Technical Notes Volume 1, Number 6

# JBL High-frequency Directional Data in Isobar Form

## 1. Introduction:

This Technical Note presents directional data on JBL's high-frequency horns in isobar form for the benefit of those users who have access to various mapping programs for loudspeaker array layout.

Recent JBL specification sheets for new horns have included such data in spherical polar projection. In this Technical Note, that same data will be presented, along with similar information on our larger Bi-Radial horns. Additionally, we will present the isobars in rectangular projection.

## 2. How the Information was Gathered:

Polar information is measured on a spherical surface, which is three-dimensional, and is plotted in two dimensions. Anyone familiar with map-making will be aware of distortions when such transformations are made. Figure 1 shows the method of presentation chosen by JBL. The HF horn may be imagined as being located at the center of a sphere and pointed toward one of the poles. Data in this form can be used directly in the mapping programs of McCarthy (1), Becker (2), and the spherical mapping method of Prohs and Harris (3). The Altec mapping method (4) is different, as shown in Figure 2. In this case, we can imagine an HF horn located at the center of a sphere and pointed at the equator. The surface is unwrapped and flattened as shown, in a manner similar to a Mercator projection map. This mapping method produces isobars in rectangular coordinates.

All three- to two-dimensional mapping methods will result in at least one point on the measurement sphere being mapped into a line or a circle. In the JBL spherical mapping method, the point 180 degrees off the major axis will map into a circle. This is of little consequence, since we are not normally interested in performance so far off axis. In the Altec mapping method, points 90 degrees along the vertical axis will map into lines, and this may limit the representation, in that mapping method, of isobars in the -12 and -15 dB range.

In the region of the major axis, the two mapping methods are quite similar. In fact, up to 50 degrees off axis, the two methods will not differ by more than 10% in angular error.

In plotting the isobars in rectangular coordinates, we have made the necessary corrections so that points off-axis in the diagonal directions are properly represented. We have included the -12 dB isobars, where possible, consistent with the limitations of the rectangular form.

## 3. The Isobars:

Figures 3 through 9 present information on a wide variety of JBL HF devices. In all cases, the data was gathered by taking polar measurements around the device at 5-degree increments in both latitude and longitude.

Figures 10 through 16 show the same information in rectangular form, taking into acount the limitations of that mapping method.

For the large Bi-Radial horns, the data is presented on octave bands centered at 500 Hz, 1 kHz, and 2 kHz. The data at 2 kHz may be considered essentially the same as would be observed at 4 kHz and 8 kHz, considering only the -3, -6, and -9 isobars.

In actual use, the isobars will have to be altered in scale and transferred to the appropriate transparency overlays.

## References:

1. McCarthy, T. G., "Loudspeaker Arrays—a Graphic Method of Designing," Audio Engineering Society preprint no. 1398

2. Becker, F. M., "A Polar Plot Method of Loudspeaker Array Design," J. Audio Engineering Society, Vol. 30 (June 1982)

3. Prohs, J. and Harris, D., "An Accurate and Easily Implemented Method of Modeling Loudspeaker Array Coverage," Audio Engineering Society preprint no. 1941

