

RENKUS-HEINZ ST SERIES

Digitally Powered Loudspeakers & RPA Clusters, with CobraNet connectivity
for completely integrated solutions

CoEntrant, Complex Conic, True Array & more

At NSCA in Denver Colorado, Renkus-Heinz launched the ST Series, the most technically advanced group of sound reinforcement systems available. In addition to advanced Renkus-Heinz developments such as Complex Conic horns, Co-Entrant drivers and True Array Principle design, ensuring unsurpassed cluster performance, the ST Series systems incorporate digital signal distribution, amplification and control networking. Powerful three-way amplification, R-Control Remote Supervision via PC, and CobraNet audio networking are all incorporated in the new PM-3 power module, engineered to allow ST Series speakers to become an active part of your integrated system design.

The benefits of powered speakers and digital networking are well known. Recent developments are already changing the way professional sound systems are designed, installed and operated. ST however brings it all into one box allowing the designer to connect the loudspeaker itself to the CobraNet network without having to specify breakout boxes in each location.



Figure 1: ST Series

Naturally, ST Series cabinets are available as Renkus-Heinz Reference Point Arrays (RPA). We pre-build your cluster at the factory and program each loudspeaker's personality module with the appropriate equalization and frequency shading parameters to ensure the cluster performs as it should, a coherent source, rather than just a collection of cabinets bolted together. Our RPA processing enables us to achieve consistent frequency and amplitude response over the entire coverage pattern: A maximum variance of $\pm 4\text{dB}$ is typical. For more information about our RPA systems and in such arrays, please contact us. We're always pleased to discuss the practical and acoustical benefits of our unique RPA design process.



Cost-effective, flexible, reliable

What is CobraNet?

CobraNet® is a technology developed by Peak Audio, a division of Cirrus Logic, to transport audio and control data over Ethernet networks. CobraNet allows high quality audio to be transported via Ethernet's cost effective cabling and network infrastructure while maintaining the integrity of the digital audio signal. CobraNet users simply connect together all of their CobraNet-enabled products via Ethernet switches or hubs in order to transfer audio between them across the network. Signals can be addressed to specific devices, or "broadcast" onto the network so that they are available to any and all of the networked devices and can be selected as required.

The standard Ethernet network protocol is not ideal for transmitting audio, because it allows all of the connected devices to "talk" at the same time. This causes collisions between data packets, which then have to be managed by introducing random time delays. A word processor doesn't really care if packet #1 arrives after packet #2, or even after #15, because it can re-assemble the packets in their proper order before displaying the document. Pro audio applications do not have this luxury: all the digital audio data has to arrive, be decoded and transformed back into sound in the order in which it was sent, and without interruptions. This is where CobraNet comes in. Its software implements a protocol that makes the transmission of data on the Ethernet network "deterministic," ensuring that no collisions occur and that the audio is transmitted seamlessly and in real time. In this way CobraNet delivers the benefits of proprietary network formats such as finite latency and real time audio, along with the significant cost, convenience and reliability advantages of standardized Ethernet hardware and cabling.

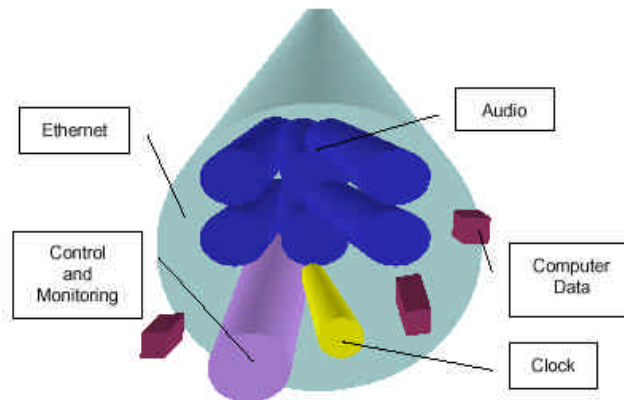


Diagram 1: schematic of data types that CobraNet transmits over EtherNet

CobraNet and EtherNet

CobraNet uses standard Ethernet hardware and infrastructure. Each CobraNet-enabled device is connected to the network and then a simple software program is used to assign the routing of audio channels from one location to another. You simply connect the system up and then "patch" the audio around the system on your computer screen. These patches can easily be reconfigured in software as required.

