VALCOM

A POTTER COMPANY

Engineered, Built and Supported in the U.S.A.

General Public Address and Intercom System Design Guidelines

This Document Is Intended to Be Viewed In PDF Format

Rev 2023-1.21

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Best Viewed With

What Makes Valcom Stand Out?

When asked what makes Valcom stand out, we find it impossible to choose one answer.

1) We are proud innovators.

   a. We invented self-amplified speaker technology that is now the standard of most government, industrial, educational, healthcare and commercial institutions. Why? Self-amplified speakers feature highly efficient, integrated point-of-sound amplifiers and therefore connect with inexpensive, modern UTP cabling. Unlike old-fashioned 25/70.7/100-volt amplifier-based systems, there is no single source audio blocking and adjusting audio levels is as easy as turning the built-in volume control.

   b. We started offering VoIP speaker products and endpoints during the infancy of VoIP technology. Today we are offering our 3rd generation of VoIP speakers, horns, feature servers, FXS and FXO gateways. We utilize industry standard session initiation protocol (SIP) and our own feature rich protocol and often use both in the same systems.

   c. We design and build 95%+ of the products we offer in our state-of-the-art manufacturing facility located in Virginia's beautiful Blue Ridge Mountains. Having our own in-house electrical/mechanical/software engineering groups, metal fabrication and production facilities allows us to provide rapid response to our customers' requests.

   d. Our competitors follow our lead.

2) We are international friendly. We have installations in the Middle East, Europe, Asia, North and South America and many other regions of the world.

3) We are problem solvers. We pride ourselves on finding new and innovative ways to satisfy the needs of our customers.

4) We are competent, we care, and we are obsessed with customer service. This is mandated from the top of the organization. A mandate that we are honored to execute:

- We run toward customer concerns and work hard toward speedy resolution.
- We support our customers, all of them, from distributor to integrator to end user.

5) We provide choices. Other manufacturers provide a single local source for their products and service. We will work with any qualified integrator selected by our customers.

Founded in 1977, Valcom is the largest manufacturer of integrated public-address systems in the world and is the product of choice for thousands of integrators and their customers worldwide. Our products are marketed through established, local direct distributors and integrators. Valcom offers a wide variety of products providing the best public-address/intercom systems and emergency mass notification solutions for manufacturing/warehouse facilities, schools, universities, airports, hospitals and for your facility as well.

Valcom has long capitalized on the many advantages of using low voltage cabling and distributed amplification. Both our Self Amplified One Way analog and VoIP IP based systems offer distinct advantages over previous technologies.

Virtually all of our products are proudly manufactured in our state-of-the-art facilities in Roanoke, Virginia, USA. Valcom's Engineered Systems Division specializes in large, sophisticated school intercom, and scalable Emergency Mass Notification Solutions. Our clients include major universities, government entities, medical and transportation facilities.

Our product offering is extremely comprehensive. We have regional product experts available. They are eager to discuss a solution tailored to your specific mass communication or school intercom requirements. We encourage you to contact us today.

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When specifying authorities' base designs upon old specs, they perpetuate old solutions.

When specifying authorities are more interested in meeting or exceeding the needs of a facility than specifying the exact equipment to do so, we can offer the best solution 99% of the time.

Select the speaker and clock types and quantities for each area, select the desired access method and features - then let us provide an amazing solution!

Introduction

Public-address systems became increasingly popular throughout the 20th century. The industrial revolution led to large scale manufacturing facilities with hundreds, if not thousands, of employees. Maintaining efficiency of such large-scale operations required the ability to locate key individuals rapidly and communicate to the masses instantaneously. The only logical solution was a facility wide speaker system.

From those early roots has grown an industry dedicated to internal communications. Systems have evolved from the old fashioned centrally amplified, microphone actuated public-address systems, to multimodal telephone-based systems that utilize integrated circuits, microprocessors and data network connectivity.

Today's internal communication systems are comprised of both primary and secondary communication devices. Primary devices provide instantaneous communication that requires no action on the part or the message recipients. Even today, primary alerting is best accomplished with a facility wide speaker system.

Secondary communication devices require the user to take some action or to be prepared to receive the message. Examples include social media, text messaging and e-mail.

Today, both primary and secondary communication systems can work in tandem.

Modern public-address systems are designed not only for general announcements, but for emergency notification. They often feature both one-way and two-way communication and supervision to insure their availability in crisis situations.

Under microprocessor control, modern public-address systems allow users to dynamically choose message destinations and feature both live voice and prerecorded audio capabilities.

Modern public-address systems save money and lives.

Requests for Proposal (RFPs)

We will be pleased to review any published RFQs or RFPs associated with your opportunities, however, it's rare that these documents provide the device types and counts required to provide a quote.

RFPs and RFQs are often crafted from bid specifications provided by manufacturers and written around specific products. Manufacturers write their bid specifications in such a way that only their products may be considered. These documents often require rarely, or never used features and functions that are specific to one manufacturer.

Occasionally, RFPs and RFQs actually represent products on which an end user has standardized. These often disallow substitution and may, if reissued without the benefit of oversight, perpetuate the use of old technologies.

Too often, however, RFPs and RFQs are fabricated using cut and paste from various manufacturers' bid specifications and cannot be met line-by-line by anyone.

Many times, strict adherence to RFPs and RFQs can limit an End User's options in obtaining superior state-of-the-art solutions offering all of the features that they really need.

In most cases, what's truly important is meeting or exceeding the *intent* of the specification.

We still see newly published RFPs and RFQs that were written in the 1950s. If no one had ever worked to modernize these, we'd all be using rotary telephones, switch bank manual intercoms and old-fashioned central amplifiers.

Remember that *RFPs simply indicate a need* and are a starting point towards obtaining the best solution to satisfy that need. Providing this solution is the best service that we can provide to the End User.

Superior results are realized when you work proactively with specifying authorities and End Users to educate them on the best solutions available. If your company simply responds to published RFPs and RFQs, and those RFPs specify dated technology, then we will offer a better solution using our innovative products. It is our task, together, to work with specifying authorities to teach them why Valcom solutions are better. We have a great deal of marketing collateral to support this fact and we will gladly participate in webinars, conference calls, and, when practical, live demonstrations to decision makers.

We offer *great* solutions; therefore, we have had remarkable success with this strategy.

As a manufacturer, our quotes are based upon customer provided material lists. Or, if you provide the information required to do so, we can assist in product selection.

Every facility has different requirements for their communication systems. There is not a "one size fits all" solution. Remember that the solution that we suggest can only be as accurate as the information that you provide.

This document will guide you to providing the information that we need to provide a complete and accurate equipment list for your application.

Conduct a Site Survey

Whenever possible, conduct an on-site survey of the intended jobsite. An ideal time to visit is when the site is in full operation so that you can gather accurate noise level and activity data from the site.

Assumptions can be costly

Site surveys can provide crucial details that RFPs alone cannot. RFPs don't typically advise of costly accessibility challenges like asbestos laden ceilings, heavy room furnishings that must be moved to complete work, requiring a rented scissor lift to mount horns, or concrete walls through which infrastructure must be routed.

1) Are prescribed equipment mounting locations appropriately sized?
2) Are dedicated power receptacles of adequate capacity located in all equipment mounting locations?
3) Will any existing equipment require removal or relocation?
4) Does the prevailing building/fire/electrical code require:
    a. that abandoned cabling be removed or that new cable be in conduit?
    b. fire/plenum ratings on backboxes, cable or other equipment?
    c. that backboxes or other equipment to be tethered to the facility's structure (i.e. seismic strapping)?
5) If existing equipment will be reused, is the equipment in working condition?
    a. Does the equipment offer suitable inputs and outputs for the required integration?
    b. If existing cabling will be reused, is it in good condition, of the correct type/gauge/conductor count for use with the new system? Are cables easily identifiable?
    c. If existing speakers will be reused, are they the correct type, in good working order and properly located?
    d. Are existing clocks keeping accurate time and compatible with the new system?
    e. Are existing amplifiers providing clear adequate sound?
    f. Is existing rack space of the correct type, adequately sized and in a suitable location?

g. Will existing data networks and data jack locations support new IP based equipment?

6) Is the environment slated for the new equipment environmentally controlled and protected from water leaks, building debris and tampering (as required)?
7) Are all work areas easily accessible?

Advise the owner of any observations and concerns in your proposal.

We've prepared a Site Survey Form to assist you in your site survey. It is available in both Microsoft Word and PDF formats.