4. Uzzle, T., "Loudspeaker Coverage by Architectural Mapping," J. Audio Engineering Society, Vol. 30 (June 1982)

*Figure 1.* **Polar Projection of Isobars.**

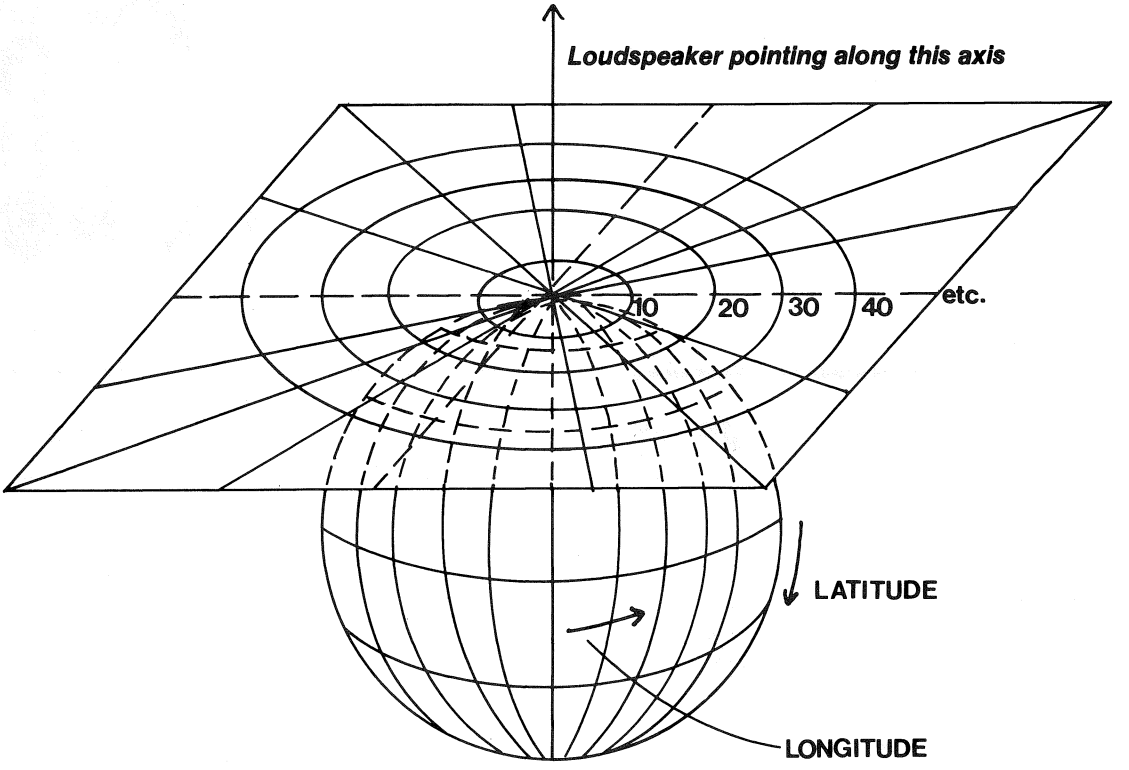



*Figure 2.* **Rectangular (Mercator) Projection of Isobars.**

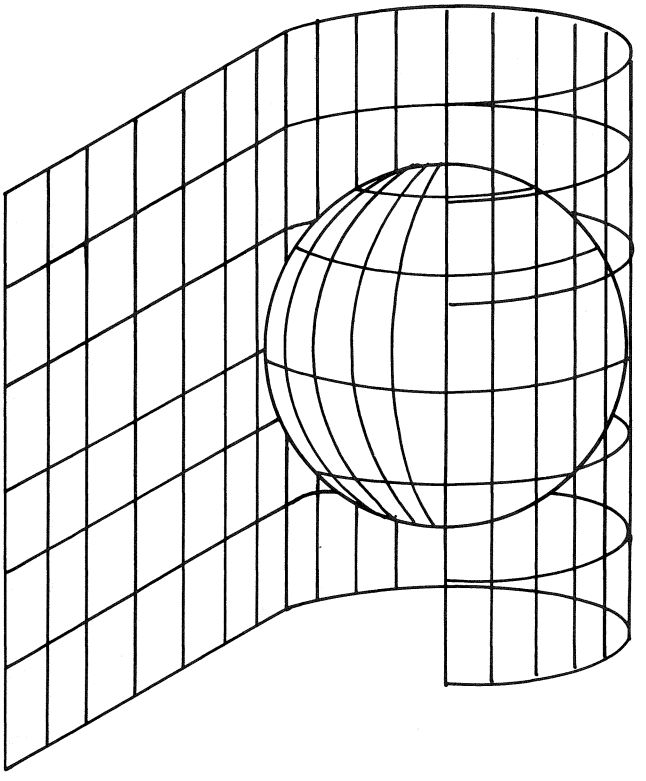


***Figure 3.*** **2360 Isobars.**

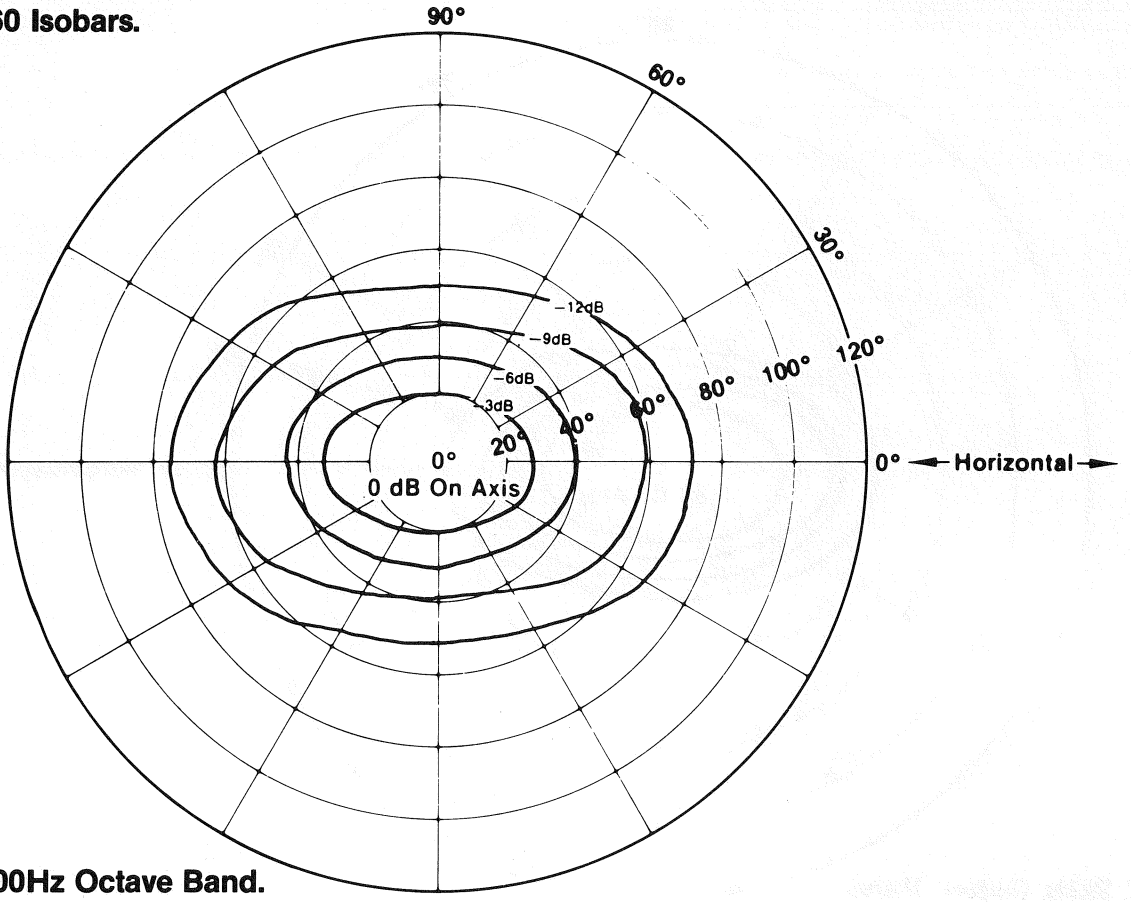



***Figure 3A.*** **500Hz Octave Band.**

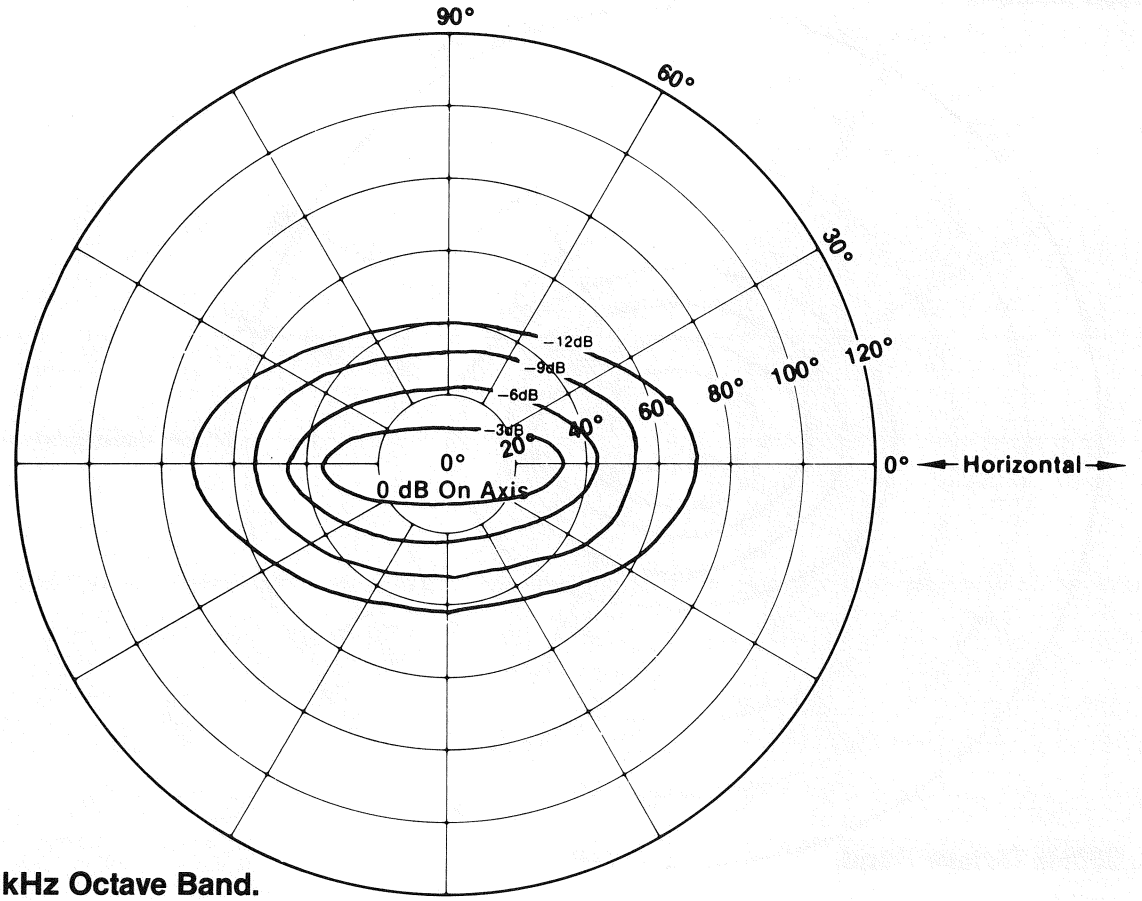



***Figure 3B.*** **1kHz Octave Band.**

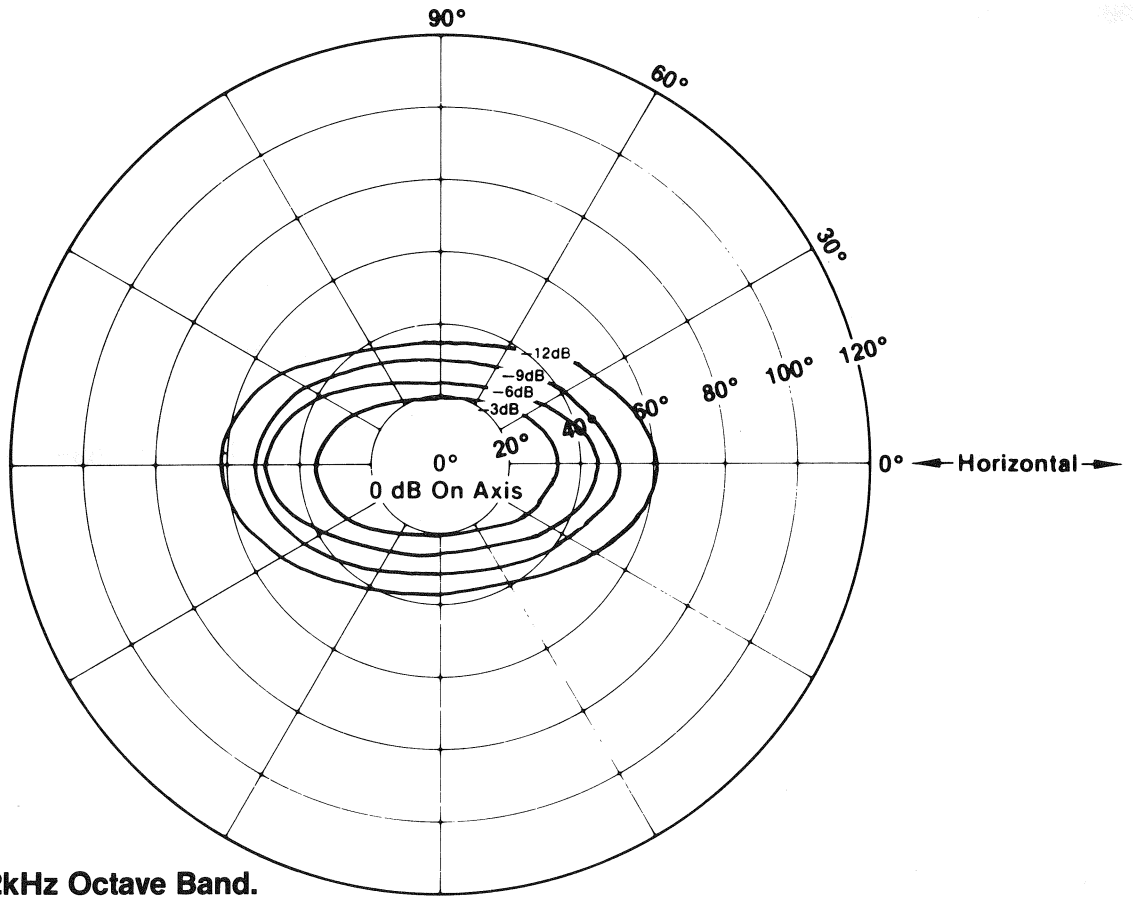



*Figure 3C.* **2kHz Octave Band.**

*Figure 4.* **2365 Isobars.**

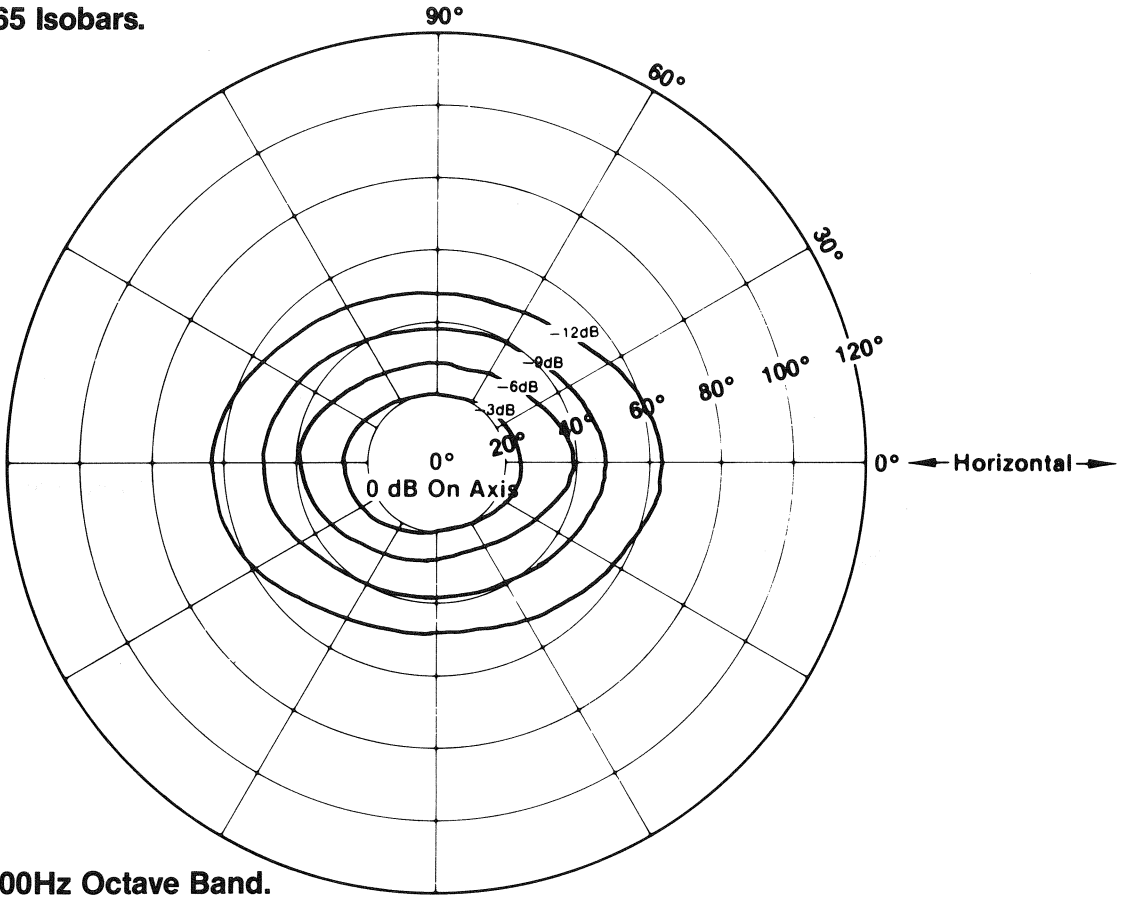



*Figure 4A.* **500Hz Octave Band.**