Cost-effective, flexible, reliable

Many existing sound systems already incorporate multi-function DSP devices because of the flexibility and power that they offer. Many of these devices, for example Peavey's MediaMatrix and Biamp's Audia, are CobraNet ready so it's a simple process to connect them all together. Once connected you have a tightly integrated system. In this way the whole system can be managed remotely from one location, or from any number of locations, without the need to get into the back of racks to re-patch.

In order to efficiently use the bandwidth available on a standard 100BaseT Ethernet network, CobraNet "bundles" audio channels together, transmitting up to 8 channels in each bundle. In this way up to 32 channels, 4 bundles, can be transmitted in each direction down a single piece of Cat 5 cable. That's the equivalent of a multicore "snake" with 32 sends and 32 returns, and it costs less than 10 cents a foot.

Clearly one concern with such a system is that you are now reliant on one piece of cable for all of your audio signals. Peak Audio engineers have thought of this, and therefore each CobraNet card has a backup network input and the system can be designed with fault tolerance in mind. In safety critical systems two complete networks can be installed eliminating any single points of system failure.

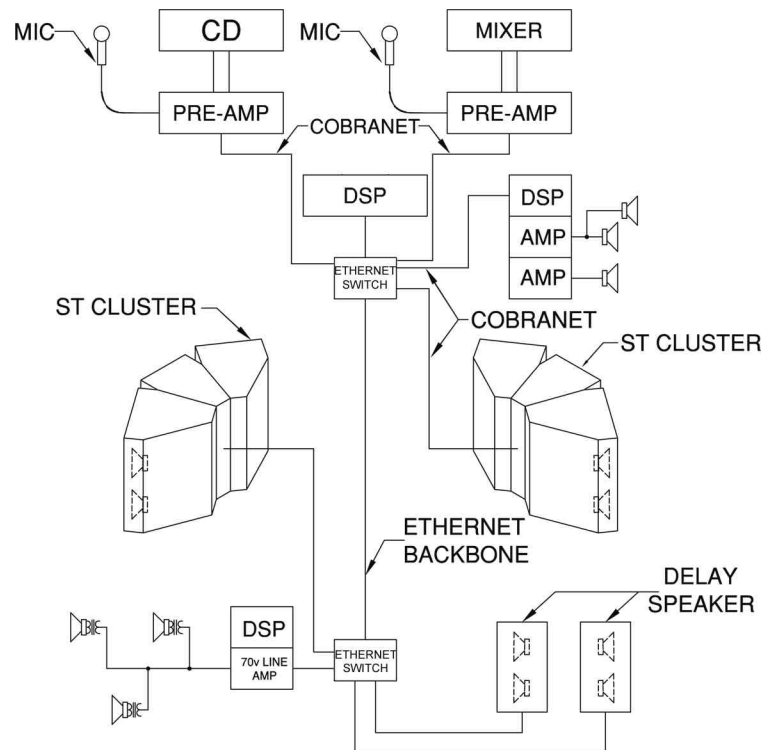


Diagram 2: an example of how a CobraNet system might be connected

Cost-effective, flexible, reliable

What are the benefits of using CobraNet?

The advantages of using CobraNet instead of analog copper in your installation are significant. A few of these considerations are outlined below:

Reduced cabling cost

Cat 5 cable may cost 10 cents per foot carrying 32 channels in each direction compared to \$ 7 per foot for 32 pair multicor and you would need 2 of them.

Reduced conduit cost

Cat 5 or fiber optic cabling can carry more channels in a smaller diameter than analog audio cables so smaller conduit may be used.

Reduced cable pulling cost

Using fewer cables and/or cables of smaller diameter can dramatically reduce the cost of cable pulling.

