

## A JBL INSTALLATION

### DENVER'S MILE HIGH STADIUM

Denver's Mile High Stadium is used primarily for football and baseball events and is adaptable for each. As shown in the aerial view, one side of the U-shaped seating array can be moved outward to create a larger playing field for baseball. For football, the movable section is brought inward, creating a three sided bowl. The seating may be reconfigured many times during the course of a year.

The new sound system for the stadium was designed by Smith Fause & Associates, Incorporated, of Culver City, CA, and the installation was carried out by Barath Acoustics of Denver during the last half of 1987.

Facing the problem of a partially movable stadium, Smith Fause & Associates opted for a high level distributed approach, consisting of a multiplicity of systems all aimed at low grazing angles of incidence into the seating space from behind the spectators. The systems can be seen in the photo, mounted on the front edges of the upper two tiers.

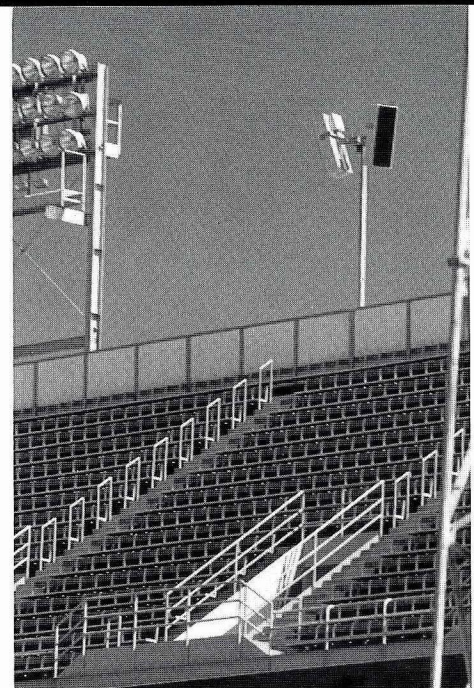
In designing the systems, care was taken to produce a precise directional pattern so that smooth coverage could be maintained from the front to back of a tier. There was a beneficial trade-off between inverse square loss and off-axis pattern attenuation. Each system covers only a defined seating area, and no single system has to produce extremely high levels.

The basic systems consist of four 250 mm low frequency transducers and a flat front Bi-Radial™ horn with a 2445J driver. Depending on the

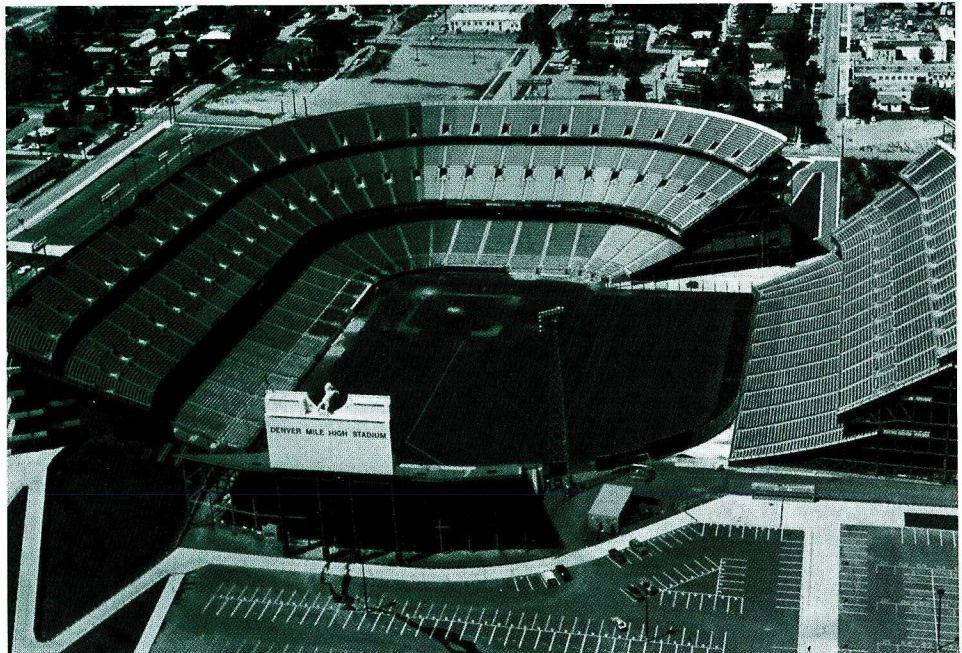
system location, either a 2380A or a 2386A horn is used. Those systems which cover the uppermost tier are configured as line arrays in order to ensure tight vertical pattern control. They are mounted on standards as shown.