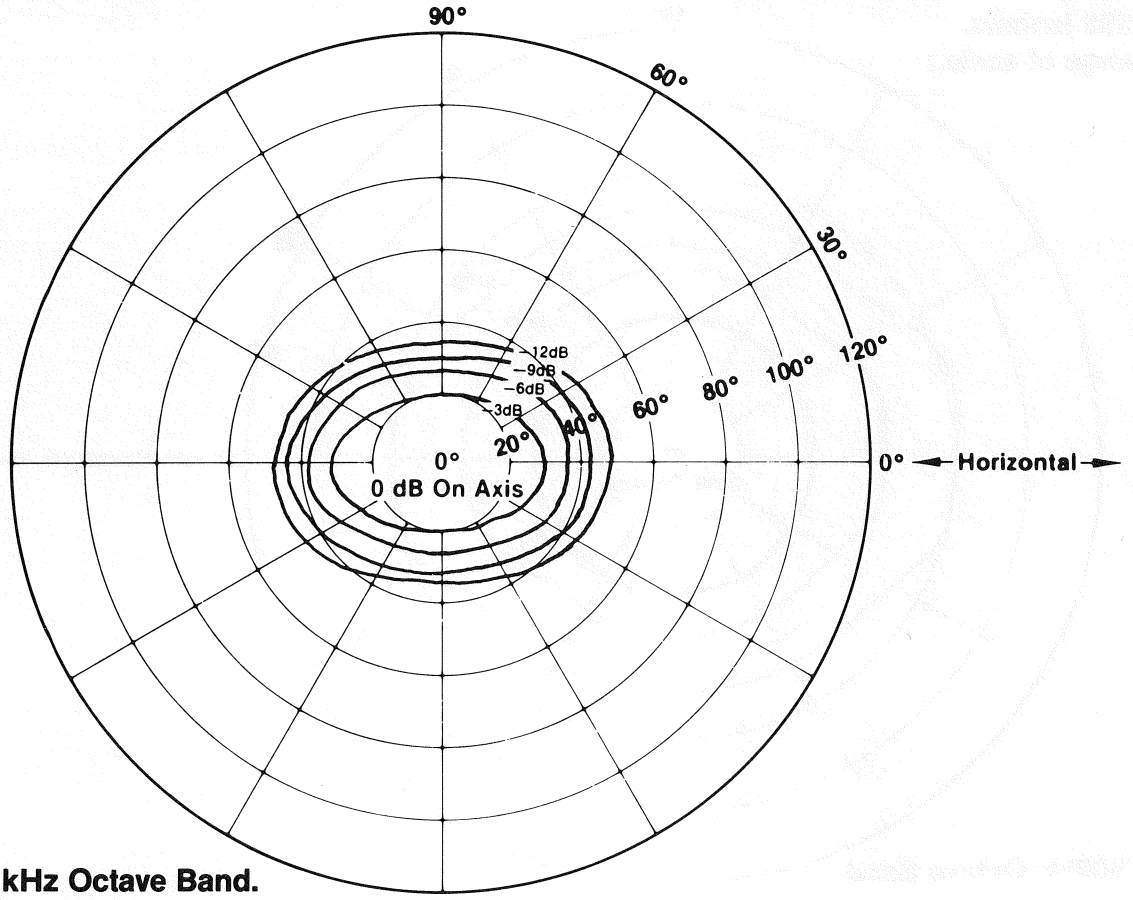



***Figure 4B.*** **1kHz Octave Band.**

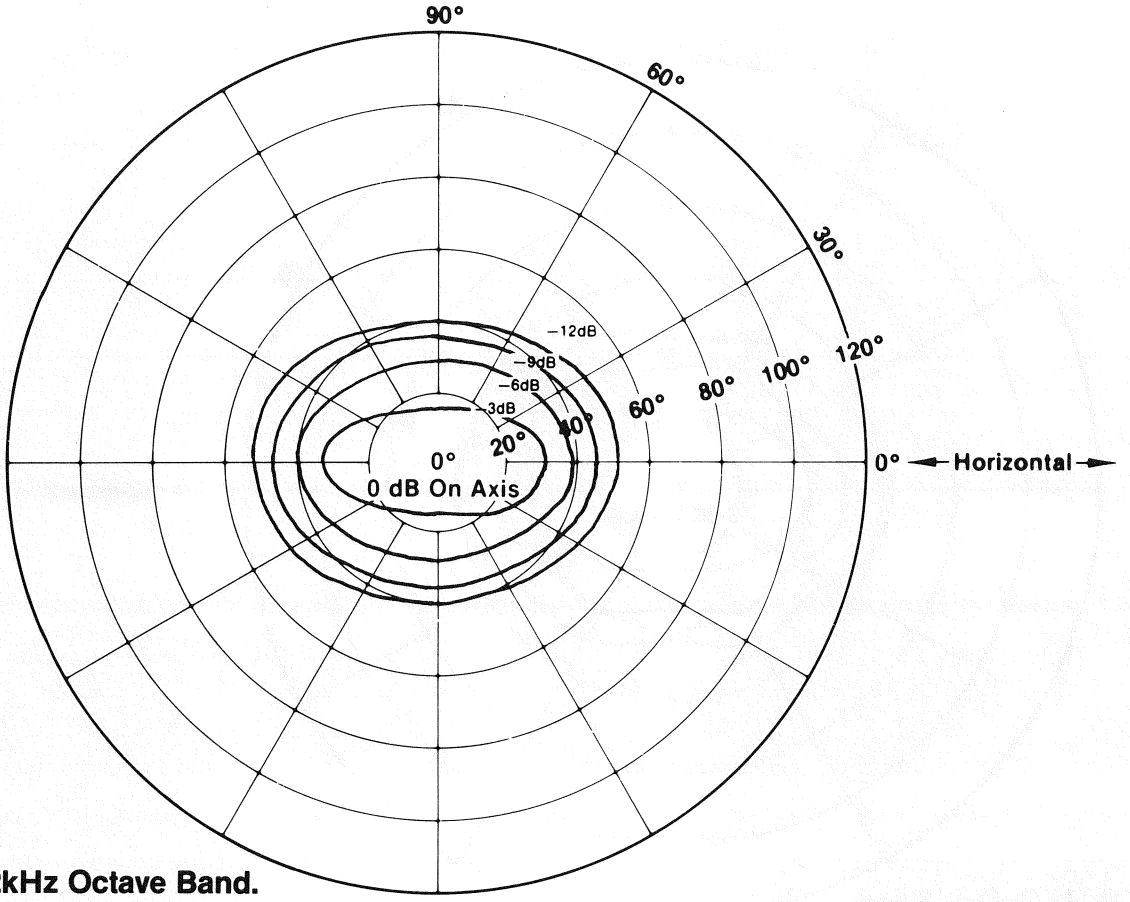



***Figure 4C.*** **2kHz Octave Band.**

***Figure 5.*** **2366 Isobars. (Note change of scale.)**

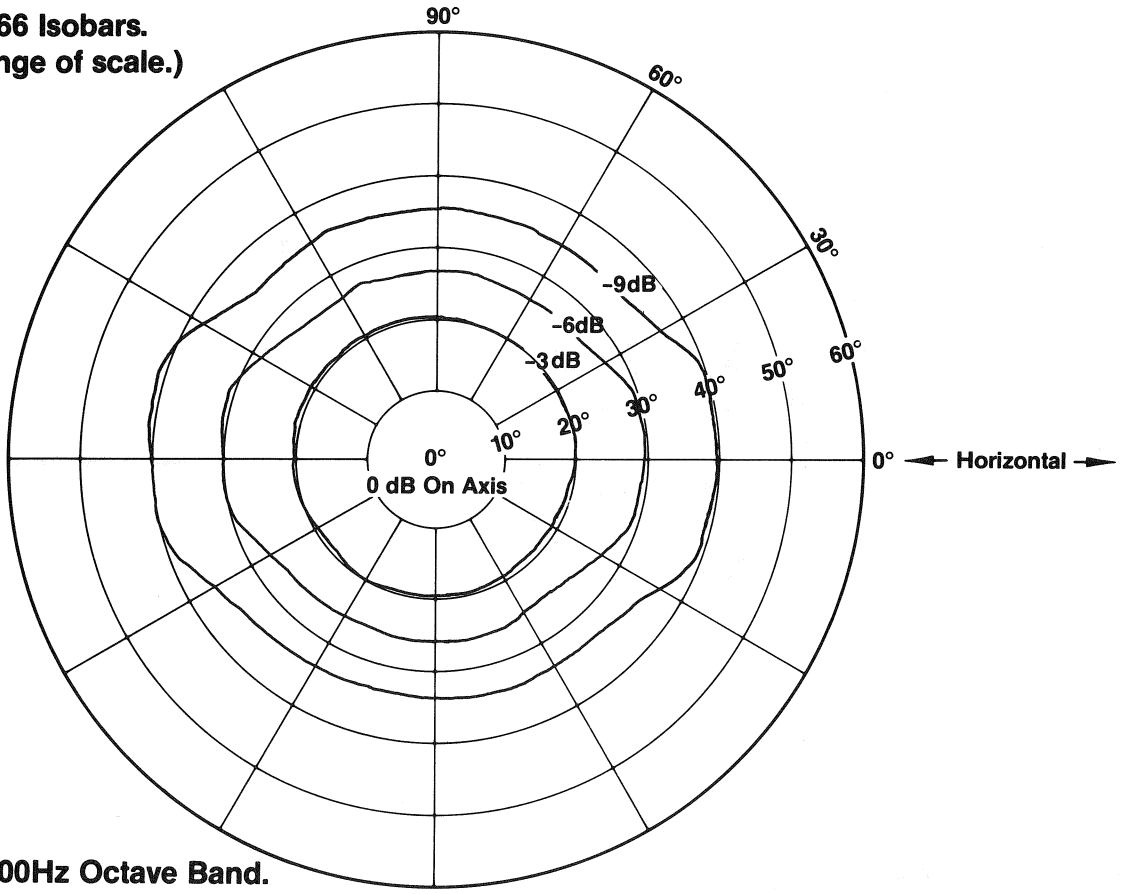



***Figure 5A.*** **500Hz Octave Band.**

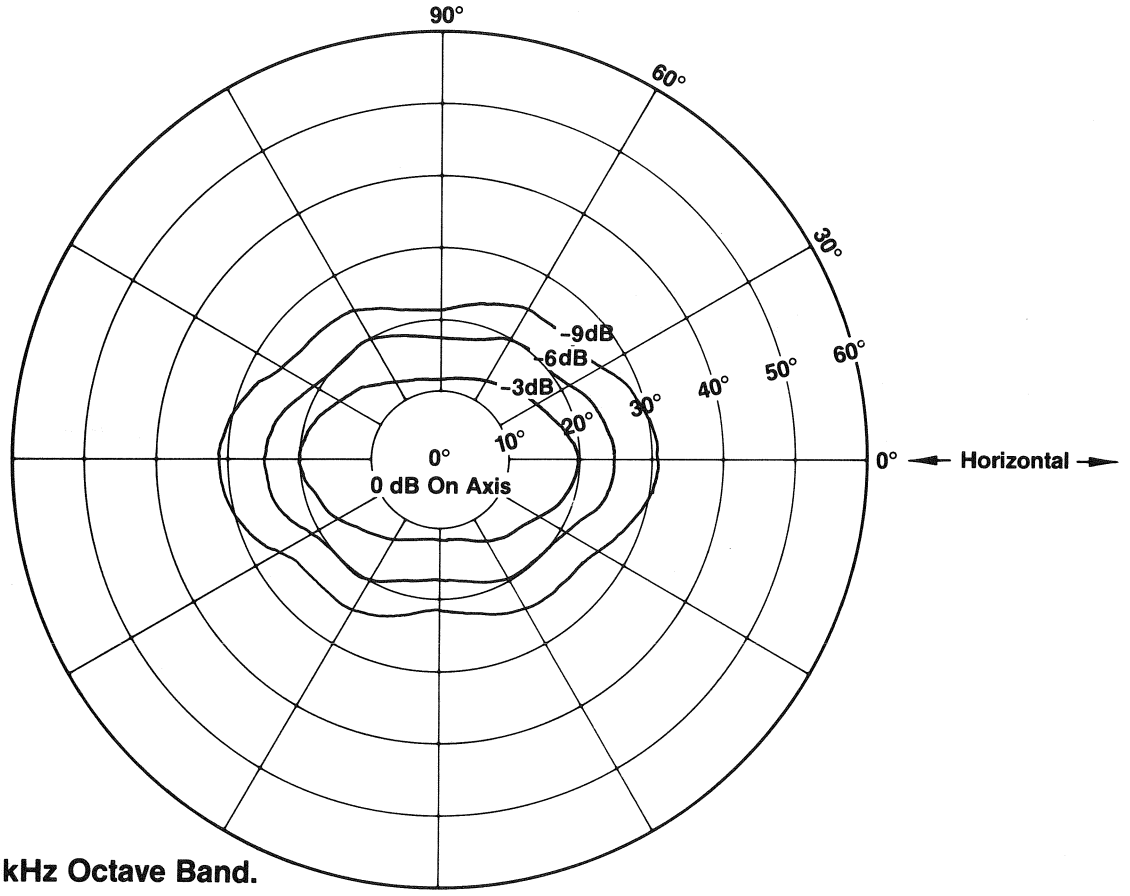



***Figure 5B.*** **1kHz Octave Band.**

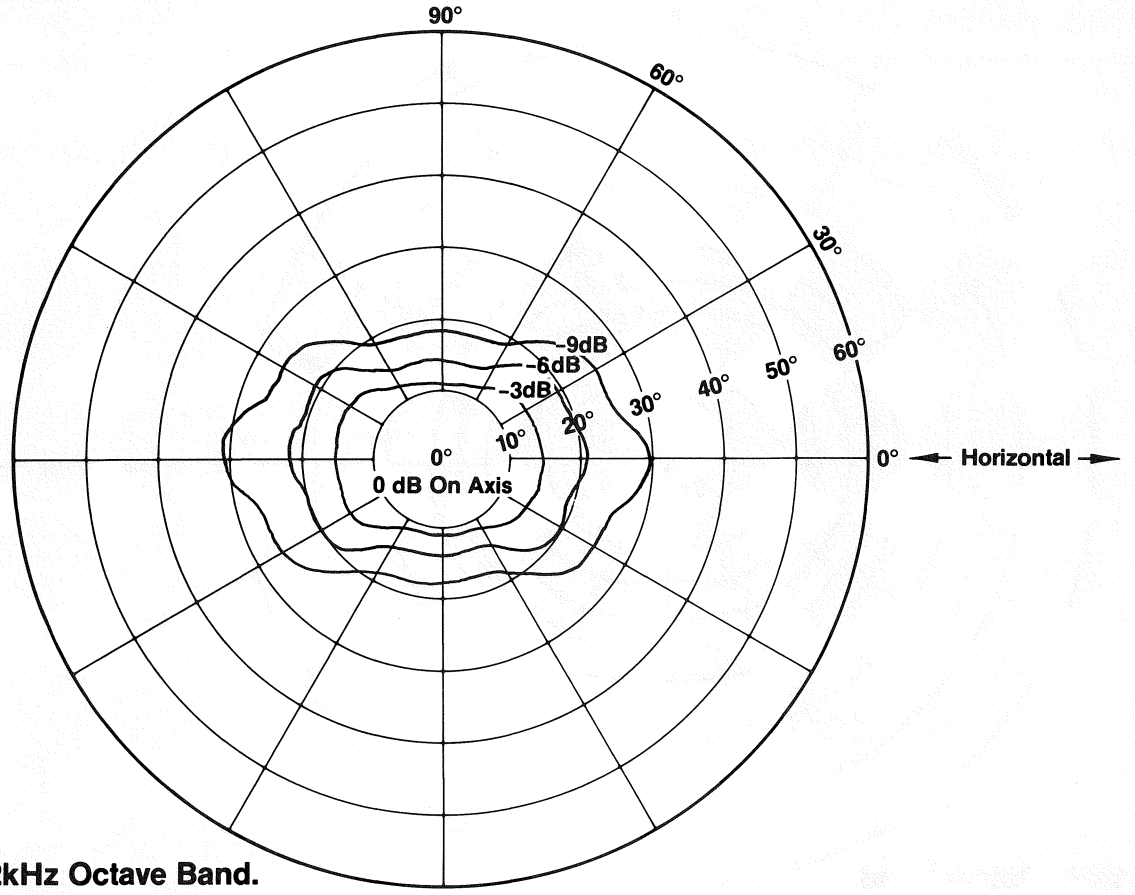



***Figure 5C.*** **2kHz Octave Band.**

***Figure 6.*** **2370 Isobars.**

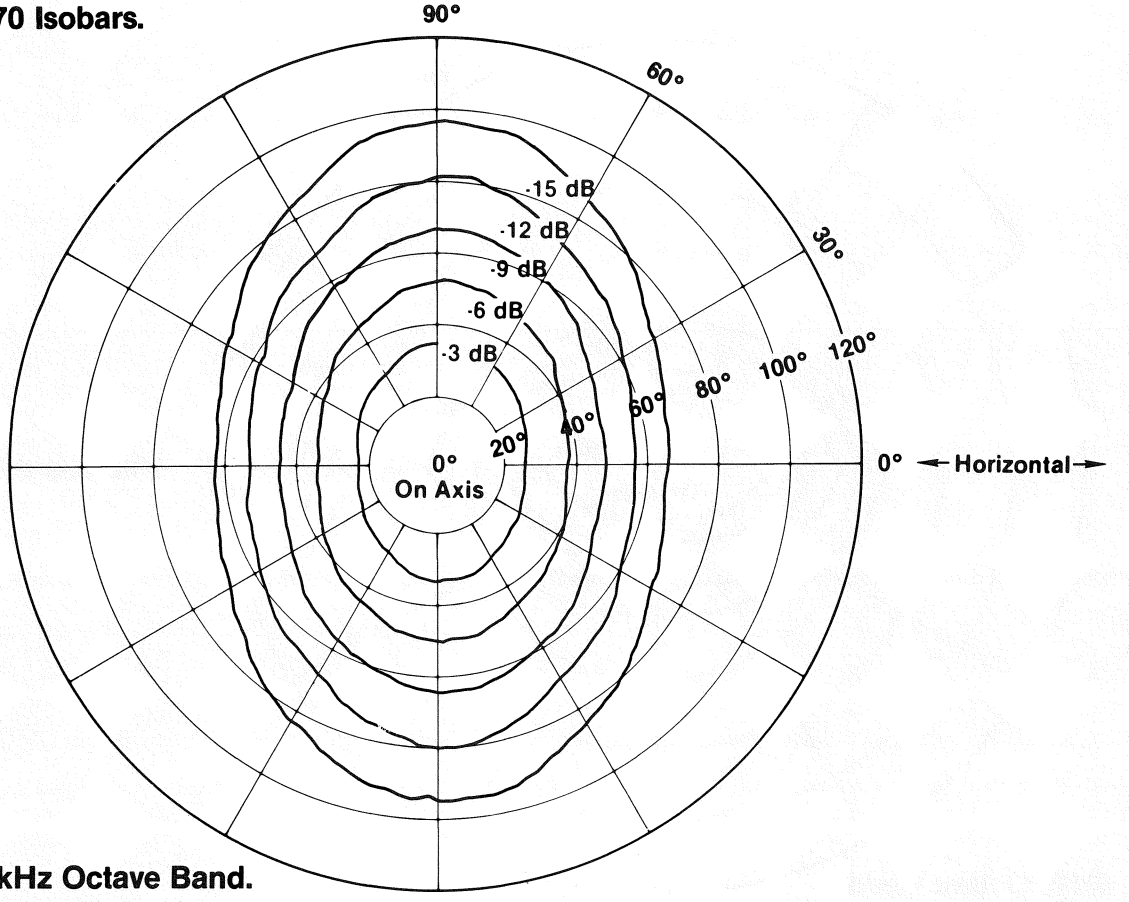



***Figure 6A.*** **1kHz Octave Band.**

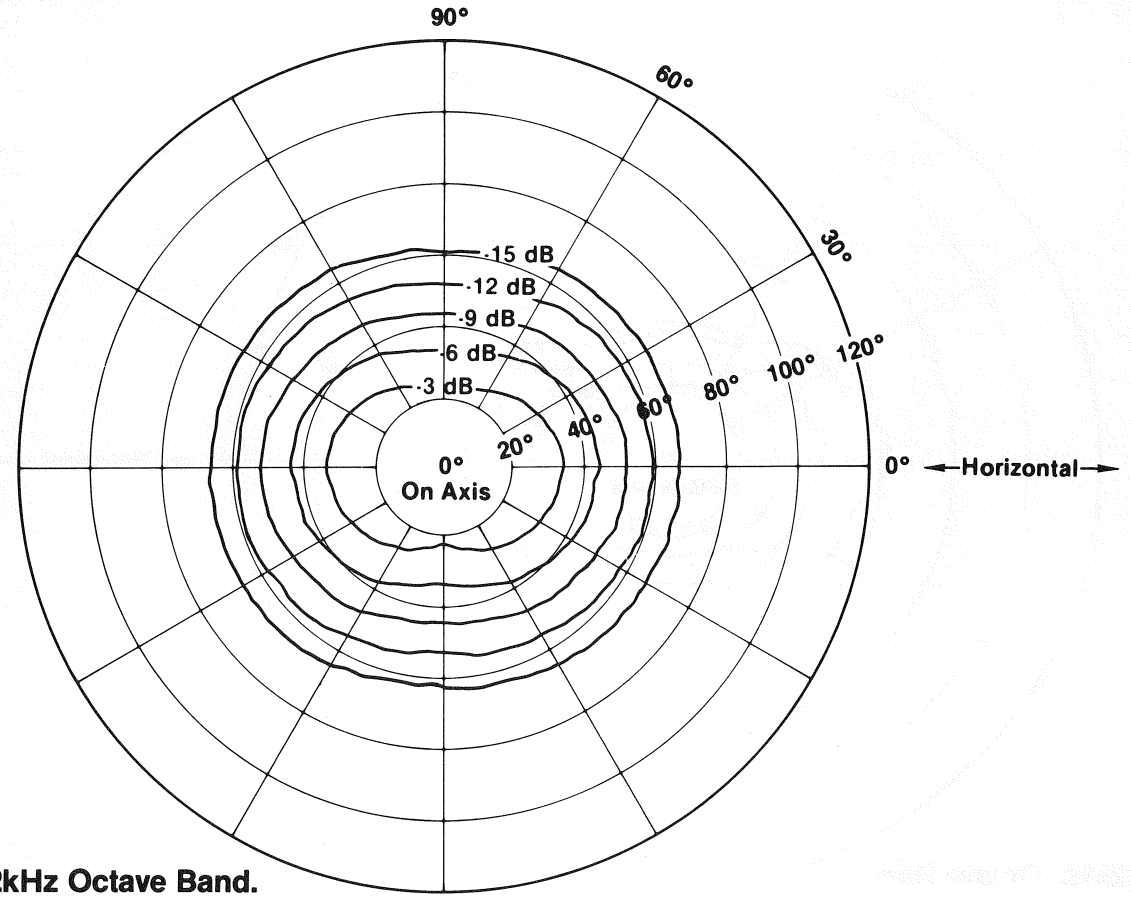



***Figure 6B.*** **2kHz Octave Band.**

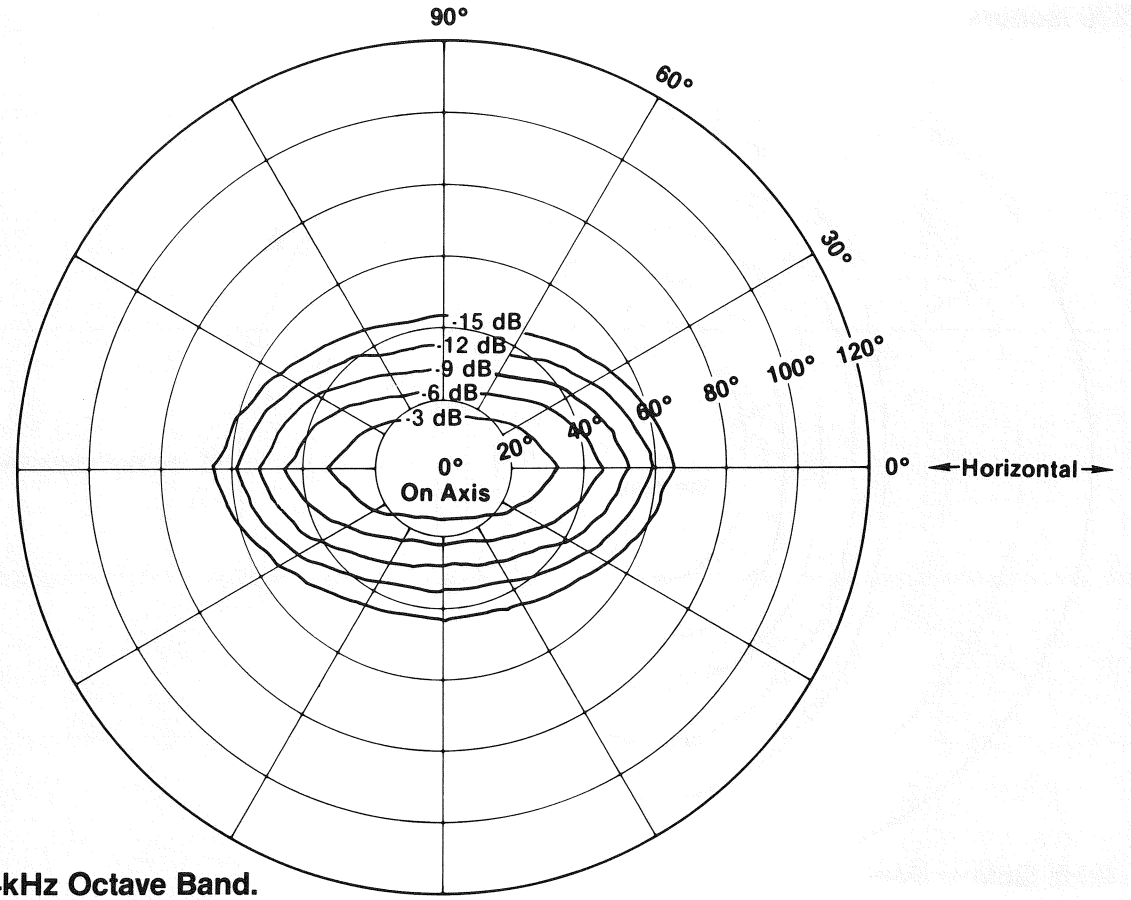