Define the Scope of Work

After you conduct a site survey, an important part of a project's initial bid process is for you and your client to formally document a detailed scope of work. Unstated customer expectations can quickly lead to dissatisfaction and expensive cost overruns. Detail the customer's expectations and where your responsibility begins and ends.

This is especially important when the proper operation of the system that you are providing is dependent on systems that you do not manage, such as telephone systems and facility networks. If necessary, your pre negotiated responsibility should be limited to proving that the equipment you've provided is fully functional and that factors beyond your scope of work are preventing successful deployment. You might even agree upon steps to determine this.

Remember, while you are installing, the customer is thinking. Failure to define a scope of work upfront will result is the customer's expectations growing in proportion to install time.

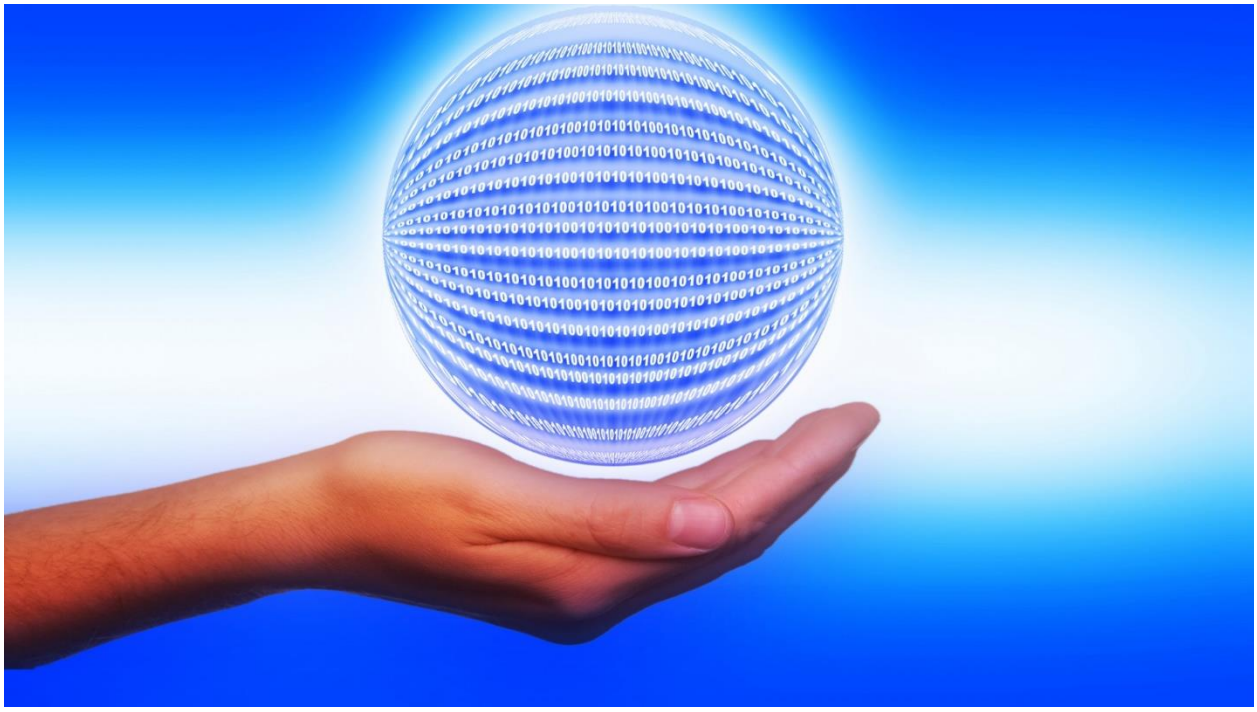
Don't firmly commit to reusing any existing infrastructure or equipment without a caveat of "if compatible and in good condition". Agree to a process of change orders should the customer expand their expectations or if site conditions are not as described in the scope and warrant additional charges.

Site access is closely related to defining the scope of work. Agree upon times when the contracted work can be performed. Oftentimes, the best time to work is after a site's regular business hours, however, work related areas may be locked at these times. Pre-negotiate unrestricted access to all areas involved in the scope. Having your technicians wait for a security guard or custodian to open a locked room is never a profitable situation.

Historic Designations

Be aware that jobsites in areas designated as having historic or cultural significance may be protected by laws or rules that regulate the types of improvements that may be made. Be aware of any such regulations before making a proposal.

Getting Started



Technology Choices

Before integrated circuit technology, most public address speaker systems used old fashioned 100, 70.7 or 25-volt central amplifiers and heavy gauge shielded wire. While old fashioned central amplifiers are still used today, a more common approach allows the use of small gauge UTP and self-amplified or IP based technology.

Self-amplified or IP based technologies allow for easy installation, functional versatility, large scale deployment, and remote maintenance. UTP based systems are always the best choice for large, busy facilities since they inherently support many simultaneous announcements and/or talkback intercom conversations.

Old fashioned centrally amplified systems are restricted to one broadcast per central amplifier at any given time.

Self-amplified speakers feature a non-blocking, independently volume controlled, matched amplifier per speaker. They connect to the audio source and a shared dc power supply using UTP cabling.

IP speakers communicate over a properly configured network and offer all the benefits of self-amplified technology plus more.

IP speakers connect and are powered via PoE network switch ports (one per IP speaker), are independently addressable and feature virtual software-based volume adjustment

and programming. IP speaker systems easily span multiple buildings, cities, states and countries.

Talkback, or 2-way intercom capability, is an option with any style of speaker or horn. Speakers or horns used as talkback intercom points are typically IP, 45-ohm or old fashioned 25-volt speakers and are often accompanied by a separately mounted pushbutton (call button). The button allows users to ring a telephone. Once the telephone is answered, a bidirectional connection is established with the talkback intercom point.

45-ohm talkback speakers may or may not have built-in attenuation. It's important to choose models that are compatible with your intercom head end equipment. There is no difference between the 25-volt speakers used for talkback or one-way audio. Their functionality is determined by the system to which they are connected.

Talkback is an automatically switched, hands-free connection and does not require push-to-talk. The talkback conversation is terminated when the telephone terminates the call.

Talkback intercom points are quite common in classrooms, hospital operating rooms, elevators, building entrances, medical examination rooms and car dealership mechanic bays. Talkback systems should not be expanded to more than 2 talkback speakers per output, and because each speaker acts as a microphone, perform best in relatively quiet environments. Having multiple speakers picking up background noise and speech can make it difficult to discern the audio from the person with whom you are conversing.

Full IP Intercom

Valcom IP Mass Notification/Intercom systems differ from analog wired systems in numerous ways.

Hosting facility systems on a LAN/WAN provides many benefits, not the least of which - long term cost savings. Managing multiple IP based systems typically requires fewer personnel since most adjustments and diagnostics may be performed remotely. That means less time lost driving to sites, fewer service vehicles required, less vehicle insurance cost, less fuel cost, and more multitasking.

Unlike analog systems, Valcom IP Mass Notification/Intercom systems do not require a central control system. They are hosted on the LAN/WAN, therefore the physical location of endpoints and their proximity to each other is irrelevant. Also, unlike analog systems, system size constraints are essentially non-existent. These systems are easily deployed on a facility, enterprise and/or global scale.

Valcom's server-less design means that if properly configured network connectivity exists between endpoints, they will be able to communicate. This robust, redundant strategy coupled with inherent supervision, explains why Valcom IP Mass Notification/Intercom systems are utilized in some of the most vital facilities in the world.

A full complement of one way or intercom PoE speakers and horns are available to suit any area. These speakers and horns *connect as network endpoints* and may be selected in any combination conceivable for announcements to a single area, multiple areas, or everywhere. Access may be via single line POTS type telephones, FXO ports, loop start C.O. line ports, loop start trunk ports, SIP, microphone or analog station ports (FXS) featuring CPD (Calling Party Disconnect).

Visual notification devices, such as LED displays, may easily be incorporated into your design to deliver messages to high noise areas, to benefit hearing impaired individuals, or anywhere that visual alerting is desired.

Multichannel Talkback Gateways are available in 45-ohm or 25-volt models. They may be used to upgrade existing analog intercoms. Each channel provides an adjustable talkback audio feed to either 45-ohm or old fashioned 25-volt intercom speakers. All models offer one or more line level outputs for direct connection to an amplifier line level input or to self-amplified speakers. Additionally, one normally open call button input is available per channel.

Input/Output Gateways allow users to launch messages from panic buttons or automatically from 3rd party monitoring devices. They also provide switch outputs to control electric door locks, lighting or any other facility system.

