wiring

Ray-On loudspeakers are vertically mounted, usually on a wall, using the supplied wall-mounting system. The next two pages illustrate the steps to follow for column mounting.

An accessory is available for mast mounting.

**Height adjustment:** If changing the column’s height is necessary, take the column off its wall-mounting system, move the “hook-slide” along the backside rail, then put the column back on its wall-mounting system.

**100V:** Power selection is made on the connection terminal.

**Safety:** An M5 thread is available at the back of the column designed to accommodate a ring for mounting a safety cable.

**“Daisy-chain” cabling:** Two bushings are available on the back of the Ray-On columns, the second one being used to connect the column to another Ray-On.

**Good to know:** The cable diameter must be less than 7.5 mm, the wire’s between 0.5 and 2.5 mm².
6  Characteristics and Technical Drawings

6.1  General Characteristics

<table>
<thead>
<tr>
<th>Acoustical data</th>
<th>Ray-On 60</th>
<th>Ray-On 100</th>
<th>Ray-On 200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 Ω mode</td>
<td>100V mode</td>
<td>8 Ω mode</td>
</tr>
<tr>
<td>Continuous power</td>
<td>75W</td>
<td>18W / 36W / 72W</td>
<td>150W</td>
</tr>
<tr>
<td>SPL max</td>
<td>91dB at 5m</td>
<td>85 / 88 / 91dB at 5m</td>
<td>92dB at 8m</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>71dB / W at 5m</td>
<td>72dB / W at 8m</td>
<td>71dB / W at 16m</td>
</tr>
<tr>
<td>Freq. bandwidth at -3dB/-10dB</td>
<td>150Hz - 14.5kHz / 120Hz - 17kHz</td>
<td>150Hz - 16.5kHz / 120Hz - 18kHz</td>
<td>150Hz - 16.5kHz / 120Hz - 19kHz</td>
</tr>
<tr>
<td>Range ±3dB/±5dB</td>
<td>6.5 / 12m</td>
<td>15 / 20 m</td>
<td>31 / 42 m</td>
</tr>
<tr>
<td>Vertical directivity</td>
<td>Wavefront synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal -6dB opening angle</td>
<td>360° at 500Hz / 190° at 1kHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loudspeakers</td>
<td>6 loudspeakers 70x70mm, outdoor</td>
<td>12 loudspeakers 70x70mm, outdoor</td>
<td>24 loudspeakers 70x70mm, outdoor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical data</th>
<th>Ray-On 60</th>
<th>Ray-On 100</th>
<th>Ray-On 200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 Ω mode</td>
<td>100V mode</td>
<td>8 Ω mode</td>
</tr>
<tr>
<td>Nominal impedance</td>
<td>8 Ω</td>
<td>556 / 278 / 139 Ω</td>
<td>8 Ω</td>
</tr>
<tr>
<td>Amp. power recom.</td>
<td>150 W</td>
<td>-</td>
<td>300 W</td>
</tr>
<tr>
<td>Connectors</td>
<td>Ceramic terminal block screw, with &quot;loop-through&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire section</td>
<td>from 0.5 to 2.5mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>Thermal fuse and protection against overload</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical data</th>
<th>Ray-On 60</th>
<th>Ray-On 100</th>
<th>Ray-On 200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 Ω mode</td>
<td>100V mode</td>
<td>8 Ω mode</td>
</tr>
<tr>
<td>Materials</td>
<td>Body: aluminum ; Grid: steel treated against rust and UV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions H x L x P</td>
<td>611 x 128 x 117 mm</td>
<td>1026 x 128 x 117 mm</td>
<td>1977 x 128 x 117 mm</td>
</tr>
<tr>
<td>Net / shipping weight</td>
<td>5.2 / 5.7 kg</td>
<td>8.3 / 9.1 kg</td>
<td>16.2 / 17.8 kg</td>
</tr>
<tr>
<td>Environment</td>
<td>IP54 ; from -25°C to +55°C, indoor / outdoor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colors</td>
<td>White (RAL9016 paintable) and Black (RAL9005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Vertical mounting on a wall or on a mast</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuning and exploitation</th>
<th>Ray-On 60</th>
<th>Ray-On 100</th>
<th>Ray-On 200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 Ω mode</td>
<td>100V mode</td>
<td>8 Ω mode</td>
</tr>
<tr>
<td>Mounting height (cm)</td>
<td>1.70 seating / 2.10 standing</td>
<td>1.90 seating / 2.30 standing</td>
<td>2.10 seating / 2.50 standing</td>
</tr>
<tr>
<td>Recom. equalization</td>
<td>Speech: 4 parametric cells / Music: 6 parametric cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modeling</td>
<td>EASE and CATT-Acoustic models available</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Unless specified otherwise, characteristics are measured with column at nominal mounting height on horizontal reflecting floor, and using recommended music equalization.
### Ray-On 60

**Warranty:** 5 years

**Maintenance:** No maintenance required

**Serial number:** YYMMXXXY (YY: year - MM: month - XXXX: serial)

**Certification:** EN54-24 type B for indoor and outdoor VA systems

### Ray-On 100

**Warranty:** 5 years

**Maintenance:** No maintenance required

**Serial number:** YYMMXXXY (YY: year - MM: month - XXXX: serial)

**Certification:** EN54-24 type B for indoor and outdoor VA systems

### Ray-On 200

**Warranty:** 5 years

**Maintenance:** No maintenance required

**Serial number:** YYMMXXXY (YY: year - MM: month - XXXX: serial)

**Certification:** EN54-24 type B for indoor and outdoor VA systems

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![Impedance Curve](image)

**Figure 4** – Ray-On loudspeakers impedance curves

(a) R60 impedance curve

(b) R100 impedance curve

(c) R200 impedance curve
Figure 5 – Technical drawings
6.3 Acoustical data

(a) Ray-On 60 vertical directivity: sound level for the speech octaves (500Hz, 1kHz, 2kHz) in the vertical median plane.

(b) Ray-On 60 horizontal directivity: sound level for the speech octaves (500Hz, 1kHz, 2kHz) on the listening plane (60cm below the column).

(c) Ray-On 60 frequency response, with recommended music equalization. Average from 2 to 10m in the axis.

Figure 6 – Ray-On 60: acoustical data

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[5] Column in nominal position at 2.30m from the floor. The reference SPL is the mean level in the listening zone.
(a) Ray-On 100 vertical directivity: sound level for the speech octaves (500Hz,1kHz,2kHz) in the vertical median plane.

(b) Ray-On 100 horizontal directivity: sound level for the speech octaves (500Hz,1kHz,2kHz) on the listening plane (80cm below the column).

(c) Ray-On 100 frequency response, with recommended music equalization. Average from 2 to 15m in the axis.

Figure 7 – Ray-On 100: acoustical data.
(a) Ray-On 200 vertical directivity: sound level for the speech octaves (500Hz, 1kHz, 2kHz) in the vertical median plane.

(b) Ray-On 200 horizontal directivity: sound level for the speech octaves (500Hz, 1kHz, 2kHz) on the listening plane (100cm below the column).

(c) Ray-On 200 frequency response, with recommended music equalization. Average from 2 to 30m in the axis.

FIGURE 8 – Ray-On 200: acoustical data