***Figure 6C.*** **4kHz Octave Band.**

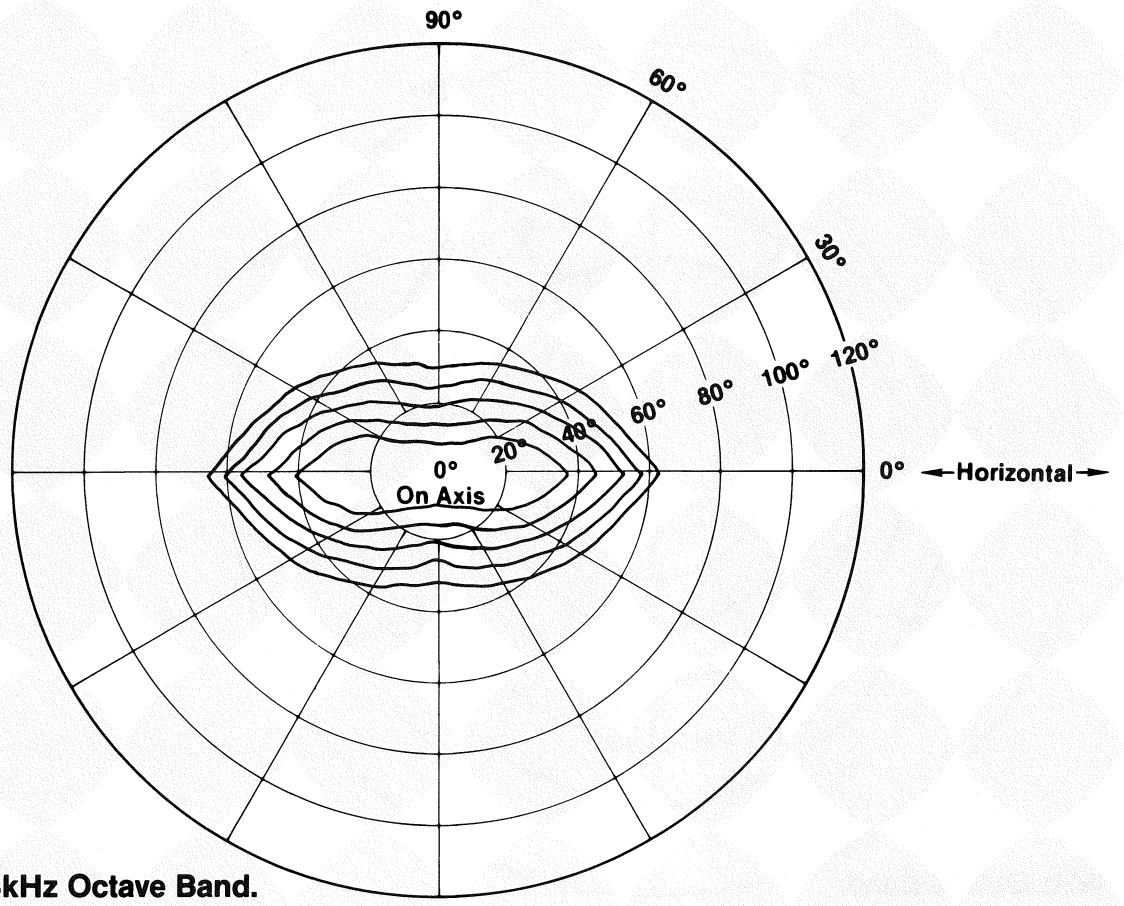



***Figure 6D.*** **8kHz Octave Band.**

***Figure 7.*** **2380 Isobars.**

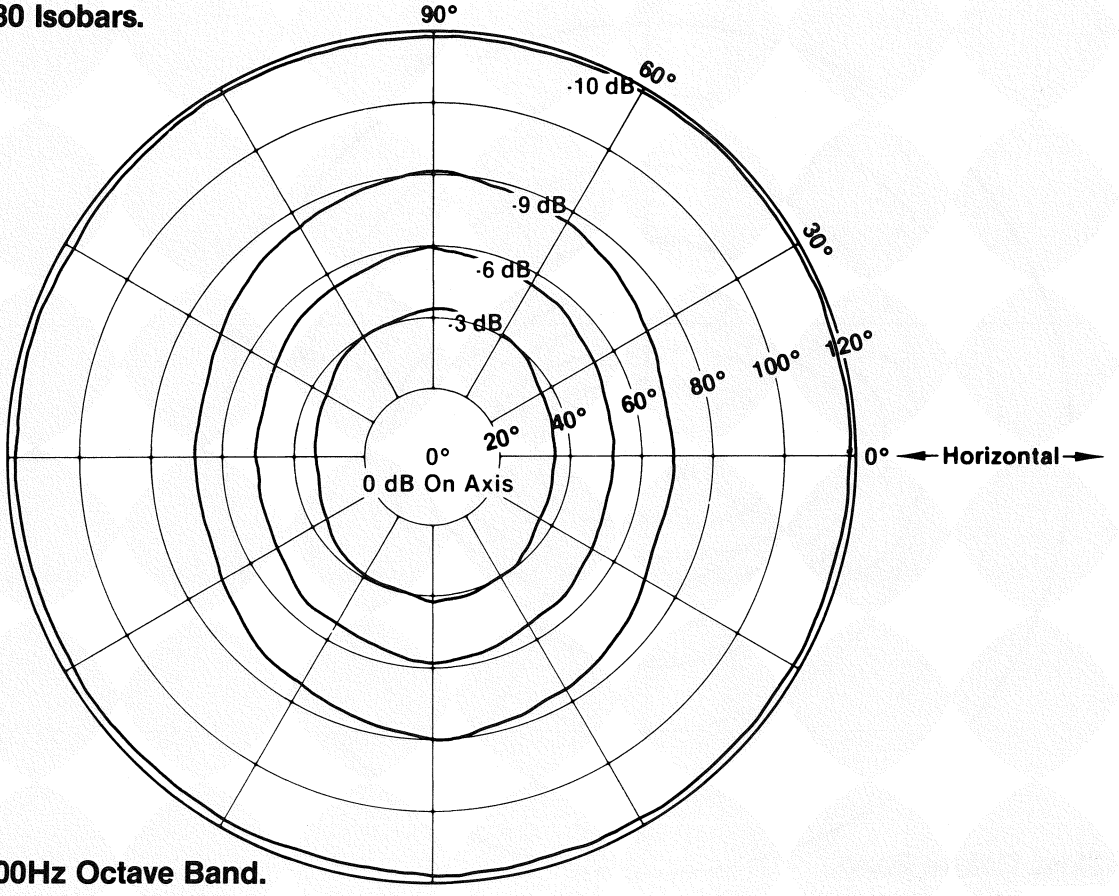



***Figure 7A.*** **500Hz Octave Band.**

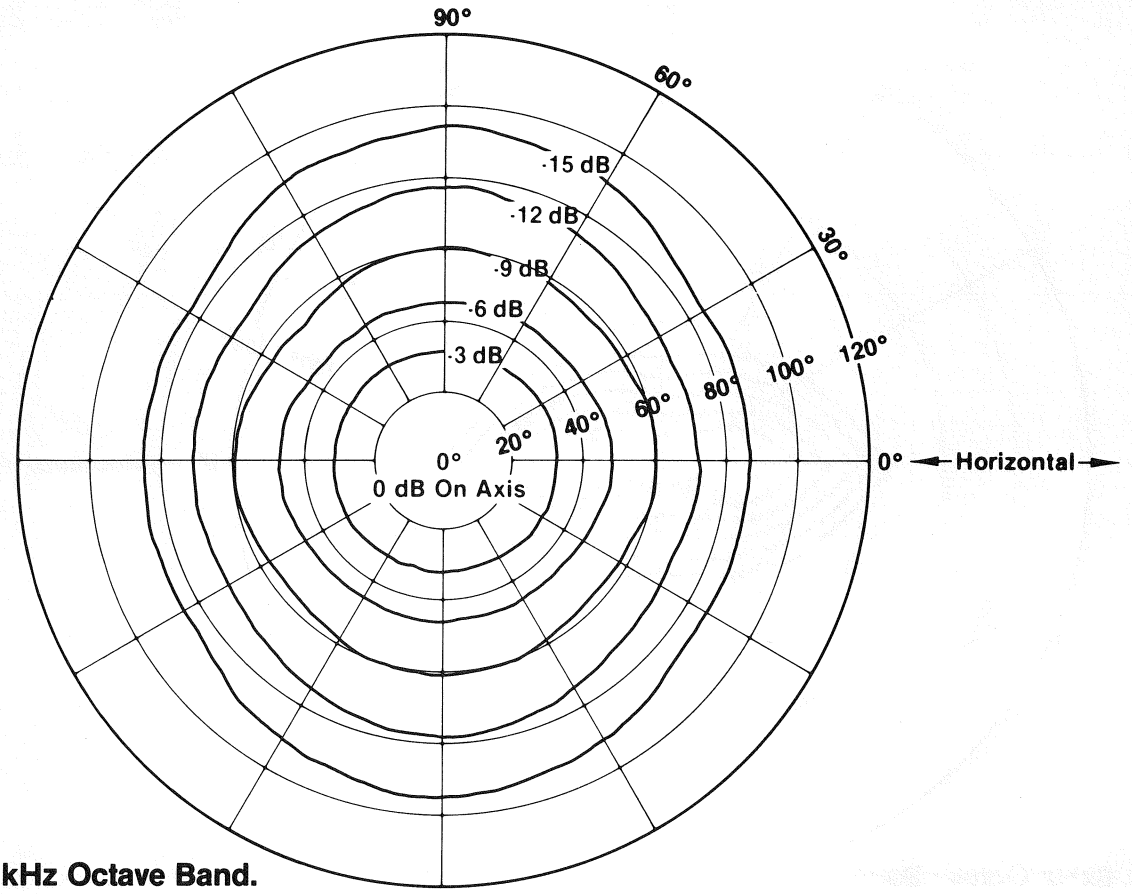



***Figure 7B.*** **1kHz Octave Band.**

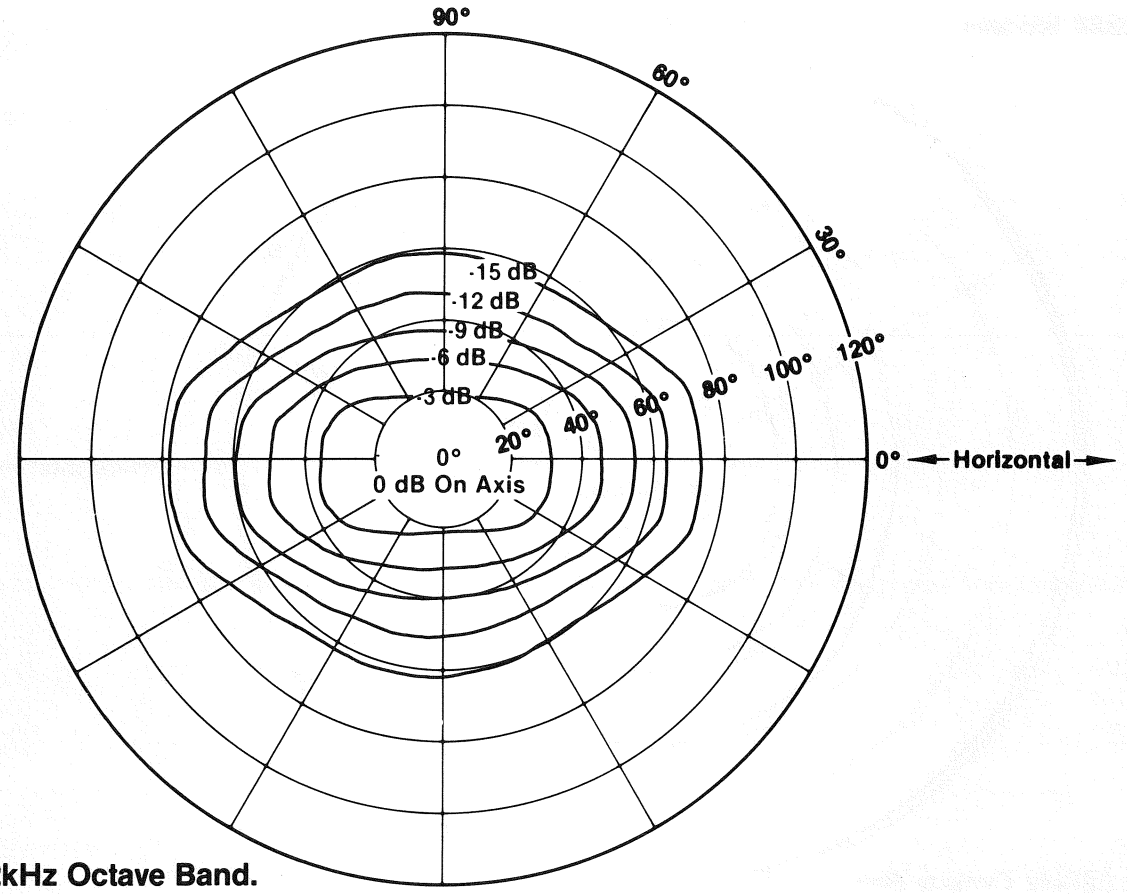



***Figure 7C.*** **2kHz Octave Band.**

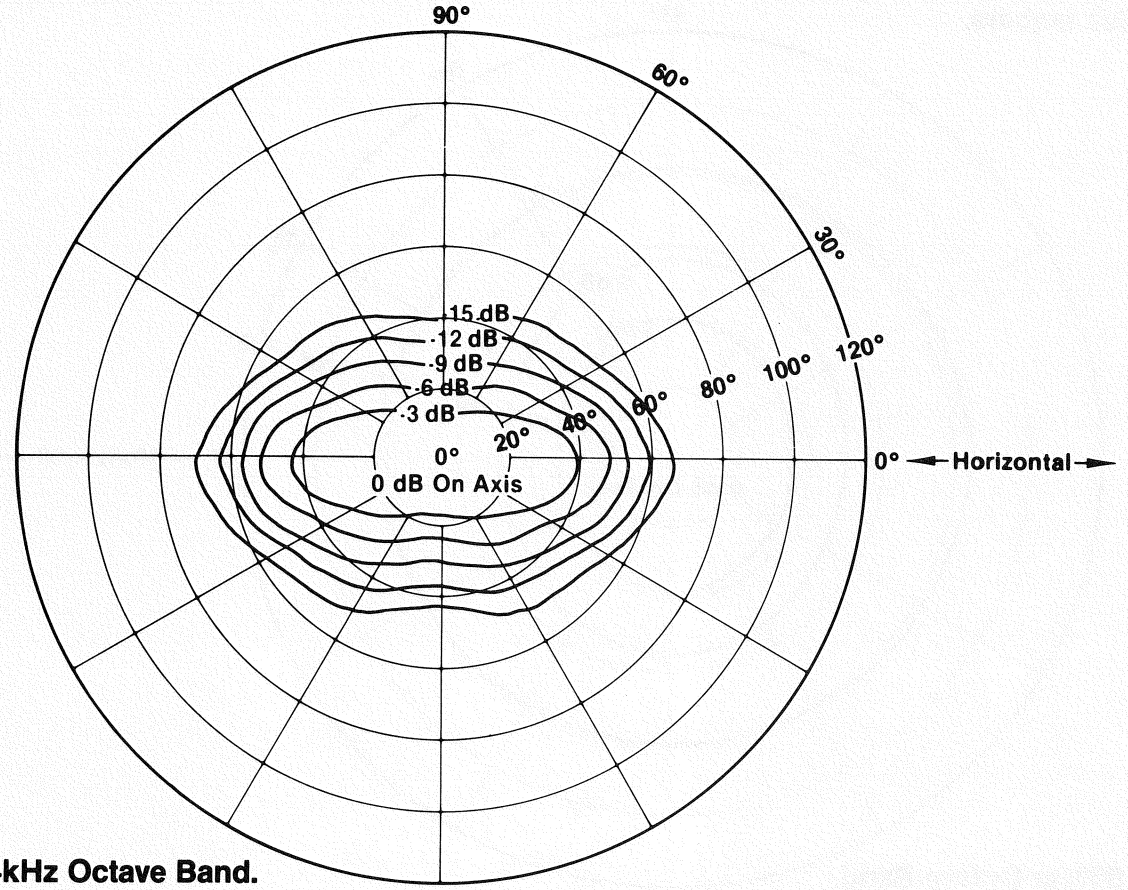



***Figure 7D.*** **4kHz Octave Band.**

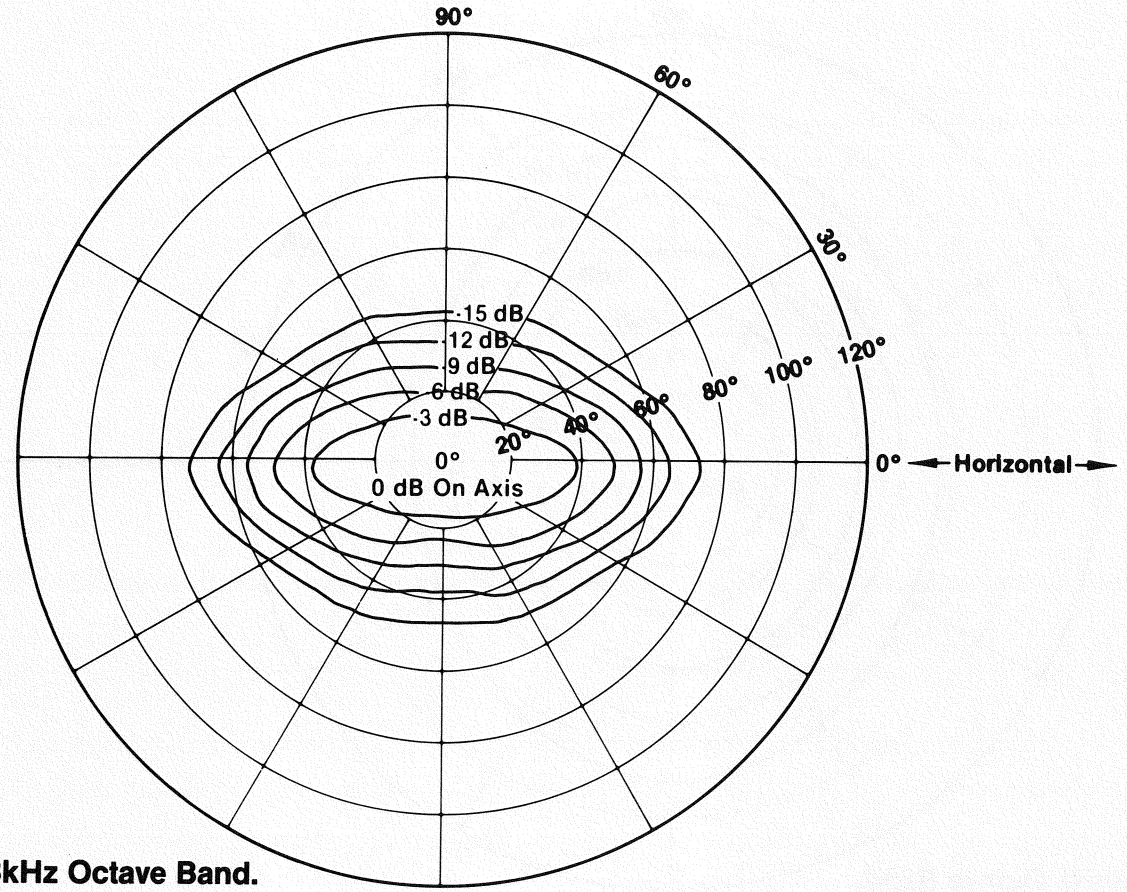



***Figure 7E.*** **8kHz Octave Band.**

*Figure 8.* **2385 Isobars.**

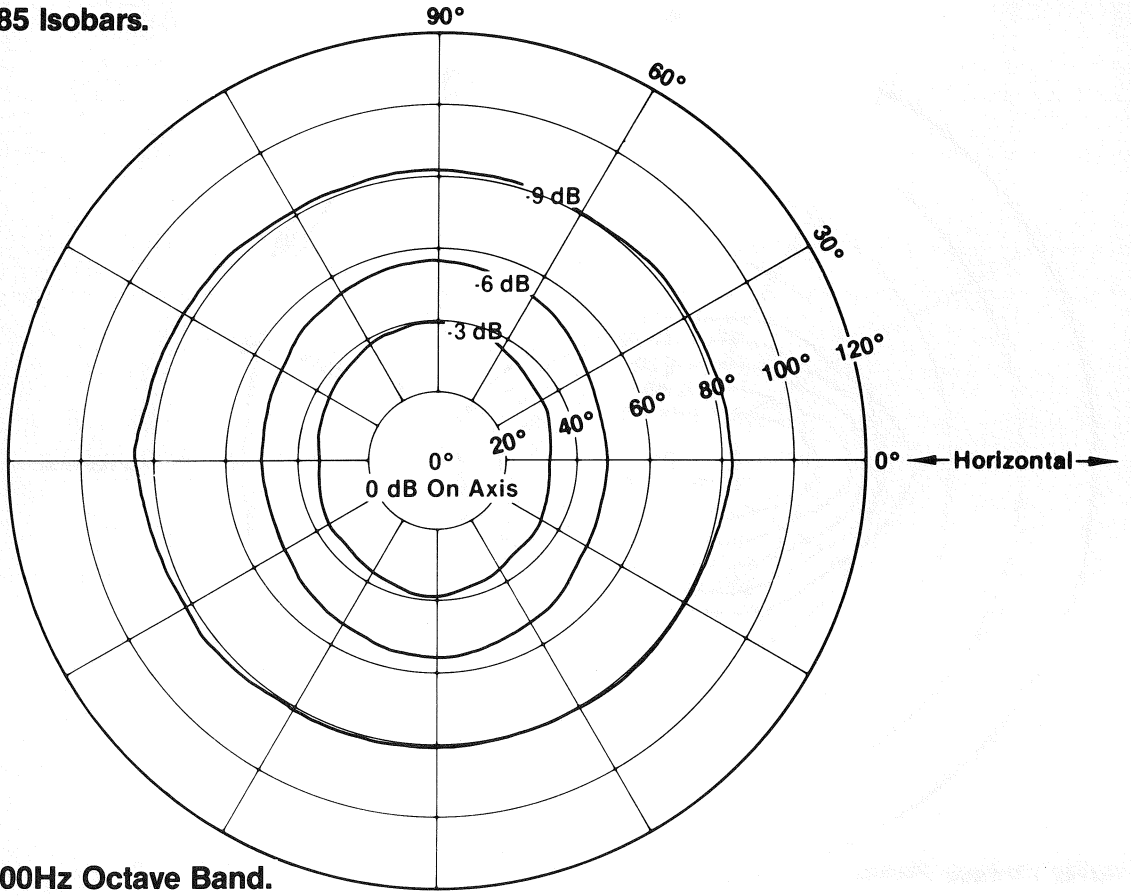



*Figure 8A.* **500Hz Octave Band.**

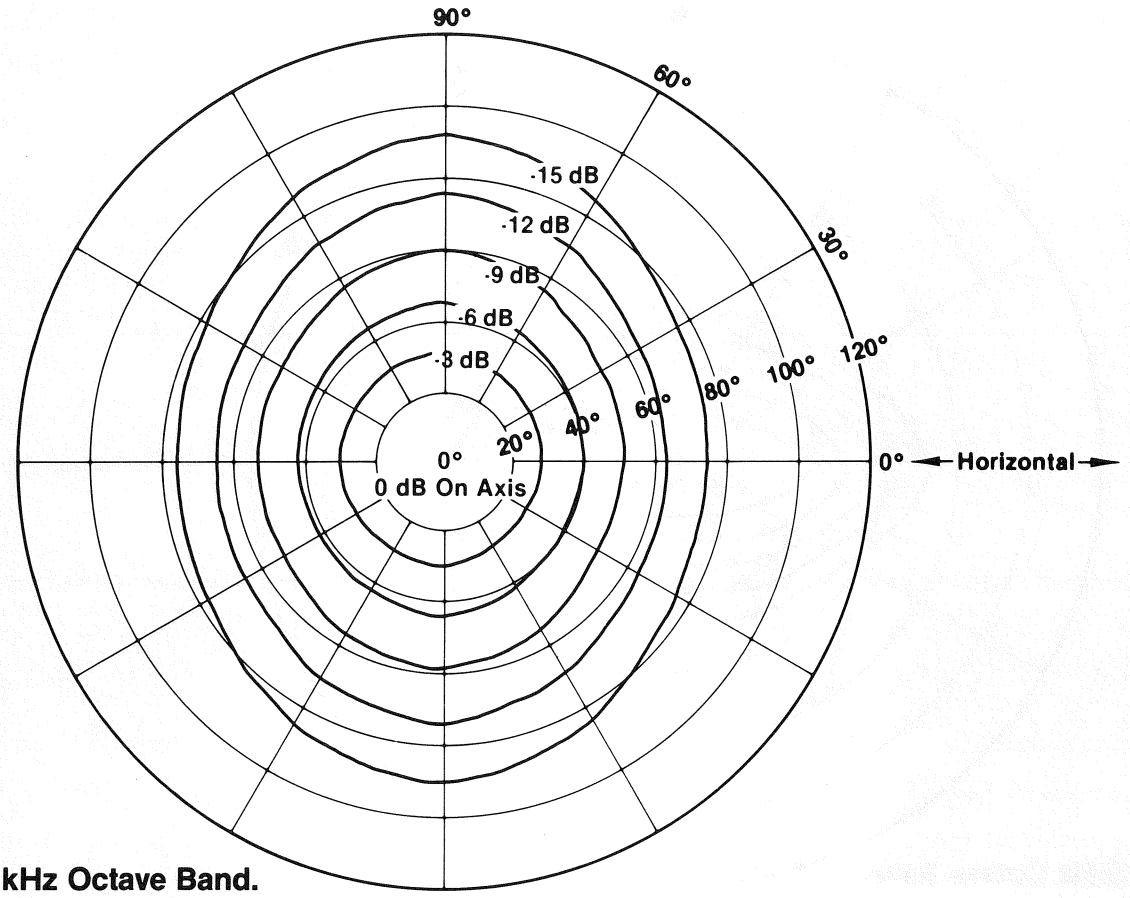