Utilizing existing infrastructure

Many facilities will already have Cat 5 cable installed for networking. Others may already have conduit or cable troughs in place. CobraNet may be able to utilize this existing infrastructure.

Better noise immunity

Once in the digital domain, audio signals are not degraded by RFI/EMI noise or cable capacitance, so the integrity of the signal is maintained. Ground loops are also eliminated as the ethernet switches opto-isolate the network.

Fewer A/D and D/A stages

In a typical analog system with a "processing rack" or "system drive rack," multiple DSP processors are used in series. An analog audio signal is sent to each unit, converted to digital (A to D), processed, converted back to analog (D to A), and then output from the device. This output may then be connected to another DSP where it goes through the A/D D/A stages again, further degrading the signal. By keeping the signal in the digital domain throughout, the centralized processor minimizes these degrading conversion stages.

Reduced requirement for equipment rooms

If Renkus-Heinz CobraNet-enabled ST Series loudspeaker systems with integral power amplification are used, the requirement for dedicated amplifier rooms (which may need dedicated HVAC systems) is eliminated. The need for large analog patchbays providing flexible signal routing can also be reduced as signal routing can be achieved in the DSP, or on the network itself.

Cost-effective, flexible, reliable

How much can you save?

Vance Breshears & Jeff Miller of Sound Technology Consultants have evaluated the costs of similar analog and digital systems. A summary of their findings is detailed in the examples below:

Small System Solutions

This example uses a design typical of those employed in smaller auditoriums, multipurpose venues, or churches. The following diagrams show a small system for a church employing a center cluster, four delayed speaker zones and a 70 Volt line speaker zone. Diagrams of the analogue and digital solutions are shown on pages 8 and 9.

Both the analog and digital systems achieve similar results, although the digital system is arguably more flexible and configurable. The table below shows the cost of implementing the two systems shown, plus a third alternative which we have termed the "Hybrid" system. This is a combination of both analog and digital systems: it uses an analog mixer and outboard electronics instead of the digital console, with output signal routing and patching via a digital CobraNet network.

Item	Analog	Digital	Hybrid
Cabling	\$500	\$400	\$400
Patchbays	\$800	\$0	\$0
Console	\$3,000	\$10,000	\$3,000
Booth Racks	\$2,000	\$2,000	\$2,000
Outboard Processing	\$3,000	\$3,000	
Amp Racks	\$4,700	\$0	\$0
Speaker Processing	\$3,500	\$4,000	\$4,000
Speakers	\$11,000	\$19,500	\$19,500
Conduit	\$5,000	\$3,000	\$3,000
Rigging	\$1,200	\$1,200	\$1,200
Amp Room	\$6,250	\$0	\$0
Cooling	\$1,000	\$0	\$0
Tech Power	\$8,000	\$10,000	\$10,000
Installation	\$7,000	\$4,500	\$4,500
Total Cost	\$56,950	\$54,600	\$50,600

In this example the fully digital solution is about 4% cheaper than the analog and the hybrid is about 11% cheaper. This benefit is in addition to the extra functionality that may be afforded by the digital or hybrid systems.

Cost-effective, flexible, reliable

Large System Solutions

In this example a much larger system is designed employing LCR clusters and 26 individually addressed zone speakers. Diagrams of these systems can be found on pages 10 and 11.

Again both systems provide broadly similar results although it should again be note that the digital system is considerably more flexible and configurable. The re-routing of signals, or turning on and off of individual zones can be easily achieved in this system through digital control.