Audio gateways allow the introduction of music, microphone or other external audio sources. They may also provide audio outputs to facilitate integration of existing legacy analog paging systems, radio systems, etc.

Although the Valcom IP Mass Notification/Intercom systems feature a server-less design, there are Application servers available to provide desirable features.

Telephone Paging Servers allow the broadcast of system announcements through the speakers of many existing IP telephones. This simple addition adds audio coverage to private offices and other areas that may not be close to a system speaker.

Application Servers may be added to provide scheduled tones, music, prerecorded or live announcements. They also provide a graphical browser interface to launch messages or monitor call status. Application servers feature the ability to monitor data feeds such as syslog, RSS, ATOM or CAP feeds to automatically launch one or more messages to speakers/horns, IP telephone speakers, text to LED signs, as well as screen pop ups on PCs. All the messaging modes may be simultaneously initiated from a single user action.

Advanced Servers allow users to launch their own emergency announcements via CAP, RSS and/or ATOM feeds. This allows the incorporation of any system capable of responding to such feeds.

All servers have a high availability option.

What's the best solution?

There is no overall best solution. It depends on the requirements of any given site. Both self-amplified and IP systems are widely deployed and used as a standard worldwide.

While full IP deployment offers the most versatility, it's not uncommon to use IP gateways and Application Servers for audio distribution between local wiring closets while using analog self-amplified or talkback speakers and horns as the actual sound points.

This is all part of the many benefits of Valcom's technologies. There are typically multiple options to achieve the end user's internal communication goals.

The choice of using VoIP or analog equipment for the main control and audio distribution is dependent upon many factors:

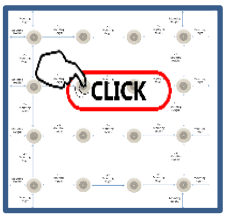
a) The preference of the owner
b) The intent of the system (live audio announcements, music, etc.)
c) The size of the system
d) The number of sites included in the system
    a. If properly configured network connectivity exists between the Valcom IP gateways and endpoints, they will work together. That's a very strong advantage of choosing an IP solution; you can have as many "main" and "remote" sites as are necessary. Systems installed in different geographical areas may all act as one. Unless a single site is providing specific services, losing network connectivity to one site does not affect the others at all. For this reason, IP is the best choice for large installations.
e) The feature set required
f) Initial budget
g) Desire for long term cost savings
h) Expertise of the installer
i) Expertise of the owner
    a. Systems that will be maintained by a facility's IT department are typically full IP deployments.
    b. Systems maintained by facilities management are typically full IP, analog or a hybrid of both.

We will gladly assist you in choosing one or more options for your application.

Speaker Choices

There are many speaker styles available.

Ceiling speakers spaced at no more than twice the mounting height are the best choice for even sound coverage in interior areas. When following this rule, coverage per speaker is simply the square of the spacing. For example, with 8 foot ceilings, maximum spacing between speakers would be 16 feet and each would cover 16^2 or 256 square feet. If working in meters, then the units simply change to meters and meters^2. Contact us if the ceilings are over 25 feet (7.6 meters) high or if the ambient noise level is over 76 dBspl.



In critical noisy areas, like airport gate areas, space ceiling speakers at [2 x (mounting height – 4 feet)]. Or if using meters [2 x (mounting height – 1.2 meters)].

The first and last rows of ceiling speakers should begin at half the spacing distance from adjacent walls.

Conveniently, our example used a room with perfect dimensions for the desired spacing. In practice, this rarely happens. If the room dimensions are not ideal for the desired spacing, simply adjust:

Desired spacing = 16 feet (16’)

Actual room dimensions 20’ x 30’

20’ ÷ 16’ = 1.25 speakers/row – round up to 2 speakers/row

30’ ÷ 16’ = 1.87 speakers/column – round up to 2 speakers/column

To determine the new spacing:

20’ ÷ 2 = 10’ spacing between speakers. ½ that distance starting from walls (5’)

30’ ÷ 2 = 15’ spacing between speakers. ½ that distance starting from walls (7.5’)

Wall speakers should only be used in small interior areas where there will only be a single speaker, or if the use of ceiling speakers is not an option.

Horns are typically reserved for use in exterior environments, harsh environments or large, loud interior locations.

As a general rule, horns and speakers providing audio to an area should be installed such that all sound is projected in the same direction.

Audio coverage by speakers and horns is a function of mounting height and the area's ambient acoustic characteristics and noise level. For non-reverberant areas, refer to the recommended spacing chart below. Note that, for horns, the chart is based upon an 18 foot (5.5 meter) mounting height. Tips for reverberant areas may be found here.

Imperial units of measure

Speaker & Horn Placement Guide						
Mounting Height x 2 = Ceiling Speaker Placement	Horns		Quiet 50-65 dB	Moderate 65-80 dB	Noisy 80-90 dB	Very Noisy 90 dB+
		5 Watt	110' (12,000 ft²)	80' (6,400 ft²)	50' (2,500 ft²)	30' (900 ft²)
Wall Speaker Placement Spaced 20' Apart (1 per 600 ft²)		15 Watt	-	-	75' (5,600 ft²)	45' (2,000 ft²)
		30 Watt	-	-	-	60' (3,600 ft²)
		Shows space between horns and coverage per horn				

Metric units of measure

Metric Speaker & Horn Placement Guide						
Mounting Height x 2 = Ceiling Speaker Placement	Horns		Quiet 50-65 dB	Moderate 65-80 dB	Noisy 80-90 dB	Very Noisy 90 dB+
		5 Watt	34 m (1,115 m²)	25 m (595 m²)	15 m (232 m²)	9 m (84 m²)
Wall Speaker Placement Spaced 6m Apart (1 per 56 m²)		15 Watt	-	-	23 m (520 m²)	14 m (186 m²)
		30 Watt	-	-	-	18 m (334 m²)
		Shows space between horns and coverage per horn				

If your design will include analog speakers or horns mounted in locations that will be difficult to access after installation, or includes areas with many speakers connected in parallel, add convenient wall mount volume controls to make future adjustment easier.

Talkback, or 2-way intercom capability, is an option with any style of speaker or horn. Speakers or horns used as talkback intercom points are typically IP, 45-ohm or old fashioned 25-volt speakers and are often accompanied by a separately mounted

pushbutton (call button). The button allows users to ring a telephone. Once the telephone is answered, a bidirectional connection is established with the talkback intercom point.

45-ohm talkback speakers may or may not have built-in attenuation. It's important to choose models that are compatible with your intercom head end equipment. There is no difference between the 25-volt speakers used for talkback or one-way audio. Their functionality is determined by the system to which they are connected.

Talkback is an automatically switched, hands-free connection and does not require push-to-talk. The talkback conversation is terminated when the telephone terminates the call.

Talkback intercom points are very common in classrooms, hospital operating rooms, elevators, building entrances, medical examination rooms and car dealership mechanic bays. Talkback capability works best in quiet areas and is designed for 1 or 2 speakers per talkback circuit.

Robust versions of talkback intercom points, known as emergency call stations or help points, are available in many forms and include one or more call buttons. These are commonly used in parking garages, parking lots and any public space where immediate assistance might be required.

There are many options for emergency help points such as integrated cameras, strobes and light beacons for easy identification.

Special Application Speakers/Horns

Valcom offers speaker and horns for specialty areas such as cleanrooms and potentially explosive environments such a petroleum refineries and grain elevators. If your application includes areas with unique requirements, give us a call to discuss the best solution.

High Fidelity Speakers

Valcom interior speakers are commonly used for background music. If your application requires higher fidelity (retail, lobby areas, etc.) then you may wish to select our Signature Series speakers which are designed to provide higher fidelity audio.

V-1420	High-Fidelity Signature Series Ceiling Speaker
V-1422/V-1422-EC	High-Fidelity Signature Series Lay-in Ceiling Speaker
V-1440	High-Fidelity Signature Series Monitor Speaker
V-1450	High-Fidelity Signature Series In-Wall Speaker

Design by Location

When designing a public-address or intercom system for larger facilities, separate the facility into logical subdivisions by floor and/or by function. Plan dedicated cabling and other support products such as power supplies and network switches for each subdivision.

Doing so will facilitate future maintenance and will logically support zoning.

Determining Zoning

A paging zone is simply a combination of speakers and horns that will receive announcements simultaneously. Zoning is usually dictated by area functions and commonality. Usually whole floors of multi-story facilities are considered a zone with sub zones further dividing the floor. *In other words, a zone is an area or areas into which you'd like to be able to direct area specific announcements.*

K-12 schools (Kindergarten through 12th grade) are by far the most granulized facilities with each classroom being a zone (called a station since it will feature talkback capability), each grade level being a zone, each floor being a zone, etc.