*Figure 8B.* **1kHz Octave Band.**

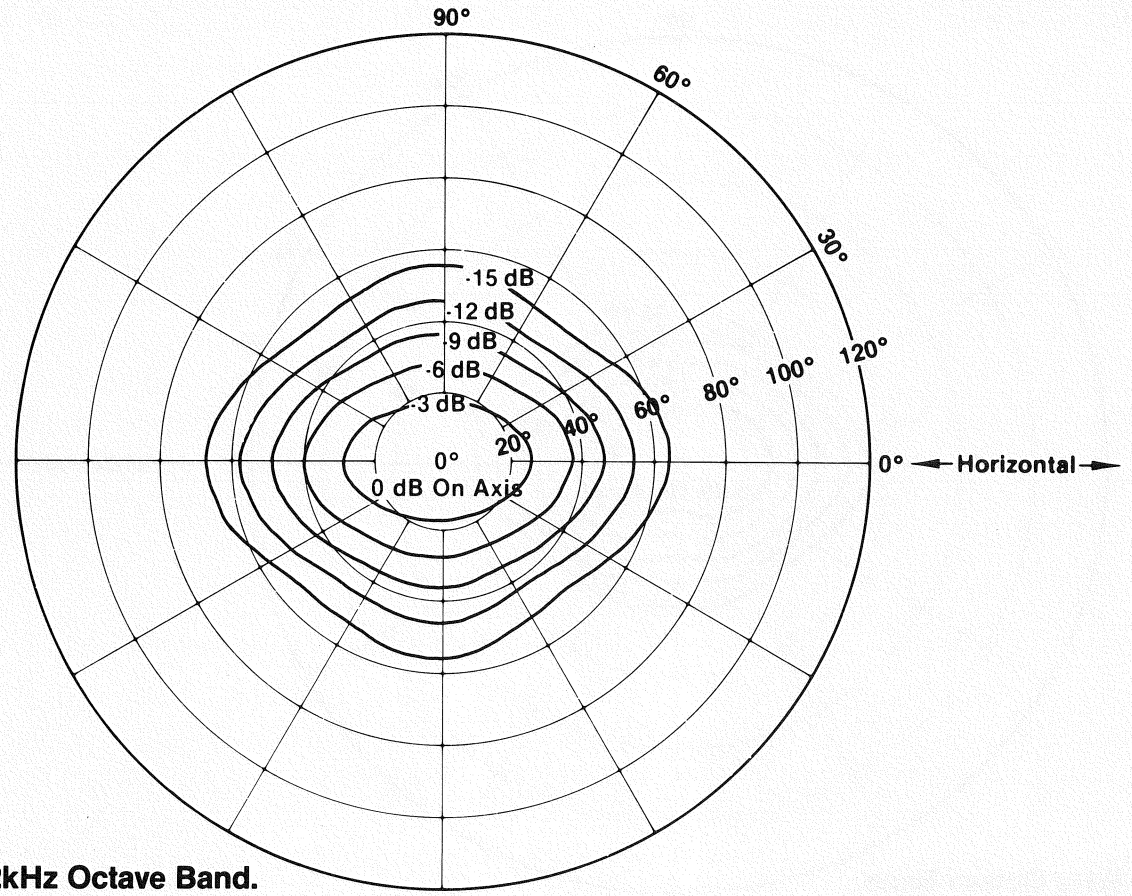



***Figure 8C.*** **2kHz Octave Band.**

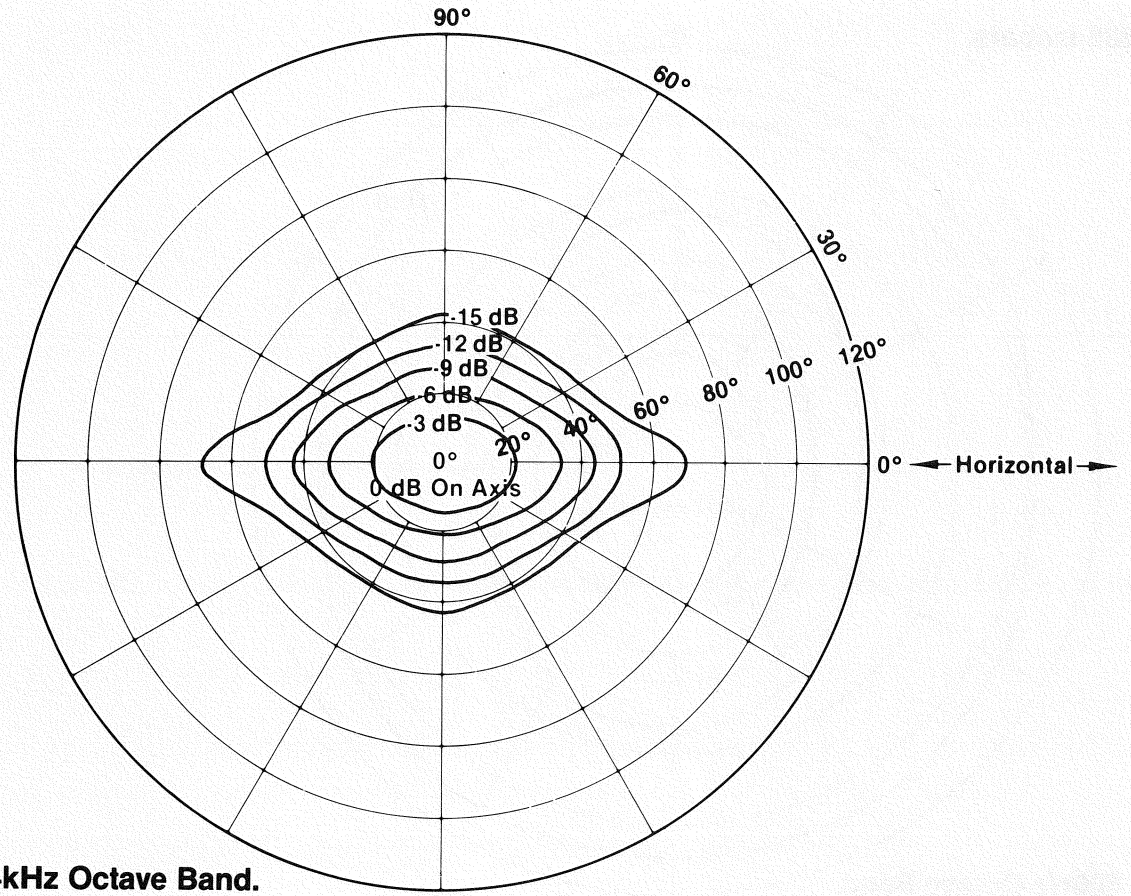



***Figure 8D.*** **4kHz Octave Band.**

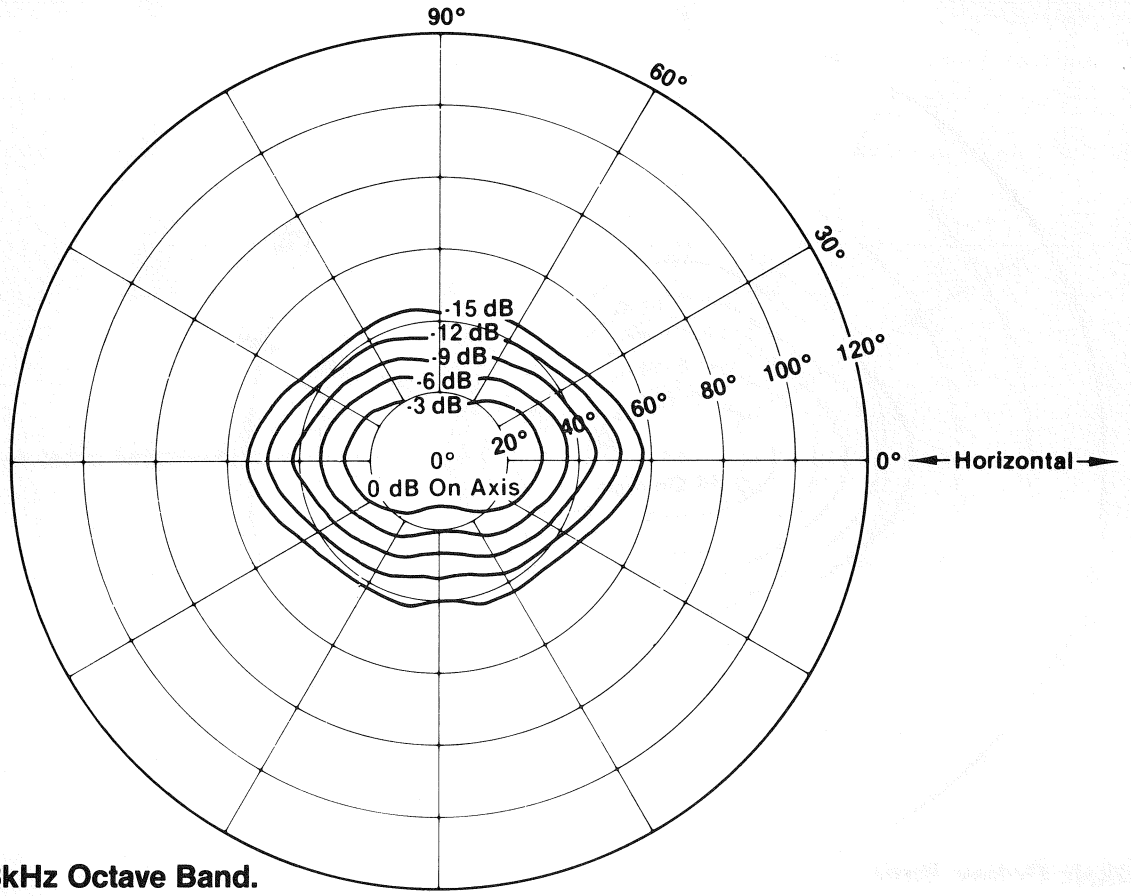



***Figure 8E.*** **8kHz Octave Band.**

***Figure 9.*** **2386 Isobars.**

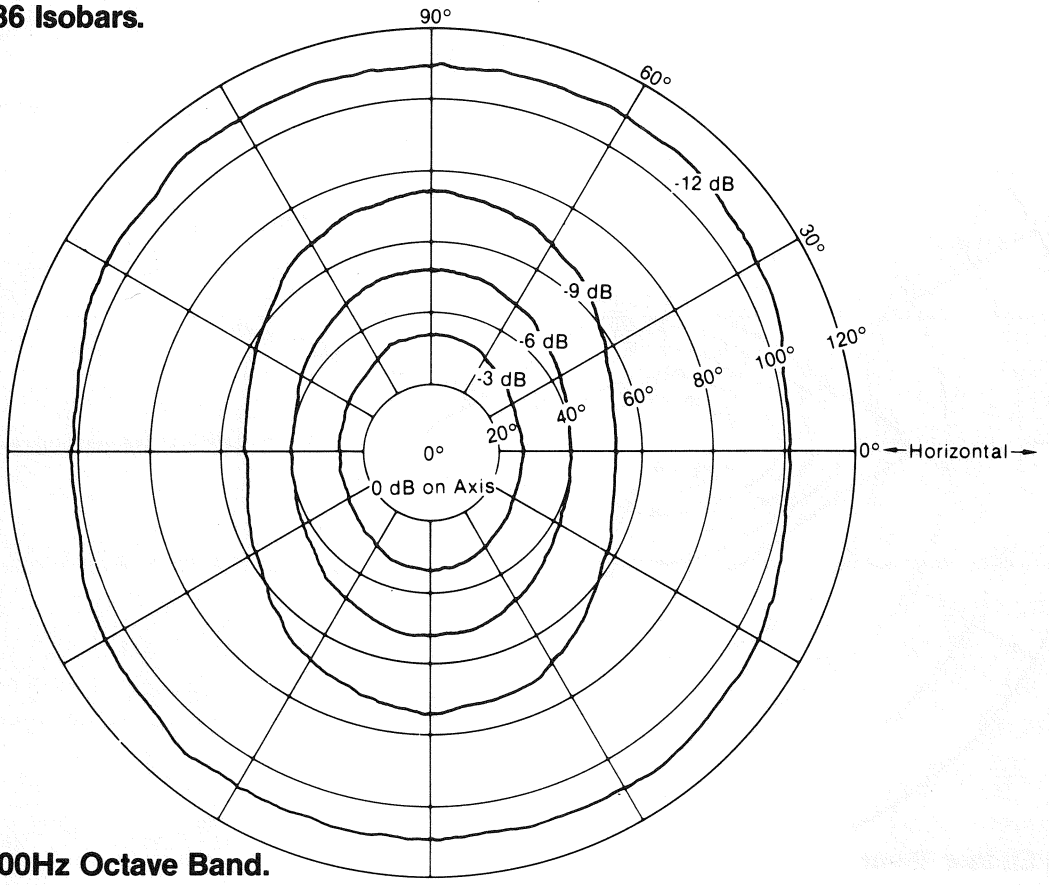



***Figure 9A.*** **500Hz Octave Band.**

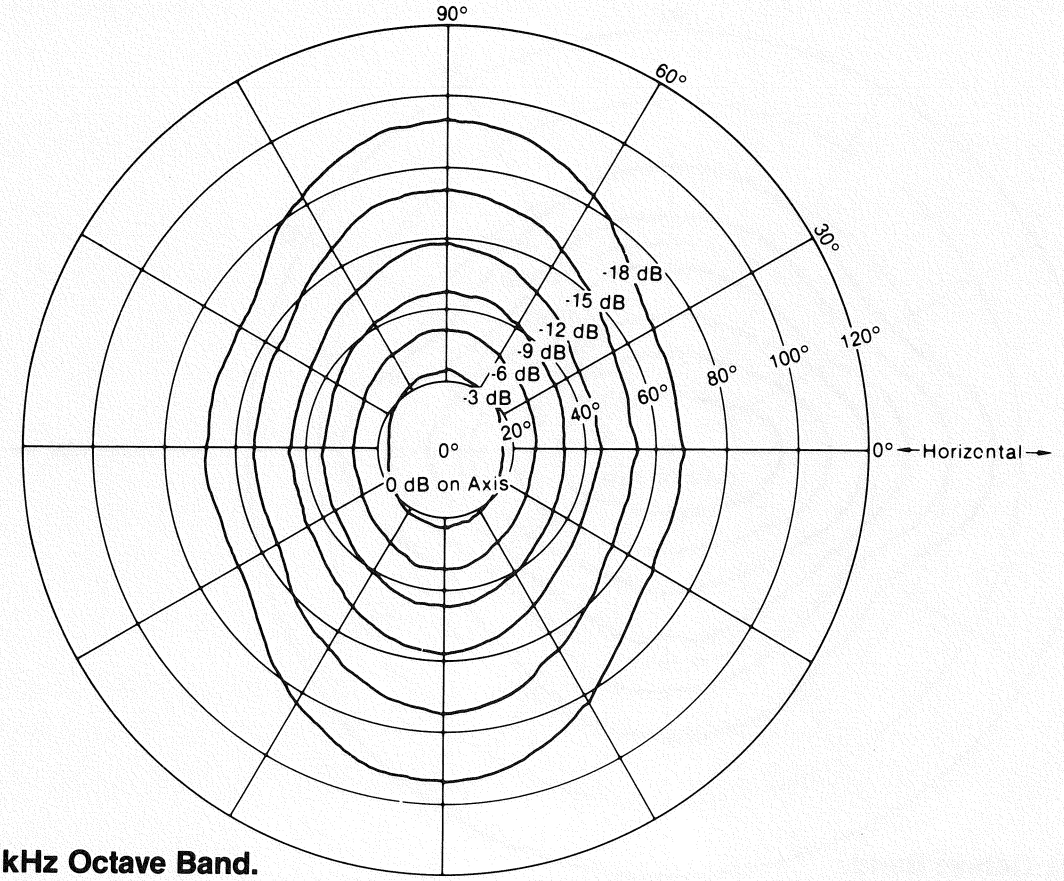



***Figure 9B.*** **1kHz Octave Band.**

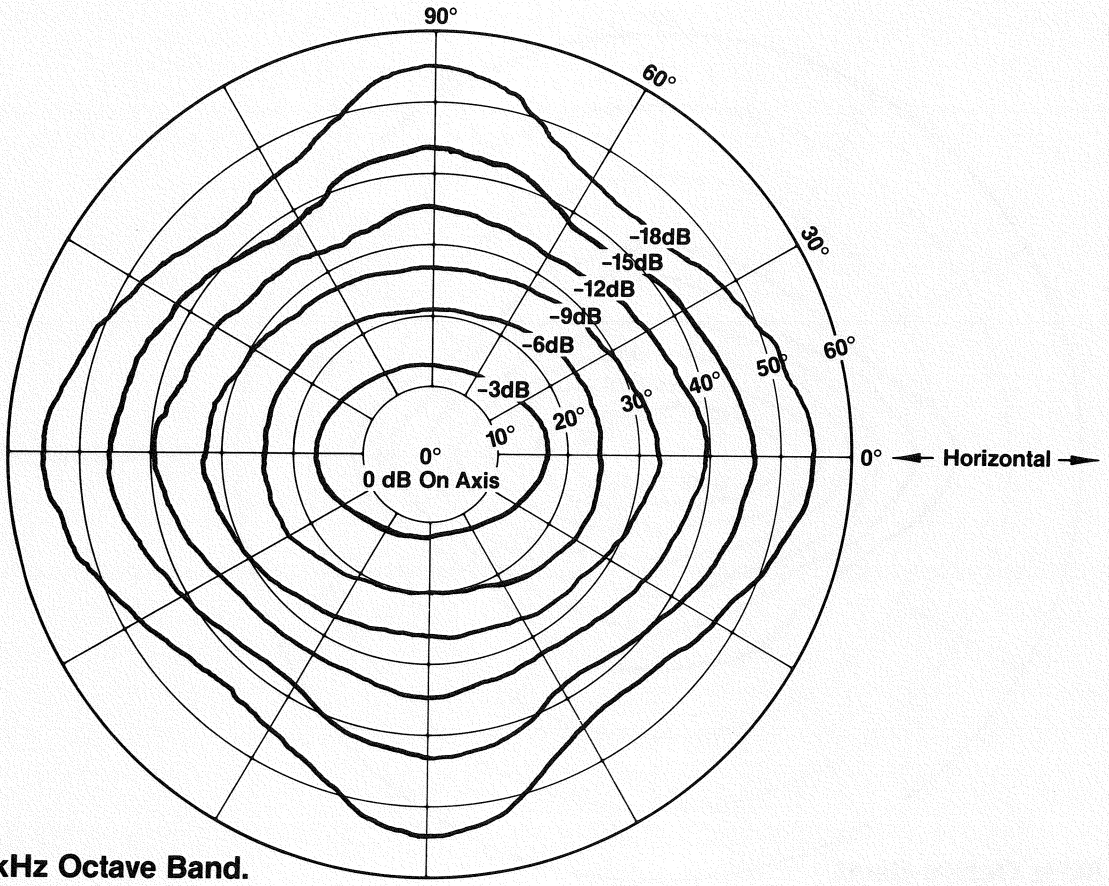



***Figure 9C.*** **2kHz Octave Band.**
**(Note change of scale.)**

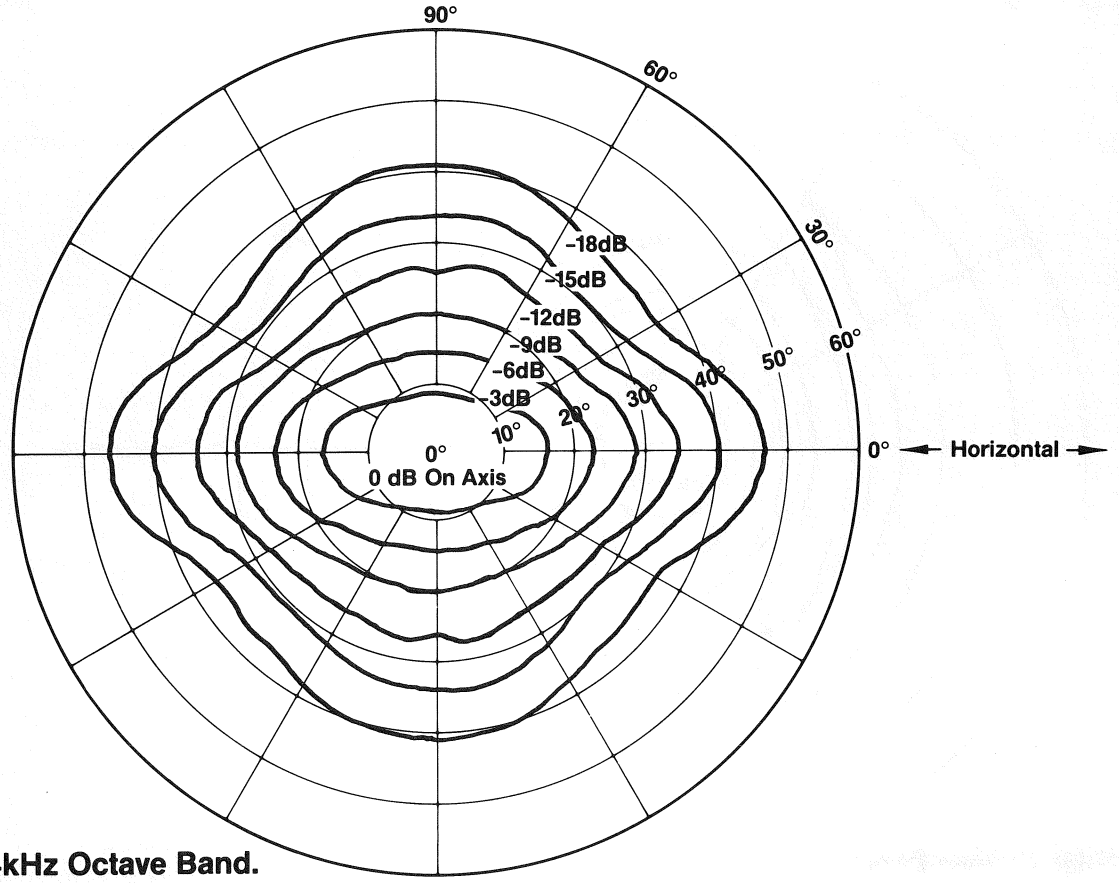



***Figure 9D.*** **4kHz Octave Band. (Note change of scale.)**

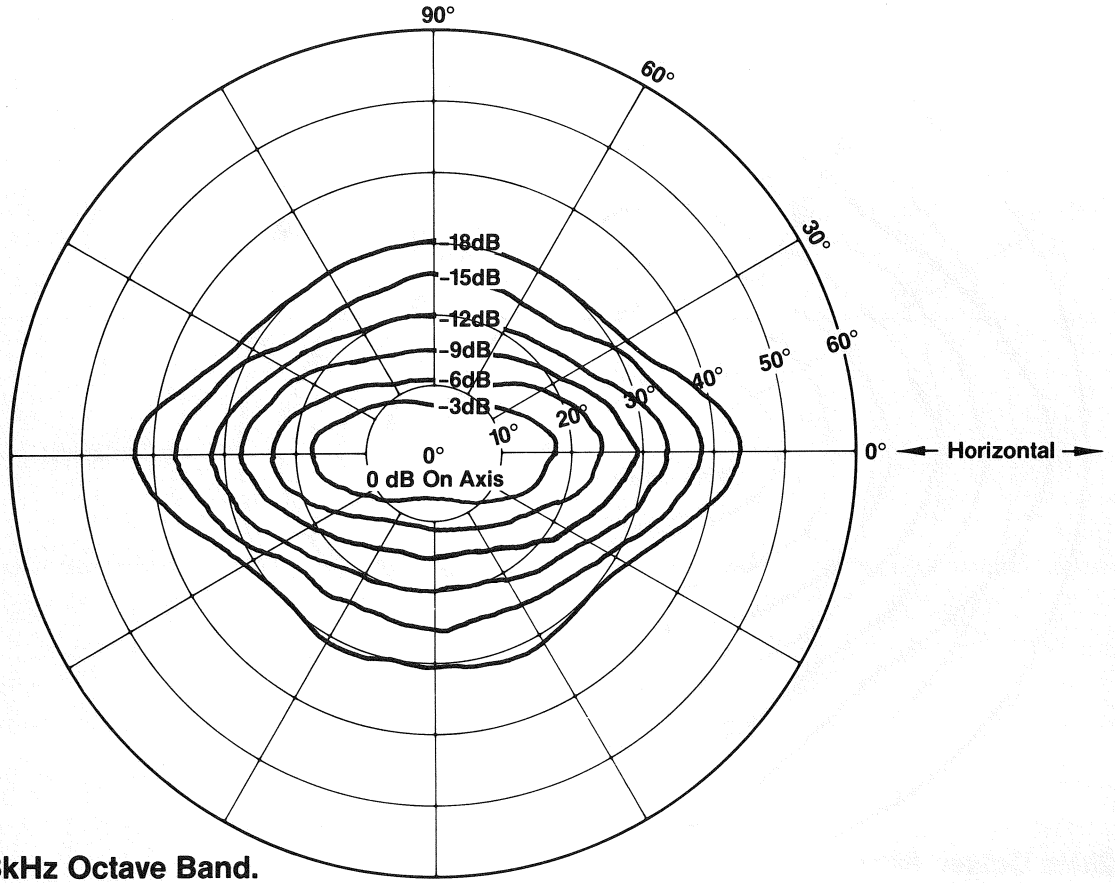