Item	Analog	Digital	Hybrid
Cabling	\$6,500	\$5,200	\$5,200
Splitters	\$12,000	\$0	\$12,000
Patchbays	\$8,000	\$3,200	\$3,200
Console	\$80,000	\$127,000	\$80,000
Booth Racks	\$14,000	\$12,000	\$14,000
Outboard Processing	\$13,000	\$3,000	\$13,000
Amp Racks	\$38,000	\$0	\$0
Speaker Processing	\$20,000	\$7,500	\$7,500
Speakers	\$81,000	\$123,500	\$123,500
Conduit	\$40,000	\$22,000	\$22,000
Rigging	\$6,500	\$9,000	\$9,000
Structural	\$0	\$3,000	\$3,000
Amp Room	\$18,750	\$0	\$0
Cooling	\$30,000	\$10,000	\$10,000
Tech Power	\$25,000	\$40,000	\$40,000
Installation	\$75,000	\$55,000	\$55,000
Total Cost	\$467,750	\$420,400	\$397,400

In this example the fully digital solution is about 10% cheaper than the analog and the hybrid is about 15% cheaper. The digital and hybrid solutions can also offer the following features:

- Amplifier control and monitoring
- Recall and automation
- Digital splitting and patching
- Multiple control surface
- Fault logging

It would also be easier to design the digital system with redundancy in mind, thereby creating a system that would be suitable for applications where safety and reliability are critical requirements.

Cost estimates given in the preceding tables are rough numbers intended for illustration purposes and do not reflect actual installed system costs.

Cost-effective, flexible, reliable

Renkus-Heinz St series: CobraNet ready

The Renkus-Heinz ST Series integrates amplification into the loudspeaker system. The PM-3 Digital Power Module has standard analogue inputs. The user can optionally add a CobraNet input card to the rear panel, thus enabling an ST loudspeaker to receive a digital audio input signal via the CobraNet network.

Multiple ST Series loudspeakers can be linked via CobraNet, or as many as six ST speakers can receive individual signals from a single CobraNet card. That's possible because each card can receive up to 6 audio channels from the CobraNet network: after D/A conversion, all six channels are made available to the user on a Phoenix/Combicon connector strip. For example in an array of six ST loudspeakers, only one speaker in the array need be fitted with a CobraNet card. This speaker automatically receives the first of the selected CobraNet audio channels: the remaining 5 channels can be delivered to the appropriate target loudspeakers by linking each target input to the "master" input via short runs of audio cable. In this way the benefits of using CobraNet can be exploited while keeping the cost to a minimum