Properly configured individual zones can always be combined into larger groups, like all call, in system programming.

There is no practical limit to the number of stations or zones in a modern public-address/intercom system.

Plan Cabling to Support Zoning/Granularity

When planning the cabling for speakers/horns in a facility, connecting them all on one looped cable pull (even if feasible) limits you to one zone of audio. All audio will go to all speakers due to the common cabling. Conversely, if you connect each speaker on its own cable all the way back to the main equipment, then the speakers/horns may be easily configured in any future combination desired. In most installations, a wiring plan between these 2 extremes is best. Loop speakers in common areas (multiple hallways, restrooms, etc.) that will always receive common general announcements. Use dedicated cables for speakers in areas that will likely require area specific audio or omission from general announcements (classrooms, boardrooms, each floor, lobby, etc.)

Redundant Designs

When designing mission critical systems, designers should consider redundancy.

For systems that rely upon a facility network, network redundancy should be implemented. Network redundancy provides a means for network operations to utilize alternate “standby” infrastructure in the event of unplanned network outages.

Such redundancy may be achieved by providing alternate network paths, redundant standby routers, and switches. Should a failure occur in the primary network path, these alternate paths will automatically be available to provide backup routing.

For public address systems, source alternate speakers from different distribution frames served by unique ac power (i.e. different phases, different electrical panels, different circuit breakers). By doing so, if one of the distribution frames loses power every other speaker will still be operational.

IP speakers should be connected such that if a speaker connects to the network switch in distribution frame A, the next IP speaker connects to the network switch in distribution frame B. IP LED sign connections should follow the same pattern.

For analog speakers, wire alternating speakers such that if a speaker connects to an audio source in distribution frame A, the next speaker connects to an audio source in distribution frame B. The 2 distribution frames should have their own power supplies, if necessary.

All system components requiring power should be matched with appropriately sized battery backup (UPS) systems.

Provide multiple ways to invoke public address announcements. SIP, FXS gateways, Interactive consoles and/or microphones should be deployed throughout the facility and should be served from independent distribution frames.

High availability options for system servers such as Application Servers should be incorporated into your design with each server of a high availability pair located in a unique distribution frame.

System Power

Valcom Self Amplified Speakers and some Valcom Controllers are rated in Valcom Power Units (VPU). Products that require power have a negative VPU rating and products that provide power (power supplies and some controllers) have a positive VPU rating. The resulting sum of the VPUs between power supplies and the products that they are powering must simply be => zero. It's simple addition and subtraction, no complex power formulas are required. Power supplies are independent of speaker zones, so one supply can power speakers in many zones. VoIP speakers are PoE powered and do not require separate power supplies. Refer to the published network requirements. In order to minimize wiring cost and facilitate troubleshooting, it's best to locate PoE switches and power supplies in IDF closets within each speaker area.

A Word about Battery Backup

Communication systems are a vital part of any enterprise. The importance of such systems grows proportionally along with the size of that enterprise. This is especially true in modern business, healthcare, transportation, government, and educational facilities.

The ability to communicate with students, staff and clients is mission critical.

The importance of communication systems to everyday operations is only eclipsed by their importance in crisis situations. During crisis situations, a daily communication system rapidly gains high status as an Emergency Communication System.

Unfortunately, crisis situations are often accompanied by municipal power failures.

In such situations, communication systems that rely solely on these failed power systems will cease to function and, in their absence, chaos, danger, and loss of life may occur.

Additionally, if failed power is restored in phases, systems that rely upon each other for proper operation may falter and may not automatically recover. For example, devices set for DHCP may not be able obtain an IP address upon power restoration. This will occur if power to the network DHCP server lags power restoration to DHCP dependent network

endpoints, or if they require significant boot time upon power restoration. Some DHCP servers may require 10 minutes or more to recover from facility power cycles.

For these reasons, ensuring that mission critical systems such as network components and communication systems are paired with appropriately sized battery backup systems is critical.

Even if automatic backup generators are available, there will be a brief interruption between municipal power failures and generator startup. This is enough to cause affected systems to reboot thus causing an interruption to service.

Feedback Elimination

When a live page is broadcast in the same area from which it is initiated, acoustic feedback can be an issue. Digital feedback eliminators and Application Servers record announcements and delay their broadcast until the initiating telephone or microphone is idle. Therefore, there can be no feedback. Valcom's Feedback Eliminators and Application Servers also allow page stacking so that multiple announcements can be recorded, queued and broadcast sequentially.

Valcom Self Amplified Speaker Wire Length

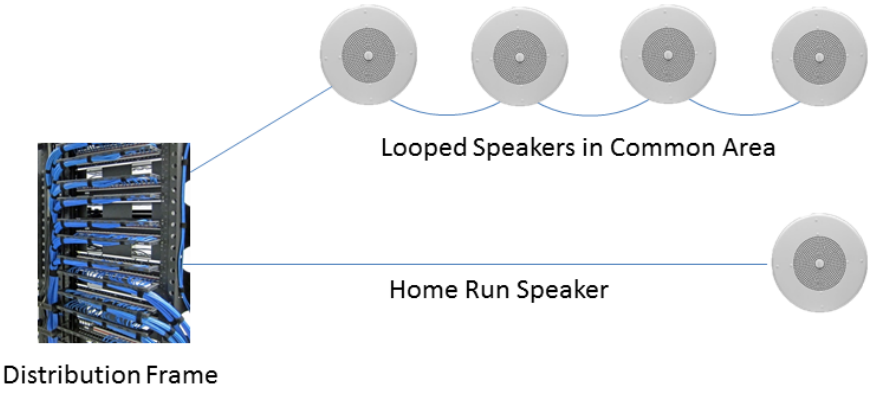
Valcom Self Amplified Speakers are connected with UTP cabling. There is a pair of wires for the audio, and a pair of wires for -24VDC (-48VDC for 30W horns) that is used to power the integrated amplifier. Speakers that will always receive the same audio can be looped together with the "tip" side of all speakers connected to one wire in a twisted pair and the "ring" side of all speakers connected to the other wire in the same twisted pair.

As with anything, there are some guidelines for how many speakers can be looped together. This is based upon the wire size and the distance of the loop.

Power Pair Wire Run Click for info on Twisting Pairs								
Number of Speakers/Horns Per Power Run					Power Run Wire Length in Feet (meters)			
1 VPU* Speakers	4 VPU* Speakers	Flex Horns	5 Watt Horns	15/30 Watt Horns	24 AWG	22 AWG	20 AWG	18 AWG
4	1	-	-	-	1000' (304 m)	1600' (487 m)	2500' (762 m)	4000' (1219 m)
7	2	1	1	-	500' (152 m)	800' (243 m)	1280' (390 m)	2025' (617 m)
15	4	2	2	-	250' (76 m)	400' (122 m)	640' (195 m)	1010' (308 m)
30	8	4	4	1	125' (38 m)	200' (61 m)	320' (98 m)	500' (152 m)

*VPU = Valcom Power Unit

Interestingly, unlike amplifiers, a single power supply may be used to power different loops of speakers, even if they are connected to different audio outputs.