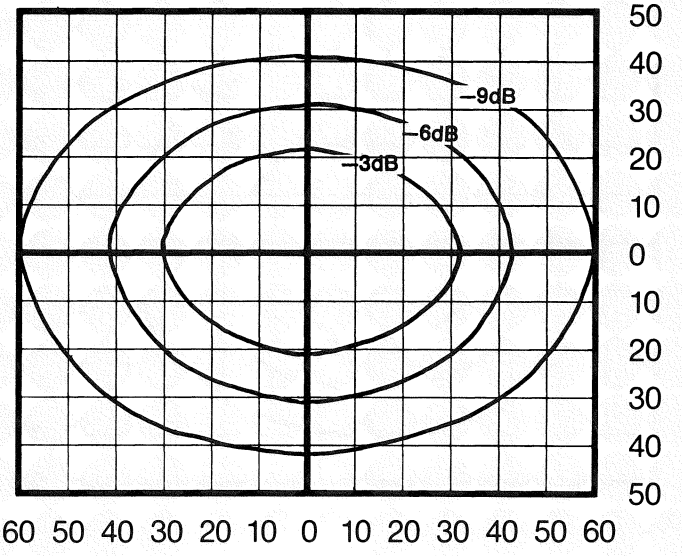
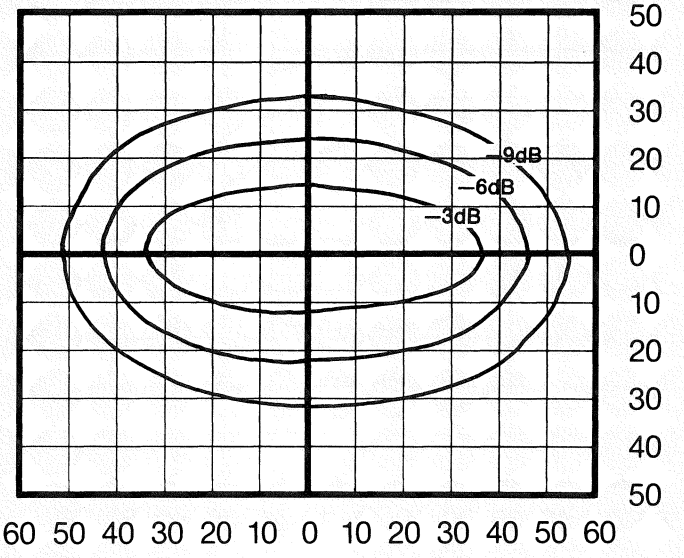



***Figure 9E.*** **8kHz Octave Band. (Note change of scale.)**

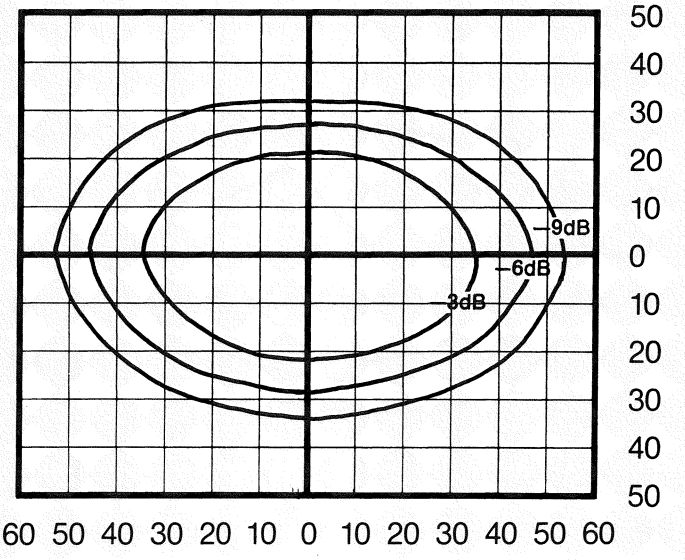
***Figure 10.*** **2360 Isobars on Rectangular Coordinates.**




***A.*** **500Hz Octave Band.**



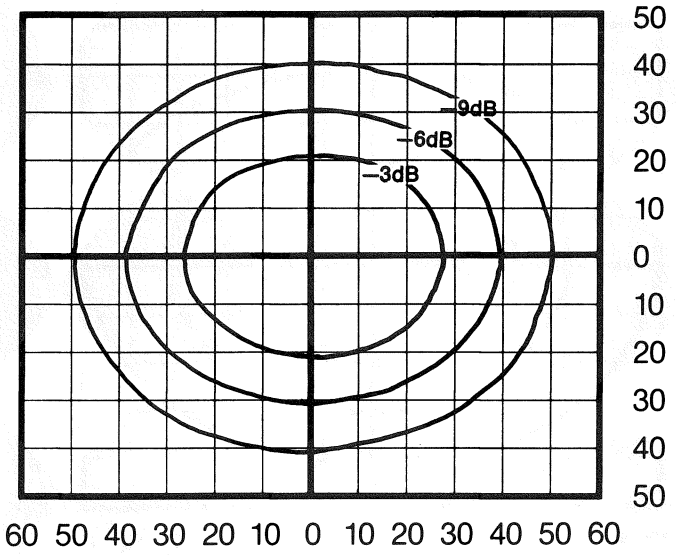

***B.*** **1kHz Octave Band.**



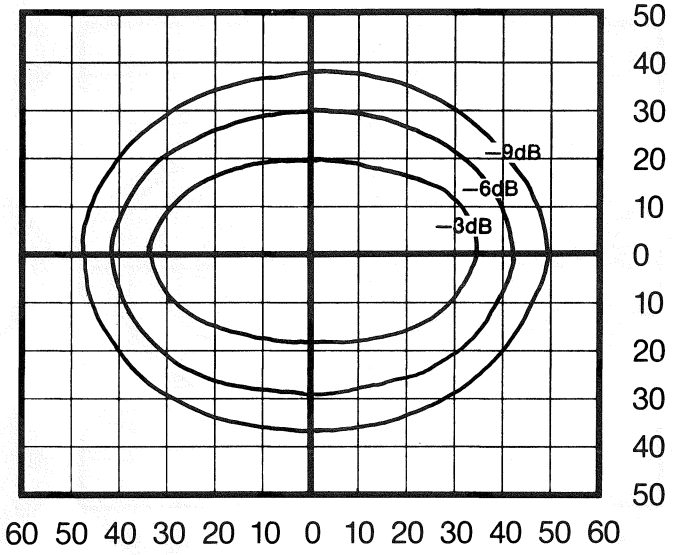

***C.*** **2kHz Octave Band.**

***Figure 11. 2365 Isobars on Rectangular Coordinates.***

**A. 500Hz Octave Band.**




**B. 1kHz Octave Band.**




**C. 2kHz Octave Band.**

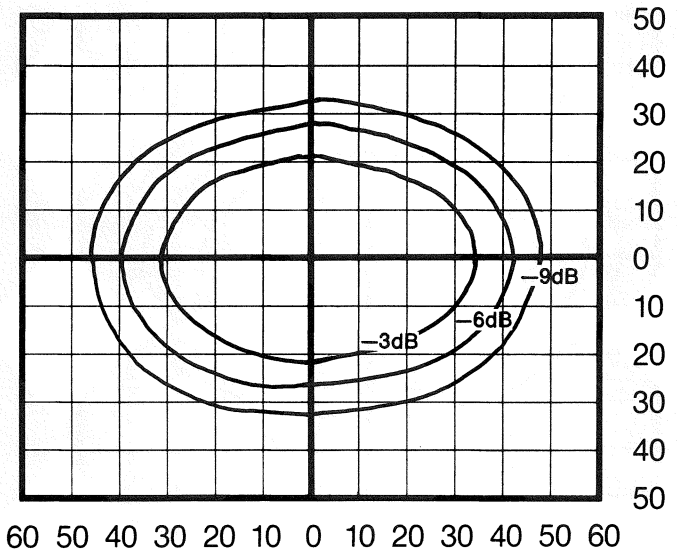
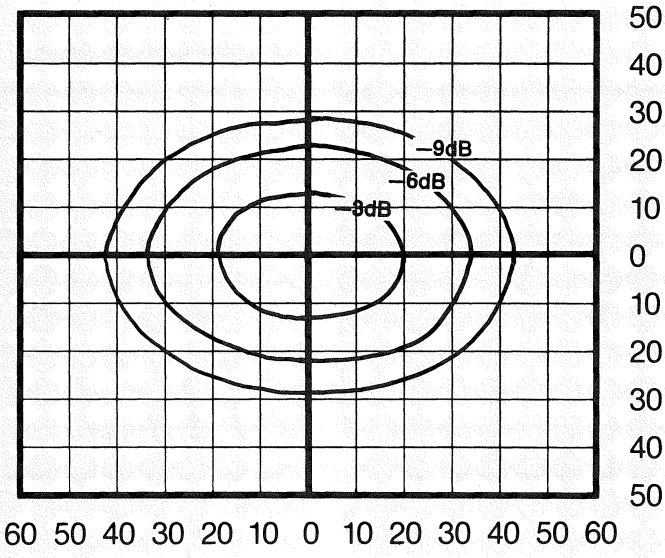
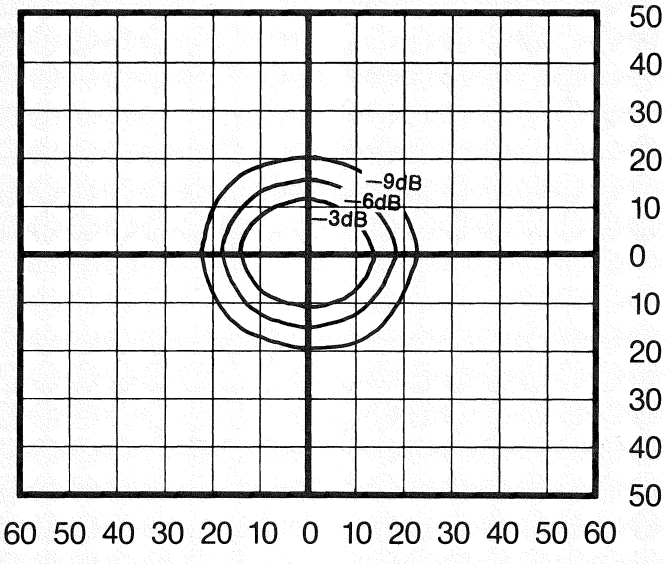