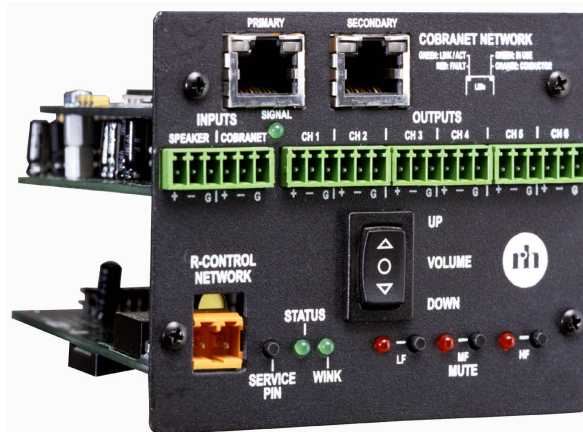


Figure 2: The optional ST Series CobraNet input

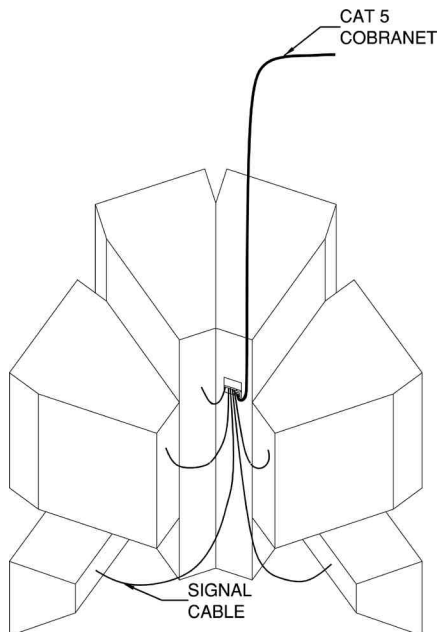
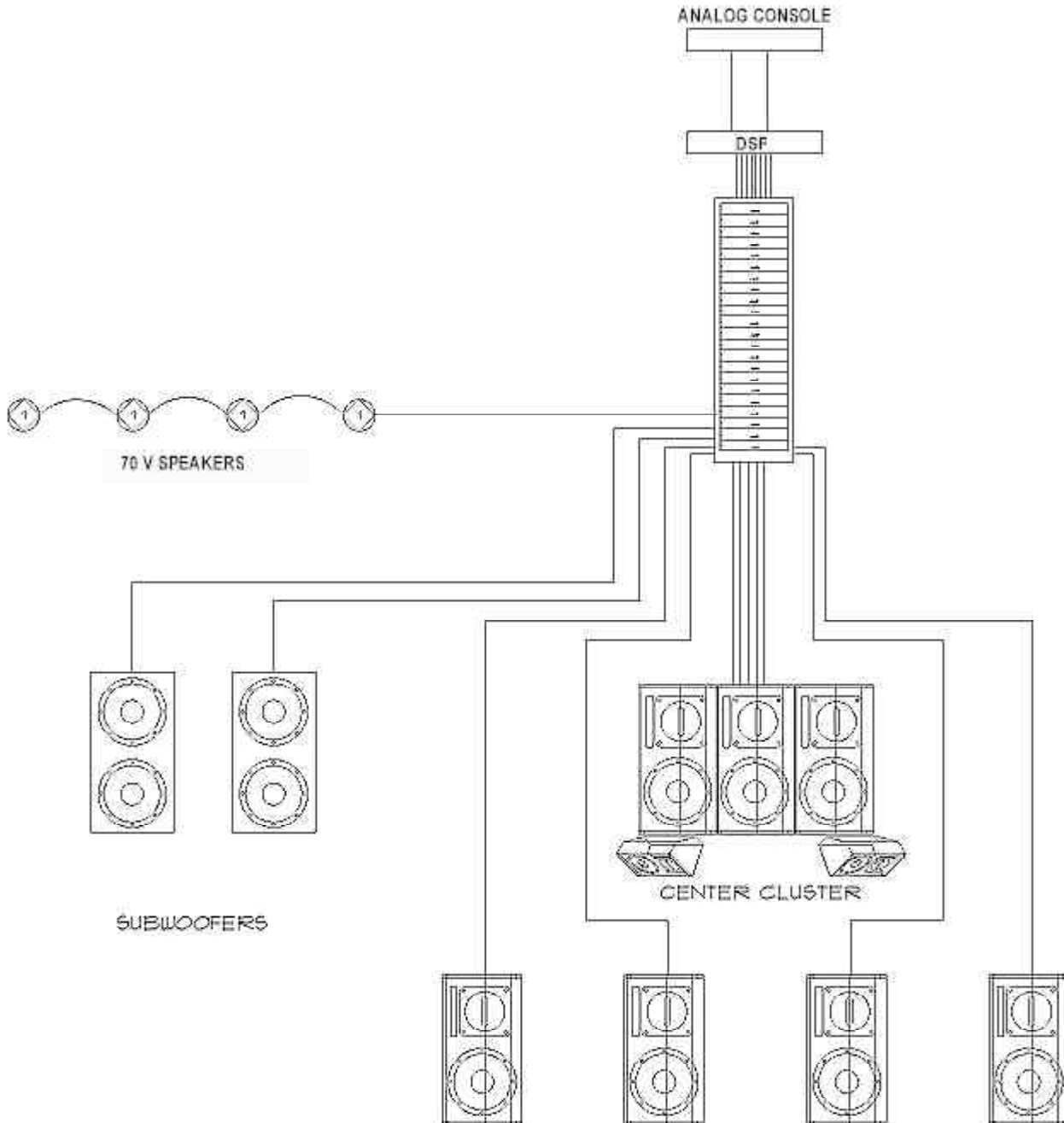


Diagram 3: Array of six ST Series loudspeaker systems, with CobraNet applied to one loudspeaker and analog "jumpers" to the other array modules