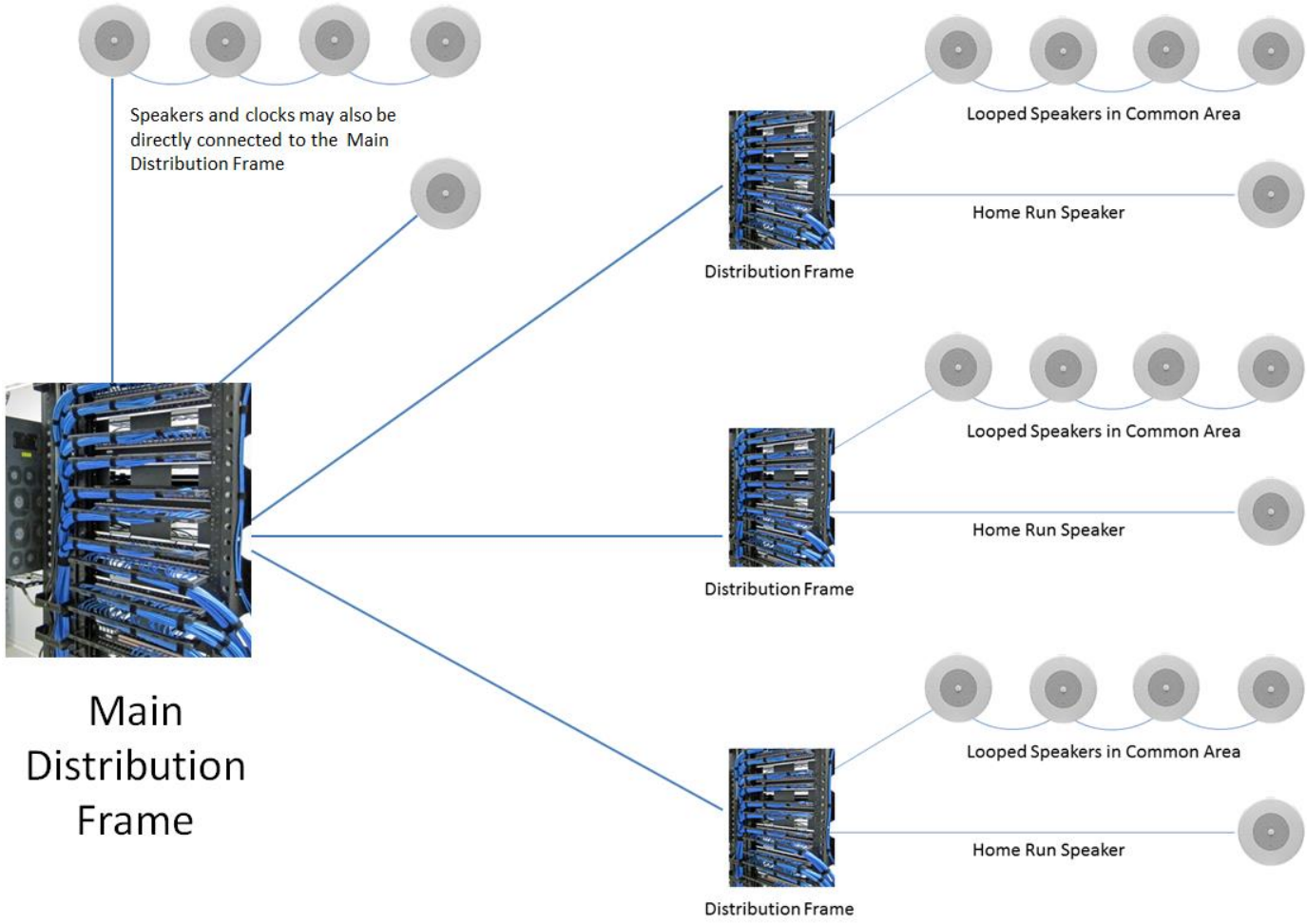


In both IP and analog systems, in areas where analog speakers or clocks will be used, a distribution frame should be established to centralize components common to those devices. This may include power supplies, amplifiers, line level audio distribution points, etc.

Speakers that will always receive the same audio may be looped (connected in parallel).

Talkback intercom speakers and single speaker zones are typically home run (use a dedicated cable).

Be certain to observe any published wire length or maximum speakers per output guidelines.

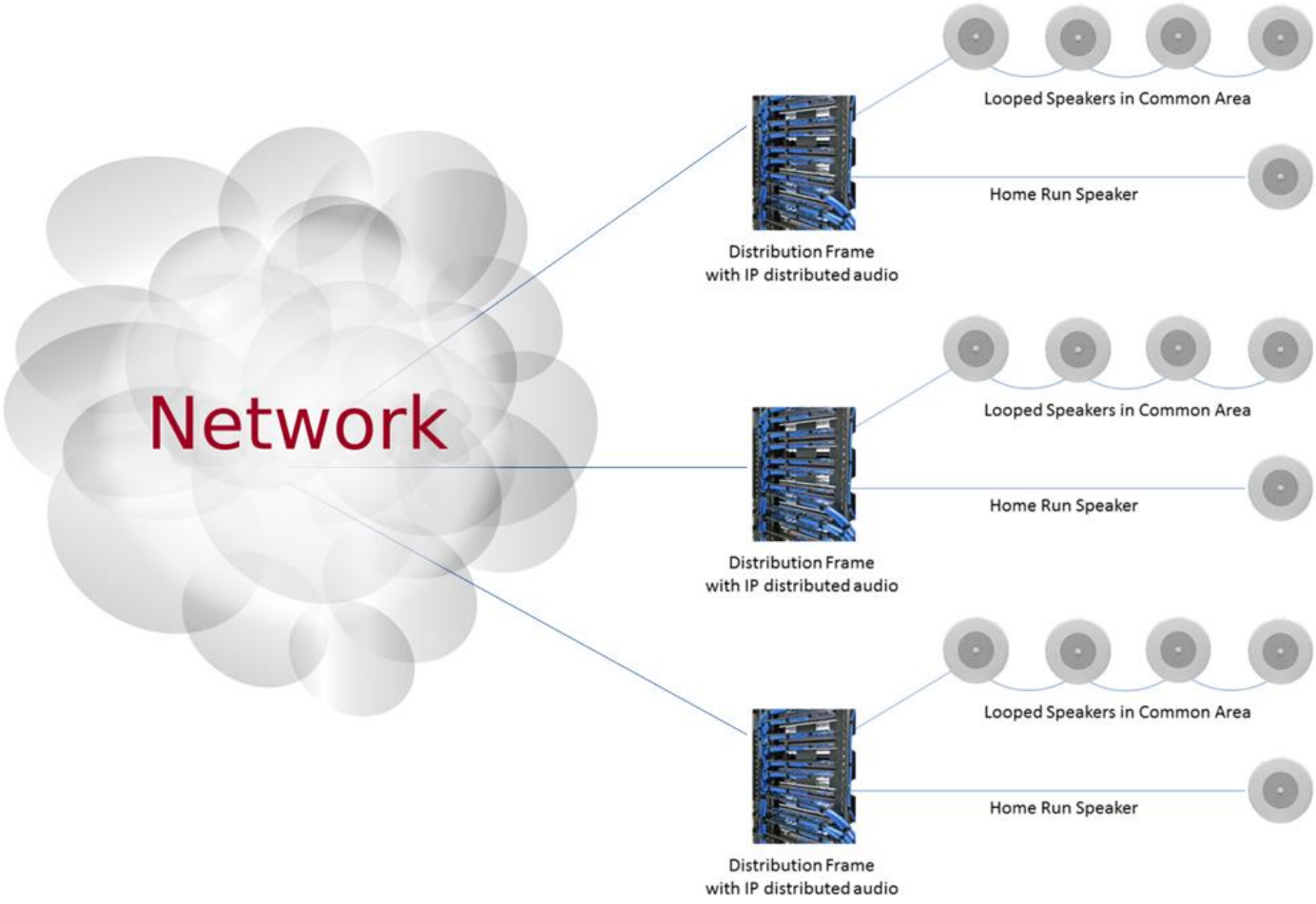


In a purely analog design, Individual area distribution frames will all connect to a main distribution frame. The Main Distribution Frame is where all audio and clock correction will originate.

Power supplies, amplifiers and other analog support peripherals for each area are distributed from the local distribution frame.

This practice facilitates troubleshooting and reduces maintenance and cabling cost.

Power supplies for self-amplified speakers are independent of audio and can power speakers in a single or many zones.



In systems that utilize IP audio distribution, a Main Distribution Frame is not typically required. All audio is distributed over the network, converted to an analog format and distributed from the local distribution frame.

Power supplies, amplifiers and other analog support peripherals for each area are distributed from the local distribution frame.

This practice facilitates troubleshooting and reduces maintenance and cabling cost.

Power supplies for self-amplified speakers are independent of audio and can power speakers in a single or many zones.

Note: With full IP solutions (not shown), there are no power supplies or amplifiers. With full IP systems, every speaker, horn, clock, and gateway simply connects to a properly configured network. These devices are powered by the network switch (PoE). There are no distance limitations or system size constraints for full IP solutions.

Plan System Access

There are no realistic limits for access paths and number of users in a modern Public-address/Emergency Notification system.

Access is typically accomplished through a telephone system so that any telephone user on-site (or off-site in some cases) can be granted access. Most often, one or more FXO (loop start trunk) ports are allocated on the telephone system, connected to the Public-address/Emergency Notification system, and programmed as a line pool (trunk group). This line pool allows users to connect to Public-address/Emergency Notification system via a trunk access code or preprogrammed line key. Session Initiation Protocol (SIP) is also a popular access method. In either case, the telephone system manages access.