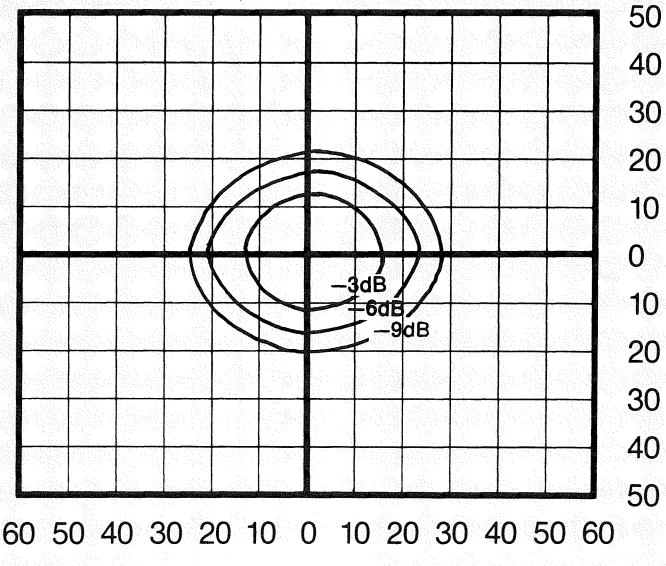
***Figure 12.*** **2366 Isobars on Rectangular Coordinates.**




***A.*** **500Hz Octave Band.**



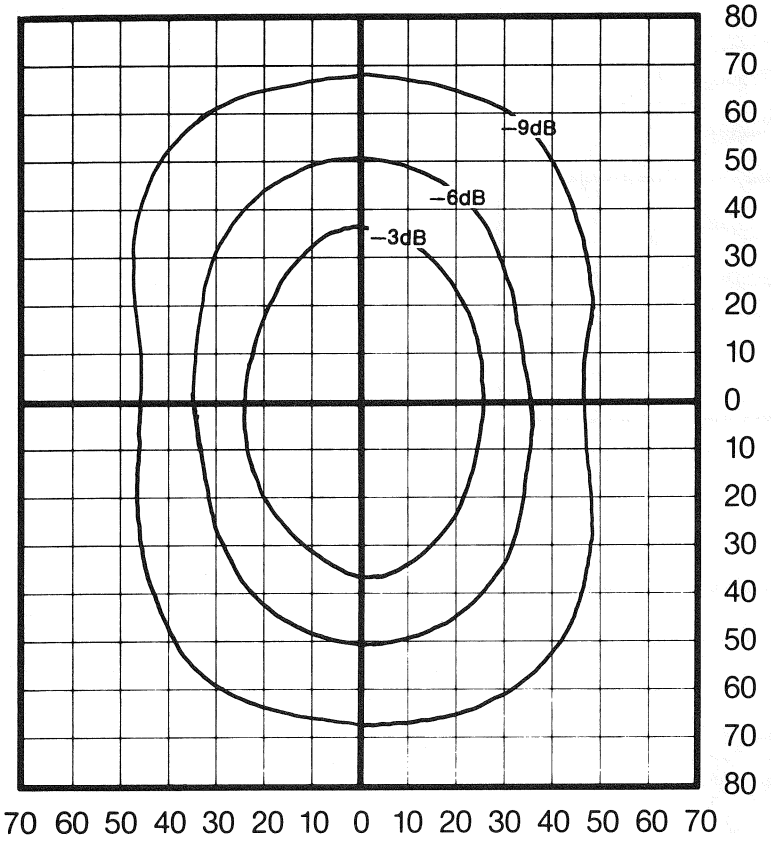

***B.*** **1kHz Octave Band.**



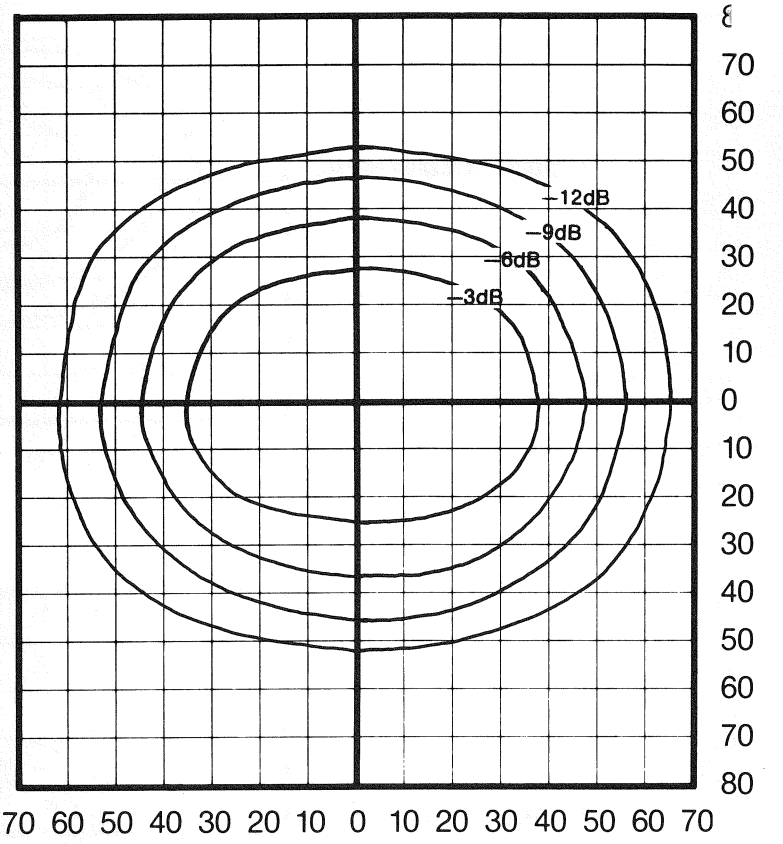

***C.*** **2Khz Octave Band.**

*Figure 13.* **2370 Isobars on Rectangular Coordinates.**

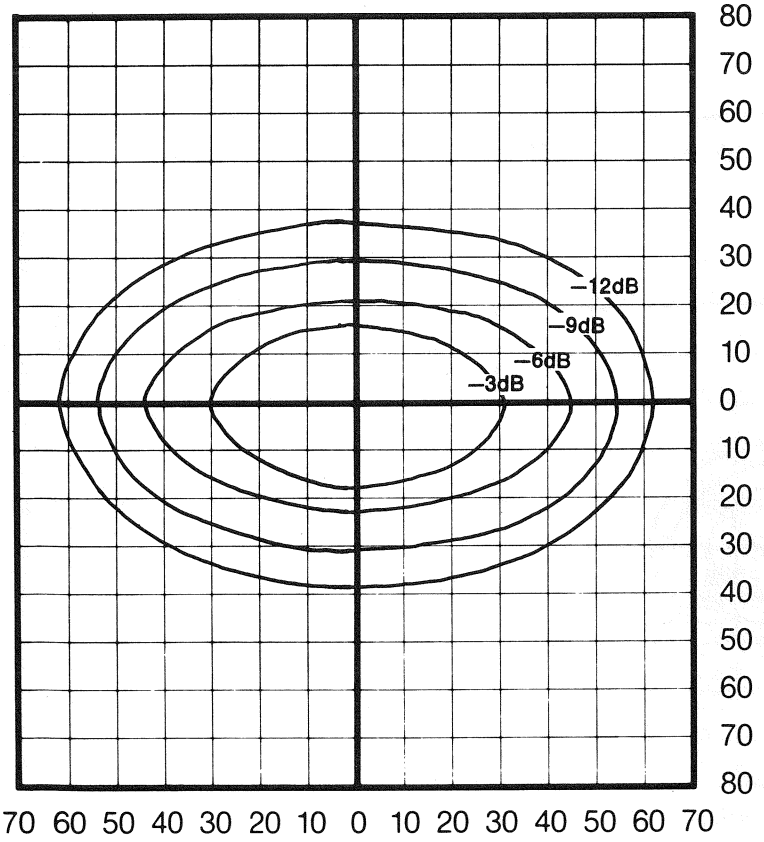
***A.*** **1kHz Octave Band.**




***B.*** **2kHz Octave Band.**




***C.*** **4kHz Octave Band.**




***D.*** **8kHz Octave Band.**

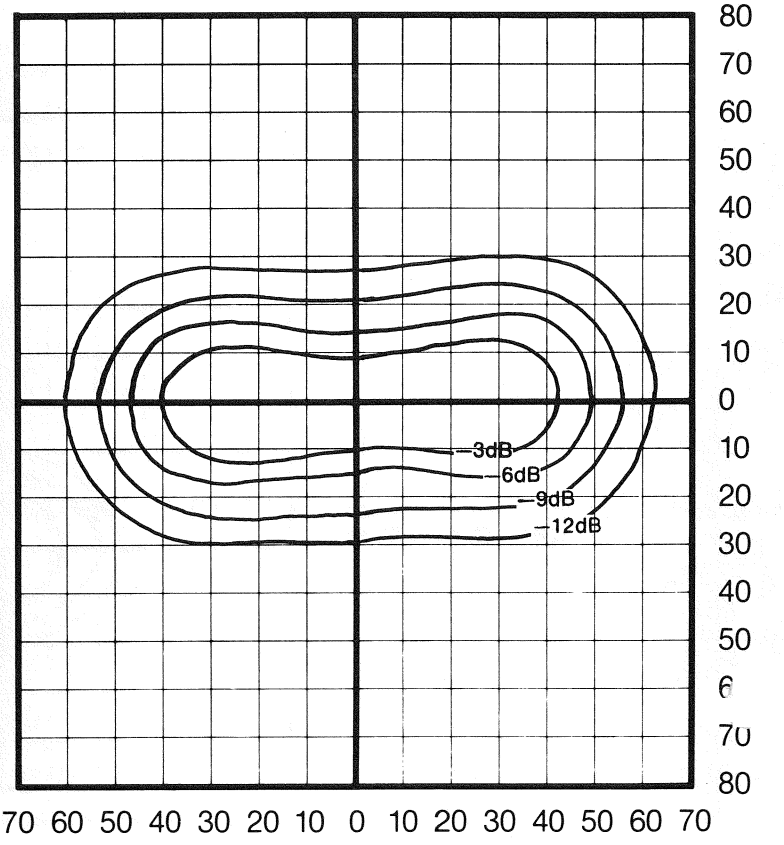
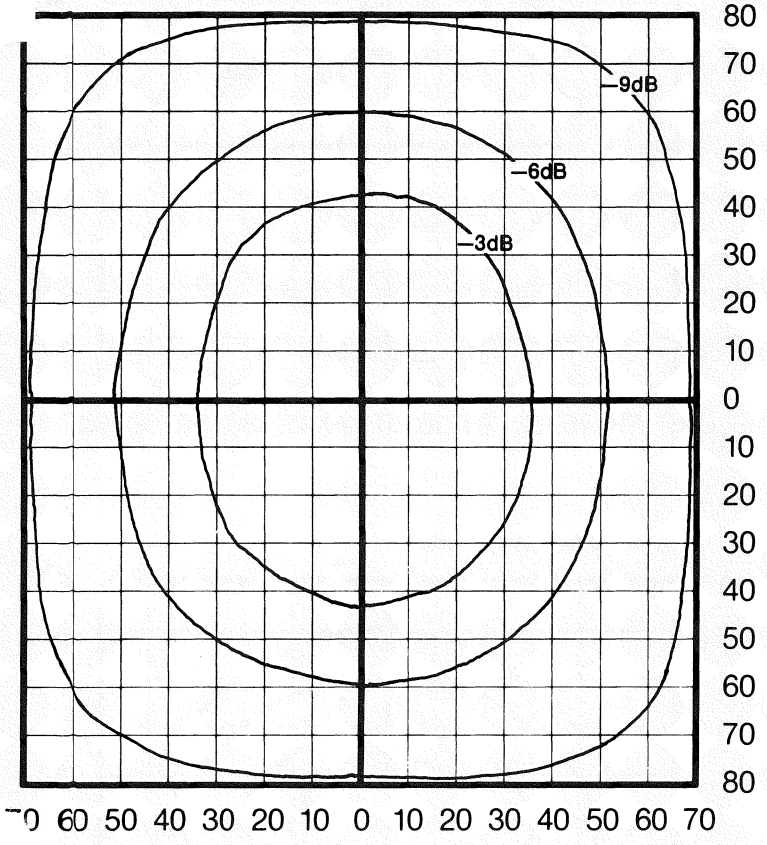
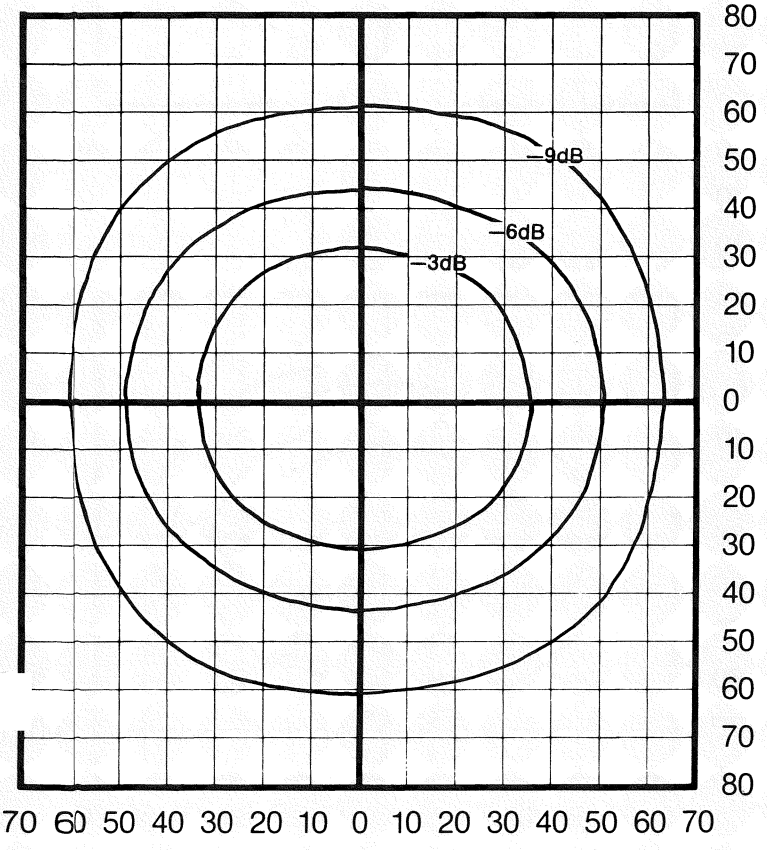