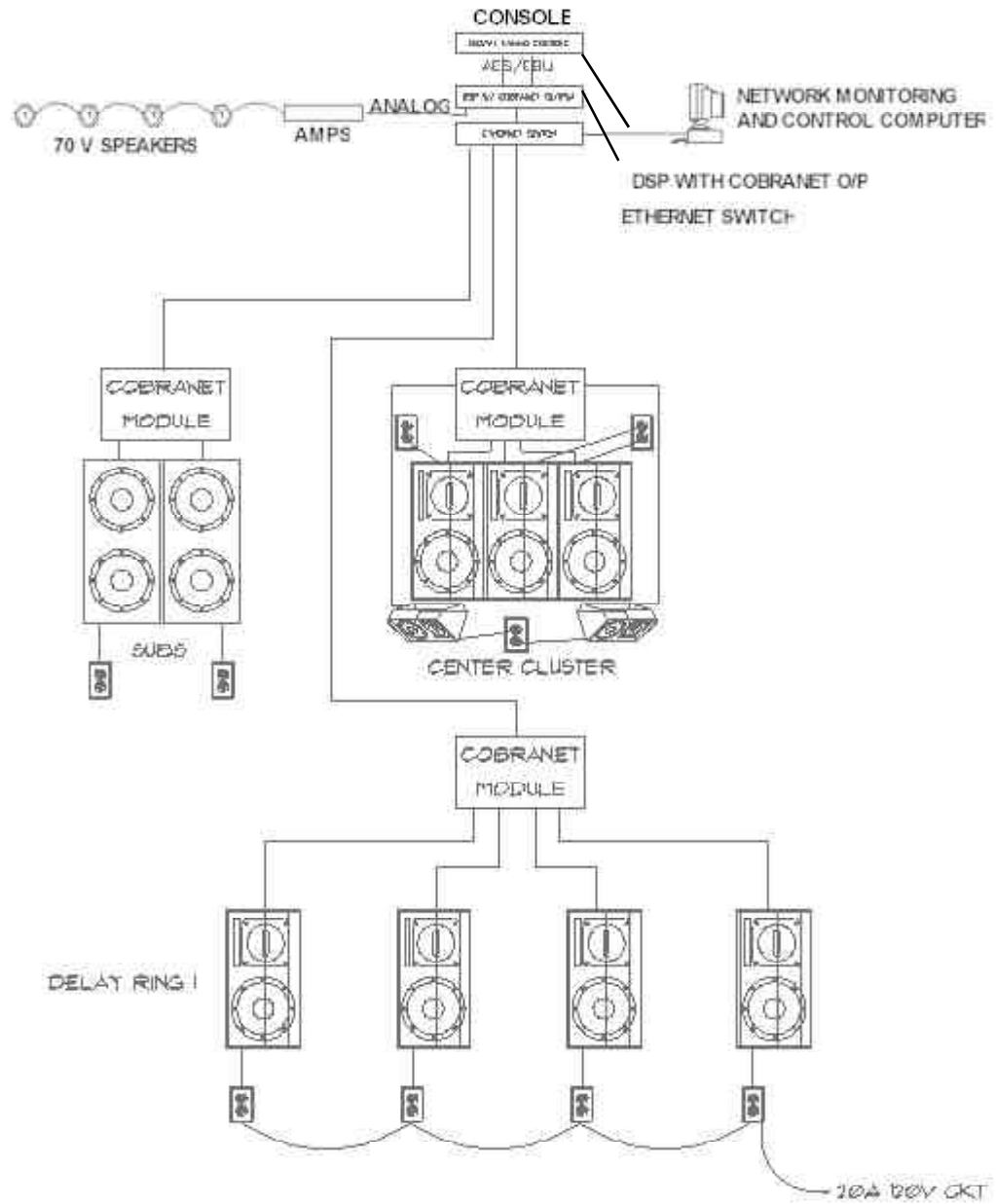
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Small System – Analog Solution