You are never limited to only one access path. In a good design, you will have redundant paths such as FXO ports on the telephone system + one or more stand-alone access phones + microphone access, etc.

Determine who will use the system. For each user, what functions will they perform?

a) Make live voice announcements
    a. Through a telephone system?
        i. Through one or more FXO (loop start trunk) ports?
        ii. Through one or more FXS (analog station) ports?
        iii. Via Session Initiation Protocol (SIP)?
    b. Through a microphone?
        1. PC based microphone?
        2. Desktop microphone?
b) Launch pre-recorded audio
    a. Through pushbuttons?
    b. Through a browser?
    c. Through a hyperlink?

Microphone vs. Telephone Access

When adding dedicated page telephones or microphones, there are several things to consider.

Dedicated page telephones offer the ability to dial select multiple zones or groups in order to direct your announcement to different areas. They also support two-way hands-free talkback communication. Dedicated page telephones are a great backup to systems that use a telephone system for primary access. If the telephone system fails, the dedicated page telephones will still provide full public-address/intercom system access.

Microphones are only suitable for one-way announcements.

Microphones are suitable for calling one area. They may be added to announce to an entire facility or to a predefined section of the facility. They do not support talkback intercom communication. One benefit of microphones is that they are easily used by untrained individuals during crisis situations.

Desk Paging Microphone
- Omni-Directional Pickup Pattern
- Push-To-Talk Switch & Locking Bar
- Lift-to-Talk Switch w/Bypass Slide Switch Provided

Dynamic Noise Canceling Microphone
- Handheld w/Press-To-Talk Lever
- Heavy Duty Coil Cord Extends to 6'

Gooseneck Microphone
- Omni-Directional Pickup Pattern
- Push-To-Talk Switch

Microphone Adapter
- Provides Contact Closure
- Specifications: In/Out Impedance: 50Kohm Unbalanced; 600ohm Balanced; Power Requirements: -24Vdc Filtered 40mA

VE8091/VE8092 Interactive Console

The VE8091/VE8092 Interactive Console is a programmable touchscreen device that sends live and/or pre-recorded announcements, pushes text notifications to LED signs, can make and receive calls from Valcom and SIP endpoints, and receives audio pages.

SPECIFICATIONS

Access Methods include Touchscreen activation of announcements, SIP protocol phone calls, Valcom intercom and page group calls

Features include:

a) Desktop interactive IP device with 10.1” color touch screen display, built in beam-forming microphone array, and loudspeaker.
b) Sends pre-recorded audio files at the push of a button.
c) Sends microphone pages, both “Live Mic” and Record & Send for feedback elimination
d) Sends text messages to Valcom LED signs
e) Makes/receives bidirectional voice calls to Valcom and SIP endpoints
f) Sends recorded audio pages
g) Receives audio pages
h) Simple configuration via web browser interface
i) Adjustable display tilt for glare reduction
j) Power over Ethernet Plus (PoE+), or external 24VDC power adapter

Telephone Speaker Utilization

In most cases, facility telephone set speakers may be included in public-address system broadcasts. This is a very cost-effective way of supplementing audio coverage and enhancing system effectiveness.

Typical System Features

a) Telephone paging
    a. Multiple access paths. One per potential simultaneous voice page/intercom call[1]. For each path:
        i. You can use an FXO port from your phone system
        ii. You can use a SIP identity from your VoIP phone system
        iii. You can use a dedicated telephone
b) Scheduling
    a. Shift change tones
    b. Class change tones
    c. Automated announcements
    d. Music
c) WAV file storage and control
d) Clock synchronization control
e) Emergency messaging
f) Microphone access
g) Remote management

Additional advanced system features include:

a) Automatic door/gate control
b) Graphical “point and click” message delivery
c) LED Sign messaging
d) Offsite access via telephone line
e) Speaker supervision
f) Text to Speech
g) Automatic Messaging from monitored CAP, RSS, ATOM feeds
h) IP Camera Integration
i) PSAP alerting/911 call alert

[1] A single system can use any mix of access methods, SIP and FXO, SIP and dedicated telephone, FXO and dedicated telephone, etc.

Clock Choices

IP PoE Clocks Wired Clocks Wireless Clocks

It may seem odd to discuss clocks in a document concerning public-address system and intercom design, but it's not odd at all.

Just as a properly designed public-address system is essential for communicating with a large number of people, a synchronized clock system is essential for keeping those people on schedule. Synchronized clocks are multiple clocks that always display corresponding time.

This is very important to coordinate the activities of personnel and students. Without a single time standard, people have no way to know when it's time to begin and end the work day, attend meetings or, in the case of students, assemble for classes.

Many public-address systems offer the ability to synchronize clocks so that scheduled audio may be broadcast when the clocks reach specified times. The use of shift or class change tones along with synchronized clocks provides an audible notification for listeners to keep on schedule. It's very important that the audible notifications and clocks are coordinated.

There are several clock correction methods that may be used:

Wireless

Wireless clock synchronization, as the name implies, is accomplished through radio frequency transmission. The master clock or public-address system's integrated master clock constantly broadcasts the correct time.

A superior system will use frequency hopping technology to avoid interference and will feature the ability for clocks to rebroadcast any valid time correction signals in order to propagate the correction signal throughout the facility. *Wireless clock systems that do not include signal repeaters in each clock may require periodic renewal of a site FCC license and expensive stand-alone signal repeaters.*

Wireless correction is a very good choice for any facility and significantly reduces the cost of wiring.

Wired Clocks

Wired clocks may use old fashioned synchronous correction protocols or modern 2-wire digital correction. New installations of wired clocks should always use modern 2-wire digital correction as synchronous correction takes a significant amount of time to update the clocks following time changes. 2-wire digital clock correction constantly provides updated time information and corrects the clocks immediately when time changes or after temporary facility power failures. 2-wire digital correction is maintenance free and uses a single pair of Unshielded Twisted Pair wire.

Network Based/IP Clocks

Network based or IP clocks connect to a PoE network port. They are powered from, and receive correction data from, the network switch. They obtain time from an NTP (Network Time Protocol) server. These are a good choice for modern facilities that choose to coordinate time between multiple networked systems with a maintenance free solution. IP clock correction corrects the clocks quickly after time changes and, should facility power temporarily fail, immediately upon restoration of the network.

Non-IP Clock Power

Analog display wireless clocks are available with long life battery power or may be powered with 24vdc over a single pair of Unshielded Twisted Pair wire. Wired digital and analog display clocks are typically powered with 24vdc over UTP cable.

Display types

All analog display clocks are available in 16-inch (40.6 cm) and 12 inch (30.48 cm). Digital display clocks are available with 2.5-inch (6.35 cm) or 4.0-inch (10.16 cm) digits. Digital display clocks may have 4 digit displays for hours and minutes or 6 digit displays for hours, minutes and seconds. 12-inch analog display or 2.5-inch digital display clocks work well in offices, lobbies, break rooms and other small to mid-sized areas. 16-inch display or 4.0-inch digital display clocks have high visibility and should be used in large rooms and open common areas.

Analog display clocks are available with custom dials incorporating corporate logos or other facility related graphics. Custom dials with 24-hour format and/or Arabic numerals are also available. Clock/speaker combinations units, popular in classroom environments, are available with digital or analog clocks.

Mounting

All clocks are available in single sided wall mounted or double-sided wall/ceiling mounted versions.

Time Base

The time displayed on the synchronized clocks will only be as accurate as the time provided by the master clock or public-address integrated system master clock. All modern systems use either NTP or receive time from GPS satellites; however, if there are readily available public NTP servers in your region of the world, there is no need to have both in one system as this simply adds unnecessary cost. Valcom offers a variety of Master Clocks for use in any application. Contact us for details.