*Figure 14.* **2380 Isobars on Rectangular Coordinates.**

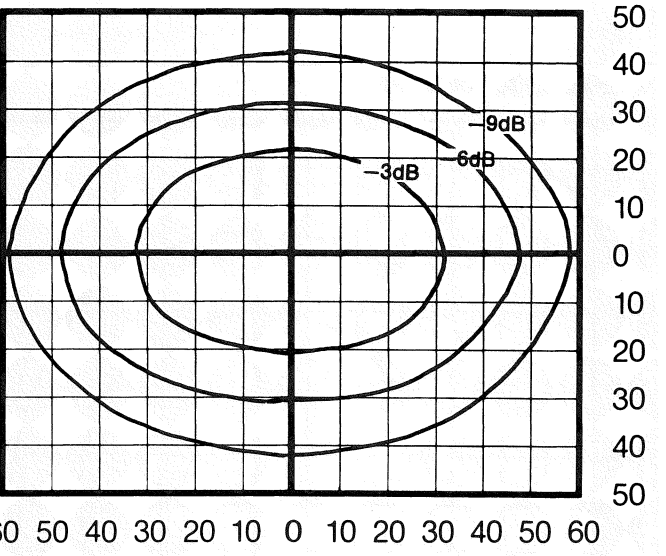
***A.* 500Hz Octave Band.**



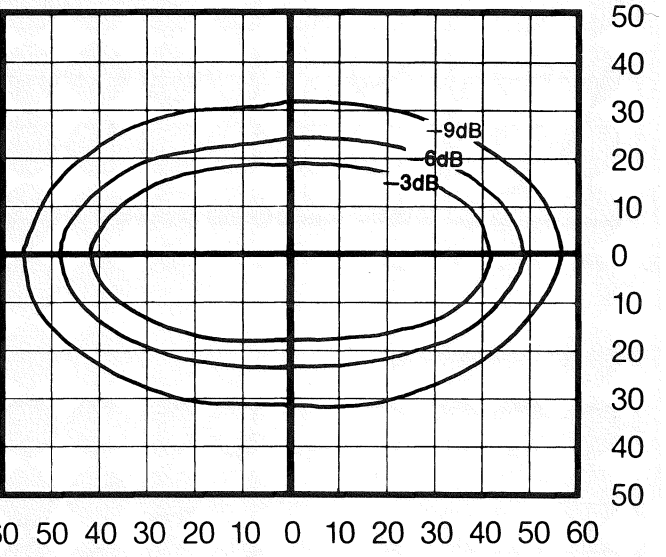

***B.* 1kHz Octave Band.**




***C.* 2kHz Octave Band.**




***D.* 4kHz Octave Band.**




***E.* 8kHz Octave Band.**

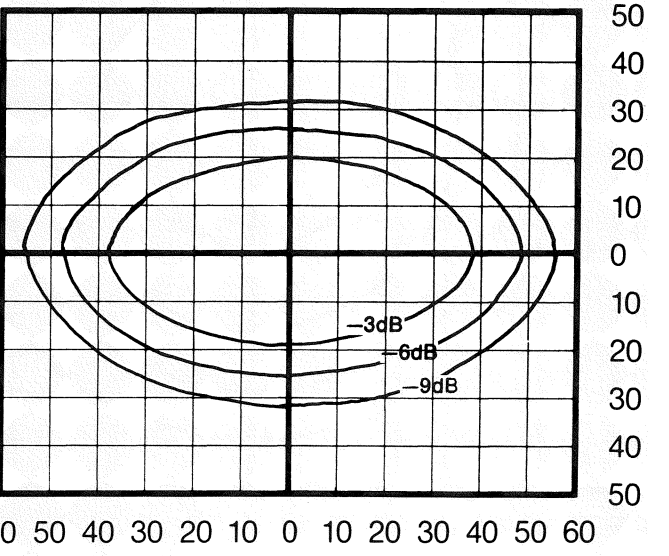
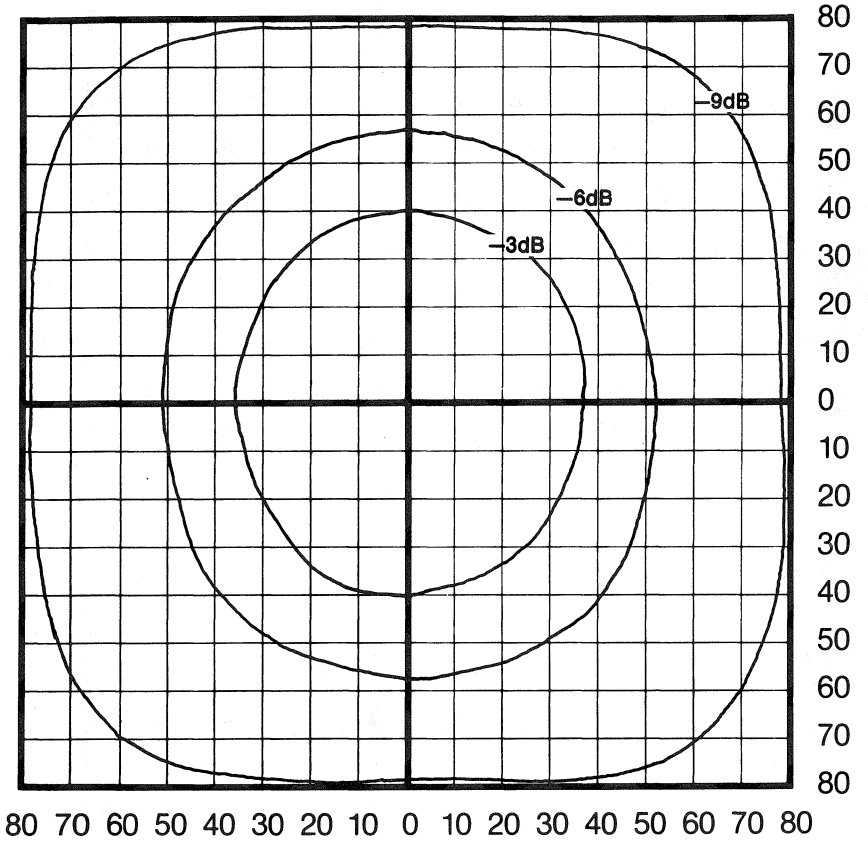
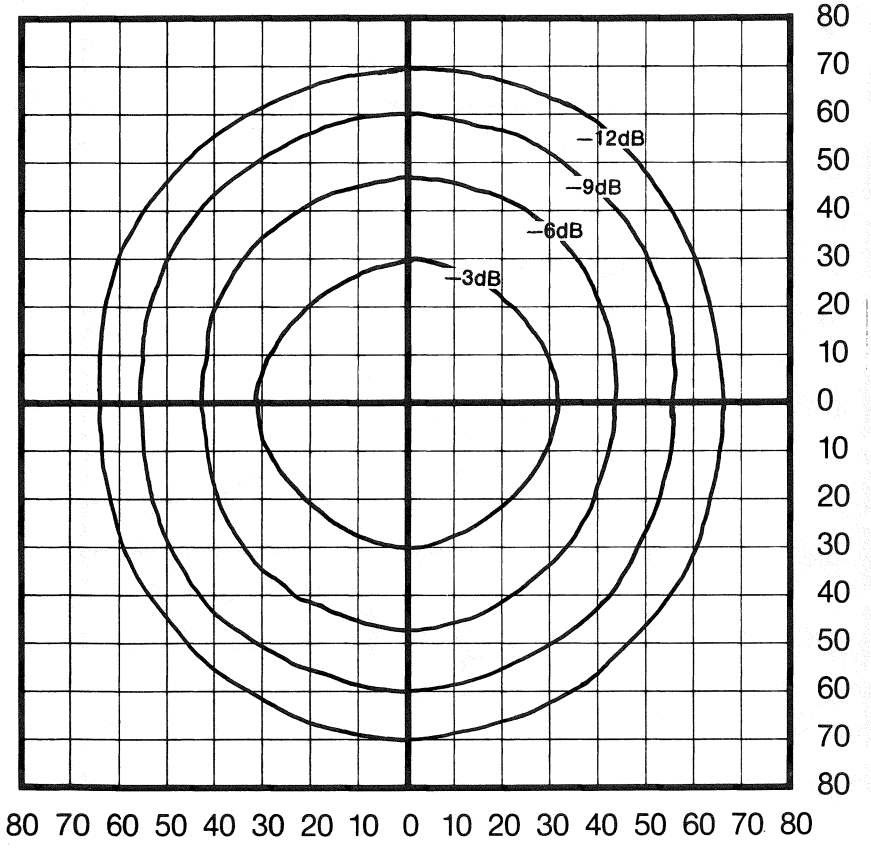


*Figure 15.* **2385 Isobars on Rectangular Coordinates.**

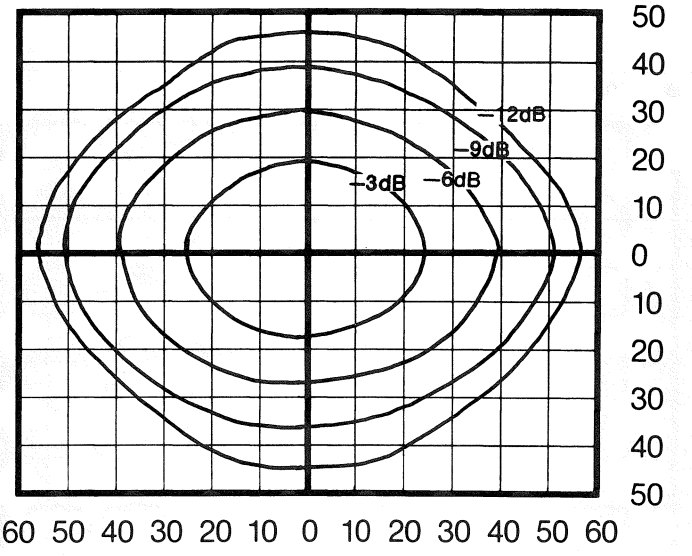
***A.*** **500Hz Octave Band.**



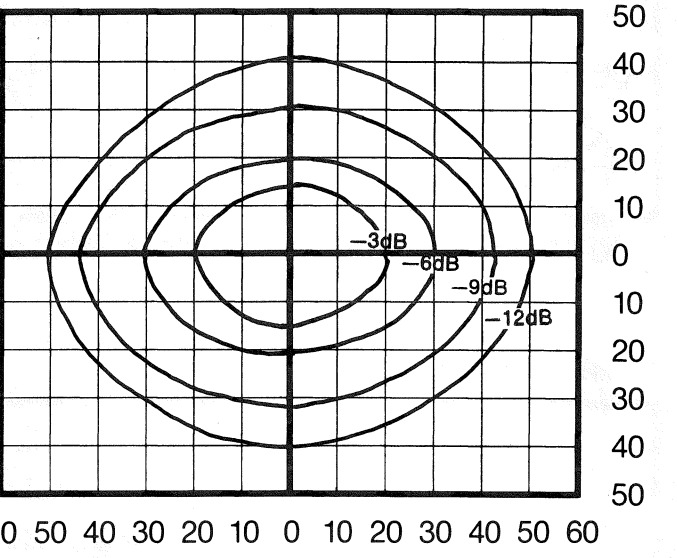

***B.*** **1kHz Octave Band.**




***C.*** **2kHz Octave Band.**




***D.*** **4kHz Octave Band.**




***E.*** **8kHz Octave Band.**

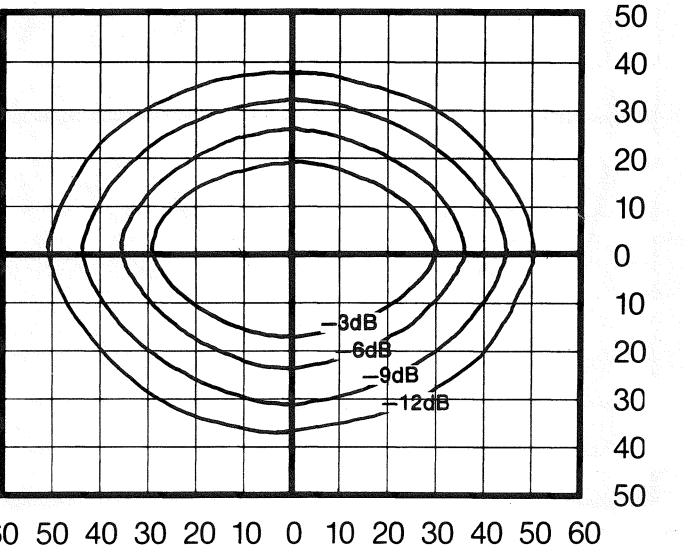
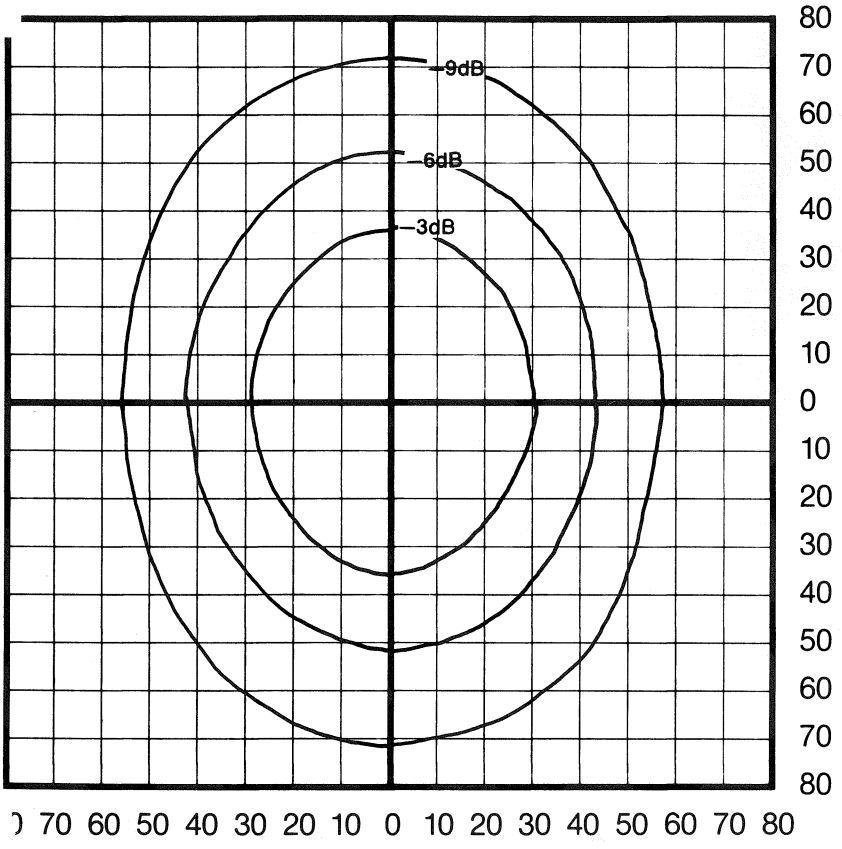
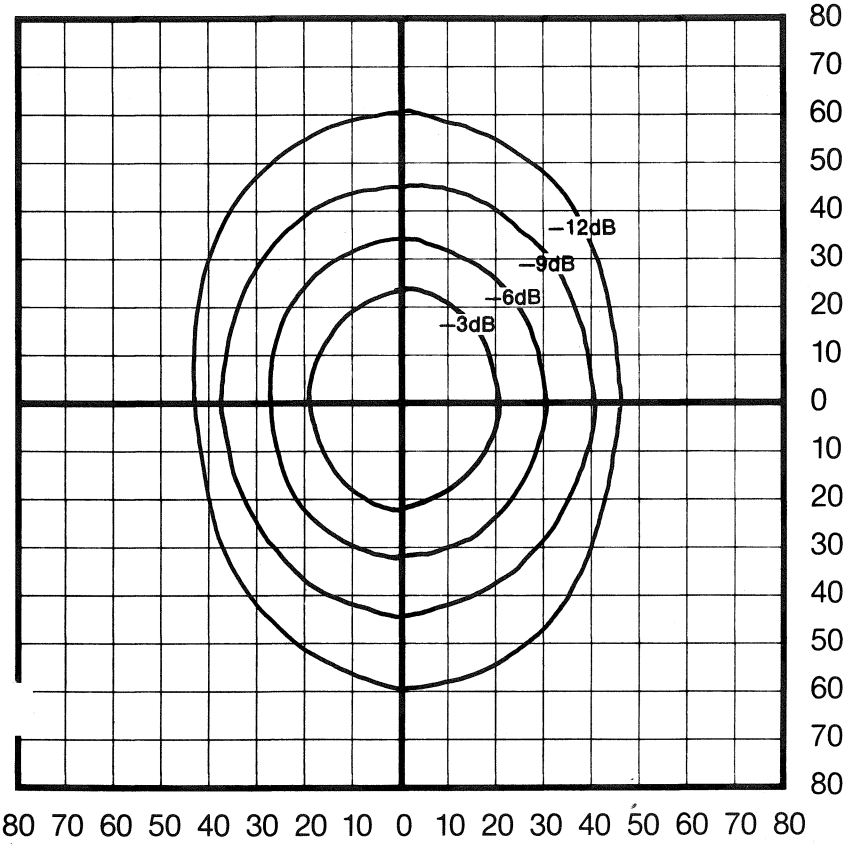


*Figure 16.* **2386 Isobars on Rectangular Coordinates.**

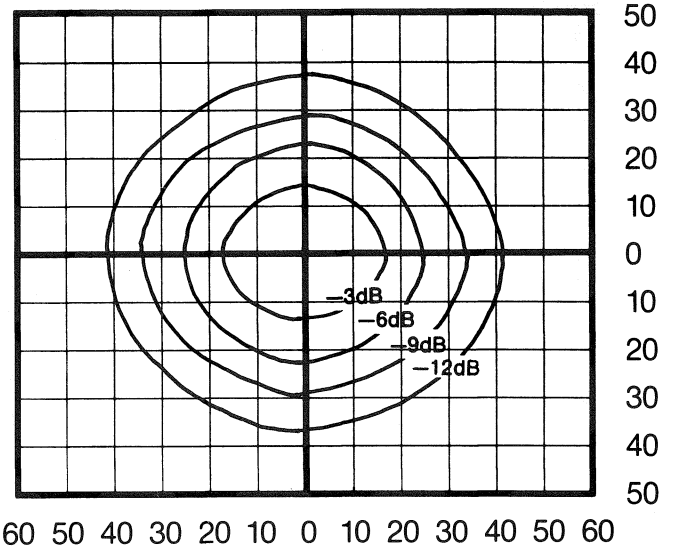
***A.*** **500Hz Octave Band.**



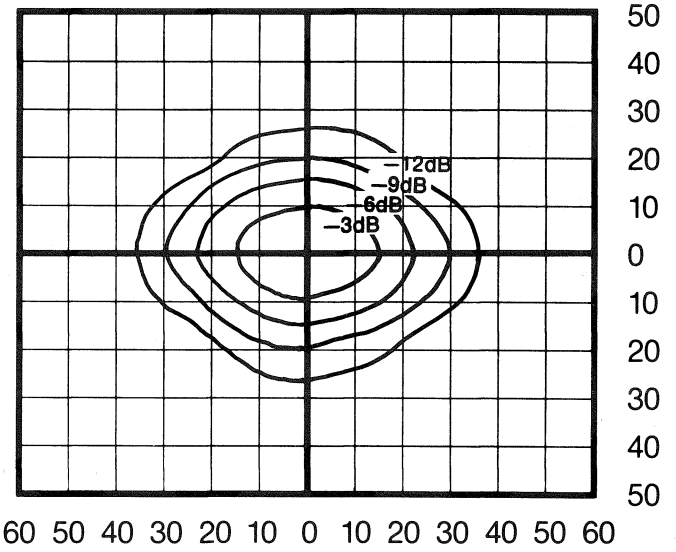

***B.*** **1kHz Octave Band.**



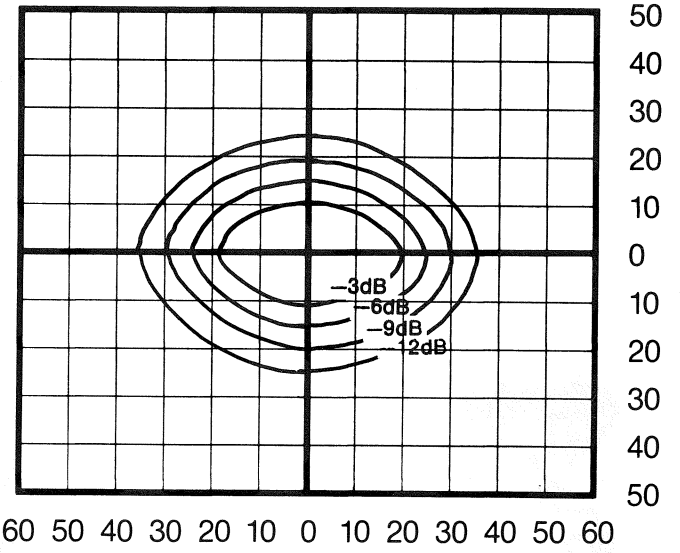

***C.*** **2kHz Octave Band.**

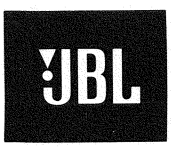



***D.*** **4kHz Octave Band.**




***E.*** **8kHz Octave Band.**





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