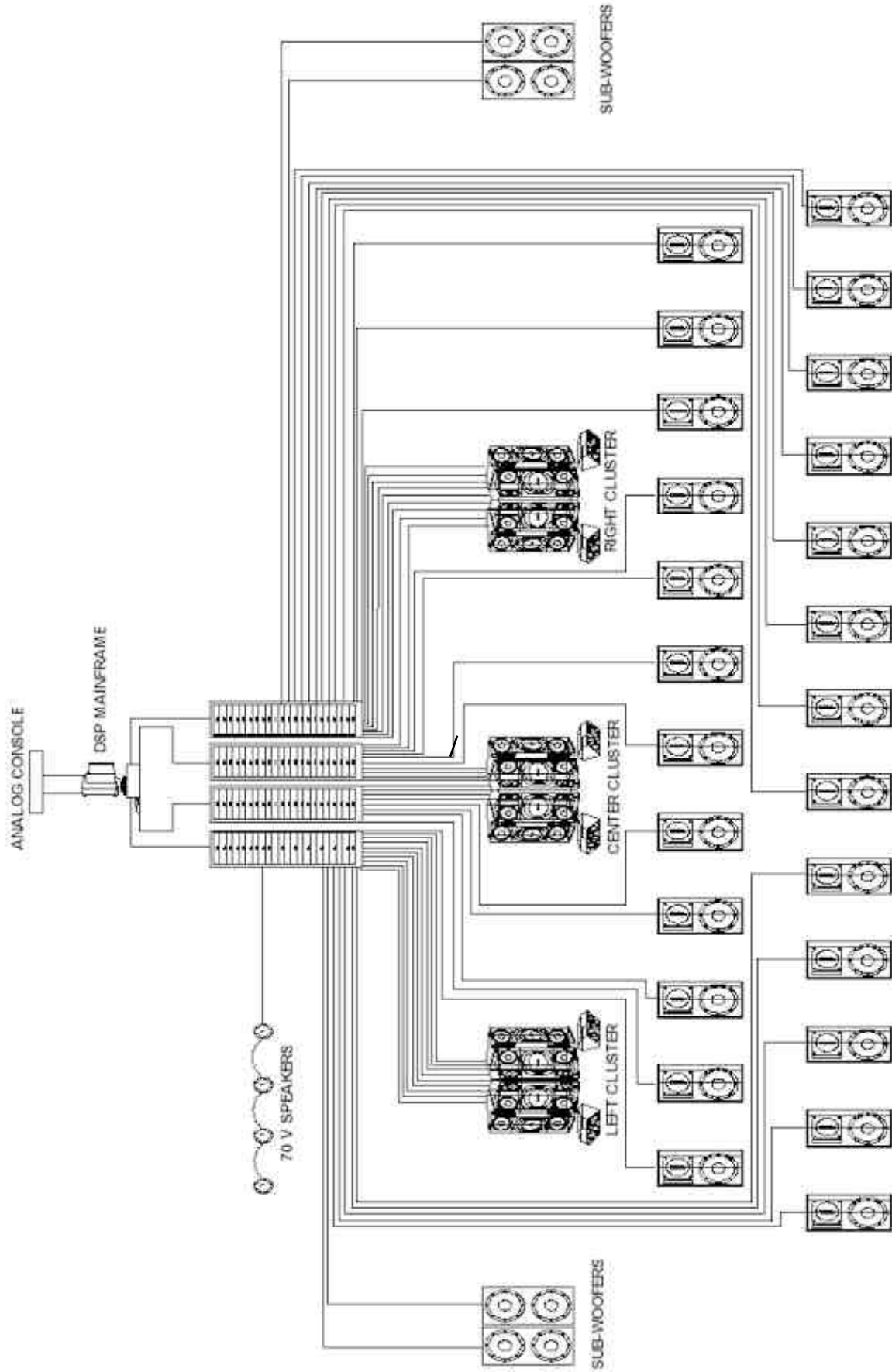
Cost-effective, flexible, reliable

Small System – Digital Solution



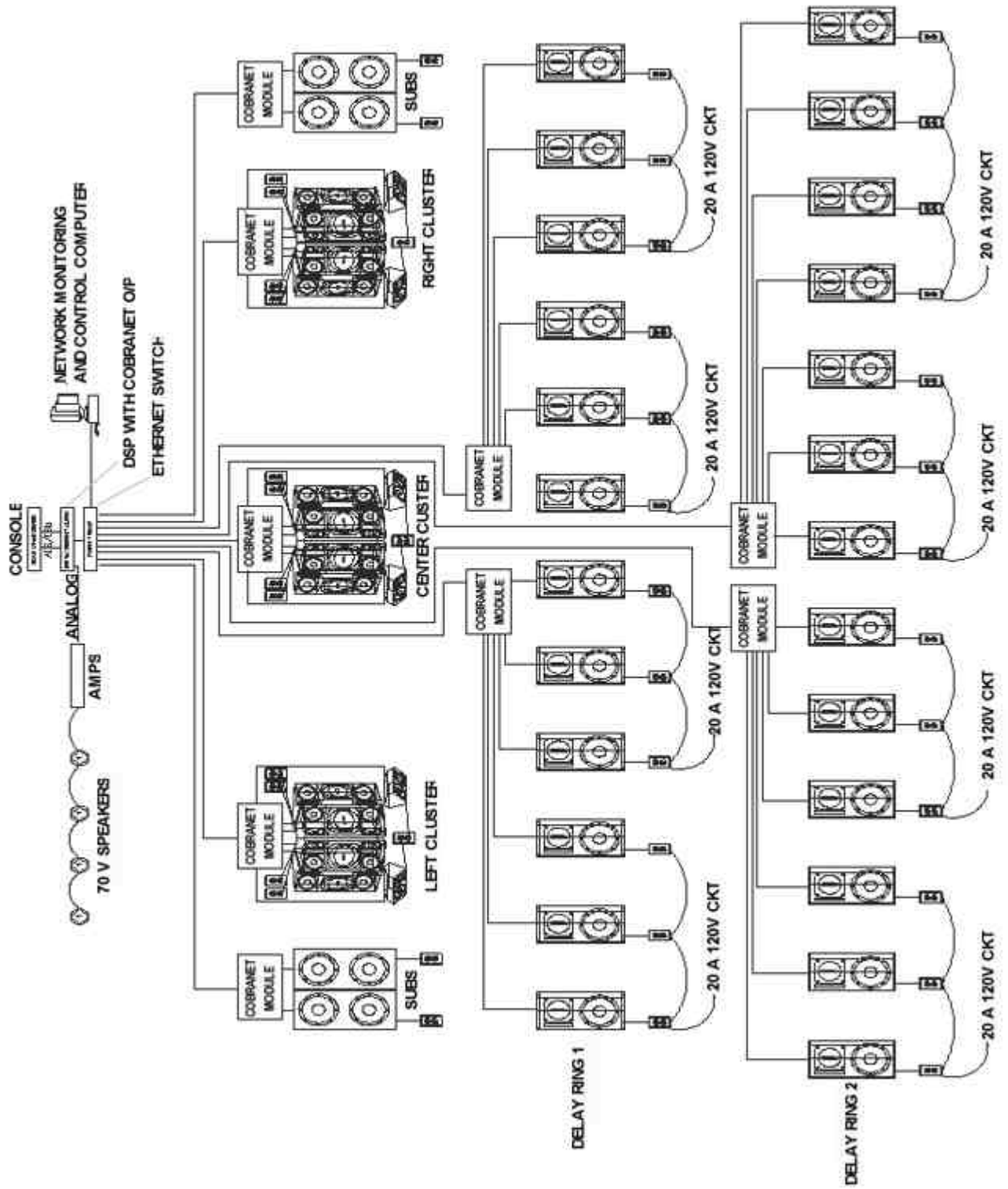
Large System – Analog Solution

Cost-effective, flexible, reliable



Cost-effective, flexible, reliable

Large System – Digital Solution





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