Spacing/wire length guidelines

16-inch (40.6 cm) clocks may be read from as far as 140 feet (43 meters)

12-inch (30.48 cm) clocks may be read from as far as 98 feet (30 meters)

2.5-inch (6.35 cm) clocks may be read from as far as 150 feet (45 meters)

4.0-inch (10.16 cm) clocks may be read from as far as 250 feet (76 meters)

Using 24 AWG UTP for 24V Clocks Click for info on Twisting Pairs					
	1 Clock per Wire Run	**5 Clocks per Wire Run**	**10 Clocks per Wire Run**	**15 Clocks per Wire Run**	**20 Clocks per Wire Run**
Analog	3000’/914 m	1000’/304 m	600’/183 m	400’/121 m	300’/91 m
2.5-inch Digital	1500’/457 m	500’/152 m	250’/76 m	N/A	N/A
4-inch Digital	400’/121 m	100’/30 m	N/A	N/A	N/A

Using 20 AWG UTP for 24V Clocks Click for info on Twisting Pairs					
	1 Clock per Wire Run	**5 Clocks per Wire Run**	**10 Clocks per Wire Run**	**15 Clocks per Wire Run**	**20 Clocks per Wire Run**
Analog	7000’/2130 m	2500’/762 m	1400’/427 m	1000’/304 m	750’/229 m
2.5-inch Digital	3900’/1189 m	1300’/396 m	700’/213 m	N/A	N/A
4-inch Digital	900’/274 m	300’/91 m	N/A	N/A	N/A

Speaker and Clock Accessories and Enhancements

Suggested accessories for a system cannot be determined by speaker types and counts alone. Details of the installation are also required. Some examples are listed below:

Product	Installation Detail
Round Ceiling Speaker	Round ceiling speakers may require bridges and backboxes, bridges without backboxes or support rings. In some cases, they may also require clock speaker baffles or square surface mount enclosures. We need to know the type of surface and environment in/on which the speaker will be installed to assist in accessory selection.
Lay in Ceiling Speaker	Lay in Speakers are designed to replace a ceiling tile. They are available in Imperial measurements 2' x 2' or metric measurements 600mm x 600mm and do not require any accessories.
Horns	Horns may require protective wire cages (guards) if they are in areas where damage from vandalism or unintentional ball strikes are possible.
Clocks	Clocks may require protective wire cages (guards) if they are in areas where damage from vandalism or unintentional ball strikes are possible. They may also require clock speaker baffles or 2-sided mounting brackets in certain applications.

If you provide the required installation details, we will happily assist you in selecting accessories and enhancements.

V-9904M-5* 4-inch Speaker Mounting Bridge (5 pk)
V-9914M-5 8-inch Speaker Mounting Bridge (5 pk)
V-9915M-5 Backbox (5 pk)
V-9916M Bridge/Backbox Combination:
*Must use V-9904M-5 & V-9915-5 together for Combo

V-9912P-12 Post-Construction Ring (12 pk)
V-9912M-10 Pre-Construction Ring (10 pk)

Visual Paging

Visual paging is a great option for:

1) Extremely loud areas
2) Areas frequented by hearing impaired individuals
3) Quiet zones
4) Messages that must repeat for a given period of time

Visual paging or “visual message systems” enjoy maximum effectiveness when LED signs are used in tandem with speakers or horns. Often flashers or strobes are added to bring attention to the fact that a message is in progress. LED signs are available both with and without integrated speakers. Note that IP LED signs require additional equipment (Interactive Console or Application Server).

Retrofit Systems

It's not uncommon for customers, especially K-12 customers, to have interest in reusing the speakers, cabling, call buttons and clocks from their antiquated intercom/public-address system. If this is the case, we'll need to know:

1) The type(s) of speakers that will be reused
2) How the existing speakers and call buttons are wired
3) Quantities and tap settings of speakers in all areas
4) Clock Model Numbers, operating voltage and wiring configuration (# of wires)

Retrofits are easily accomplished using either analog or IP technology. Be aware, however, that if the existing speakers, cabling, call buttons or clocks are not in good operational condition, then the resulting retrofit system's performance will suffer.

See our Best Practices and General Troubleshooting Procedures for information on assessing existing cabling. An Impedance Meter, also described in this document, may be used to determine the wattage load of existing common area speakers. This information is required to choose amplifiers.

Since retrofits use both new and existing equipment, it's important that you and your customer discuss, and agree upon, your scope of work upfront.

Reusing Existing Equipment

It's not unusual for new equipment to be interfaced with previously installed, sometimes rather dated, equipment. Contractually defining your scope of work for the newly installed equipment and documenting where your responsibility begins and ends is very important.

There's always a reason why end users contract new equipment upgrades or replacement, it's typically because the old equipment is no longer performing satisfactorily. However, by reutilizing parts of the old system, they potentially introduce troubles to the new system.

1) The accuracy of failing electromechanical clocks with worn gears will not increase because you've replaced the master clock.
2) Intermittent push buttons will still be intermittent when connected to new equipment.
3) Sticking contacts from monitored equipment will still stick when connected to new equipment.
4) Speakers with broken paper cones will not sound better when connected to new amplifiers.
5) Intermittent cabling will still be intermittent when connected to new equipment.

The author recalls a site where relays from Valcom equipment were being utilized to operate 40+ year old electromechanical door locks. These same locks provided a contact closure when the door was unlocked or ajar. These contacts were connected to Valcom equipment to provide indication that the door was unsecured.

Several of the doors would not unlock as designed. However, monitoring the relay outputs of the Valcom equipment verified that the activation contact closures were indeed operating as designed. Therefore, the locks were at fault. The scope of work was to provide activation for the lock.

On this same site, several doors would intermittently indicate that they were unsecured when they were actually closed and locked. By monitoring the inputs of the Valcom equipment where the "door ajar" contacts were connected, it was obvious that the "door ajar" contacts were sticking closed from time to time, thus causing the fault.

Integrating with non-Valcom Equipment

If you plan to interface your new Valcom solution with non-Valcom equipment, you will need to gather information concerning the desired interface. Depending upon the desired interface, you will need to know one or both of the following.

1) What does the non-Valcom equipment require from the Valcom equipment?
2) What does the non-Valcom equipment provide to the Valcom equipment?

For audio interface, you will need to know:

1) output levels and impedances
2) input levels, sensitivities and impedances
3) physical connection form (XLR connector, RCA jacks, etc)

For contact closure interface, you will need to know the contact voltage/current ratings and operation.

For data interface, you will need details on the data format and any security credentials.

For voltage triggers, you will need to know the voltage type (ac/dc), level, and current capacity.

Putting It All Together

With public-address/intercom systems, there are typically multiple ways to achieve the desired end result. For very simple paging systems - typical small to medium sized office/ manufacturing areas, car dealerships or medical/dental offices, Valcom offers the "Easy as 1-2-3" method of design.

For more complex opportunities, once you've selected the features you'll need, the number and type of clocks, speakers, horns and zones/stations you'll need per area, a quick call to Valcom will result in a suggested equipment list for your job. Note that the accuracy of the suggested equipment list will only be as accurate and thorough as the information that you provide.

Basic Pre-Call Checklist

Are you comfortable with your understanding of how the system will be utilized?

Do you have specific information of the capabilities, Input/Outputs, tap settings of speakers, capacity of amplifiers, etc. of any existing equipment that will be reutilized?

Have you determined an adequate zoning plan so that announcements can be broadcast/displayed to target audiences without disrupting everyone?

Have you determined how you'd like to deploy announcements? Speakers/Horns, Computer pop up alerts, LED signs, etc.

Have you given thought to the type of system you'd like? IP, analog, both

Have you determined the number and type of speakers, horns, clocks and LED signs required on a per area basis? (Use the worksheet in our Site Survey Form)

Have you selected speaker/horn/clock/LED sign styles?

Do you know ceiling heights and type of ceiling for each area?

Do you know the potential mounting height for ceiling speakers in each area? This may or may not be the same as the ceiling height.

If areas have drop ceiling, do you know the dimensions of the grid?

For round ceiling speakers, do you have requirements for mounting rings, speaker bridges and/or backboxes?

For surface mounted speakers, do you have requirements for backboxes?

Have you identified wiring closets in each area to accommodate support products such as power supplies and network gateways?

Have you gathered details for any non-Valcom equipment?

Have you determined how and from where the system will be accessed?

Do you have information on the available FXO ports and SIP capability of the host phone system?

Have you determined how many users may be using the system simultaneously?

Have you determined an appropriate feature set for the facility?

In addition to overall system zone capacity, access methods, features and functionality, for each area of the facility our design team will need the following information:

- From which distribution closet will equipment in the area originate?
- How many audio zones are required?
- Area specific features required
- Styles of speakers and horns
  - How many of each?
- Styles of call-in buttons
  - How many of each?
- Styles of wall mount volume controls
  - How many of each?
- Styles of LED signs
  - How many of each?
- Styles of clocks
  - How many of each?
- Styles of strobe lights
  - How many of each?
- Details of any existing equipment that will be used as part of the system
- How many buttons to launch LED sign and/or voice messages from buttons?

Use the site survey form in each area to guide your information gathering.