The areas beneath the upper tiers require close-in, relatively dense overhead coverage, and for this purpose JBL Industrial Series 8130 loudspeakers are used.

The entire system is powered by 96 JBL/UREI 6260 stereo amplifiers. The photo shows the 12 racks of 8 amplifiers each.



Loudspeakers mounted on standards for covering uppermost seating areas.

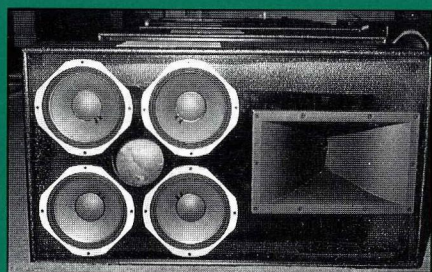


Aerial view of Mile High Stadium with seating section moved outward (Photo courtesy City of Denver).



Prior to settling on the distributed design approach, a test was carried out. Several systems were built, mounted as shown, and used during an actual event. Spectators reported excellent results, and the complete system layout commenced.

Detail of loudspeakers used to cover lower seating areas.

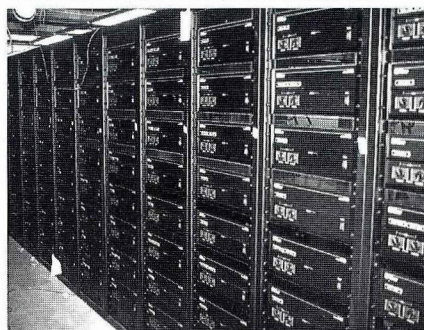


Recessed seating areas covered by overhead JBL 8140 distributed array.

In commenting on the system design approach, Howard Smith states that high level distributed systems in a stadium have certain advantages over the central array approach. One of these is cost. He estimates that rigging costs for large arrays can be extremely high, and that "one kilogram of steel for each kilogram of loudspeaker" is a good rule to remember. He further states that a distributed system, properly laid out, puts sound where it is wanted at relatively short distances and

relatively low levels, with a minimum of sound going elsewhere. By comparison, even the most carefully designed central arrays have to produce quite high levels at considerable distances, and this inevitably means some degree of sound leakage into adjacent residential areas. Distributed systems enable sound coverage to be balanced for the acoustic and crowd noise environments which tend to differ from area to area within a large stadium.

View of electronic rack room showing 96 JBL/UREI model 6260 power amplifiers.



### Denver Mile-High Stadium Component List:

8	JBL 5547
6	UREI 950
22	JBL 5235A
44	JBL 51-5133
96	UREI 6260
8	UREI SC-5
185	JBL 2123H
46	JBL 2445J
29	JBL 2380A
17	JBL 2386A
1	JBL 2404
1	JBL 3105
81	JBL 8130HR/A

### CREDITS:

**Sound Contractor:**  
Barath Acoustics, Inc., Denver, Colorado

**Acoustical Consultants:**  
Smith Fause & Associates, Inc., Culver City, California

**Electrical Installation:**  
Head Electric, Inc., Denver, Colorado

**Design Consultants:**  
RMH Group, Inc., Denver, Colorado

**City and County of Denver,**  
Department of Parks and Recreation



Lower seating areas covered by loudspeakers set at low grazing angles of incidence.



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