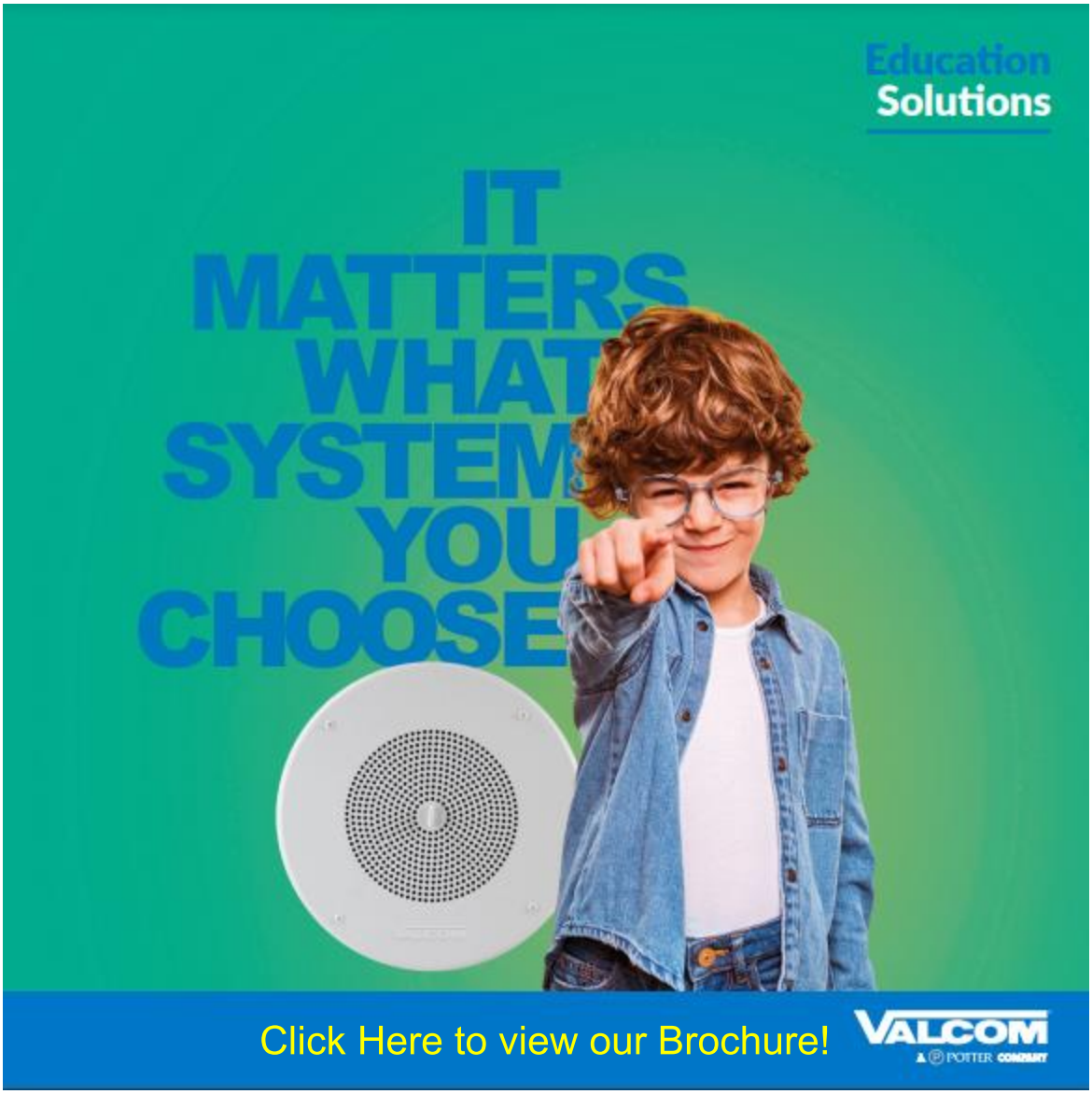
Common Vertical Market Features

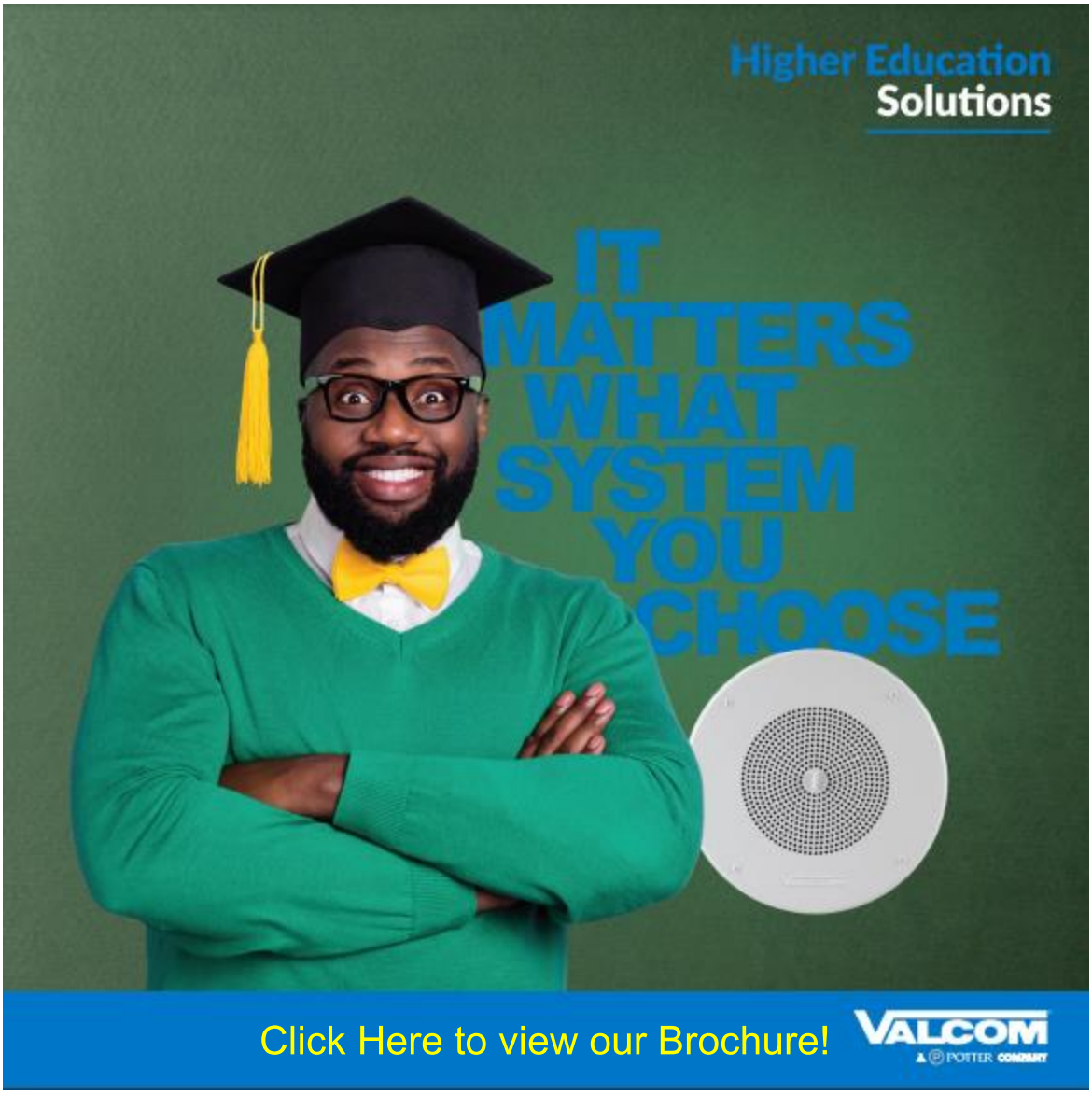
As concern for crisis preparedness grows, K-12 and most other densely occupied facilities often require both an emergency notification system and a bell/clock/intercom/public-address system. A cost-effective approach is selecting an emergency notification system that also offers all of the functions of a bell/clock/intercom/public-address system.

Benefits of this approach include:

1) *Labor savings. Stand-alone emergency notification systems, even supervised systems, must be tested periodically to verify operation. By utilizing the system daily for intercom and general announcements, operational testing requires little or no additional effort.*
2) *Significant cost saving:*
    a. *Using speakers, visual messaging LED signs and core equipment for both emergency notification and daily intercom/paging saves on equipment and infrastructure costs*
    b. *Installation cost to install one comprehensive system will be less than the installation cost for 2 separate systems*
3) *One system results in less maintenance.*
4) *One system results in less training.*
5) *Daily use means that periodic refresher training is unnecessary.*

Click each image to view the full brochure

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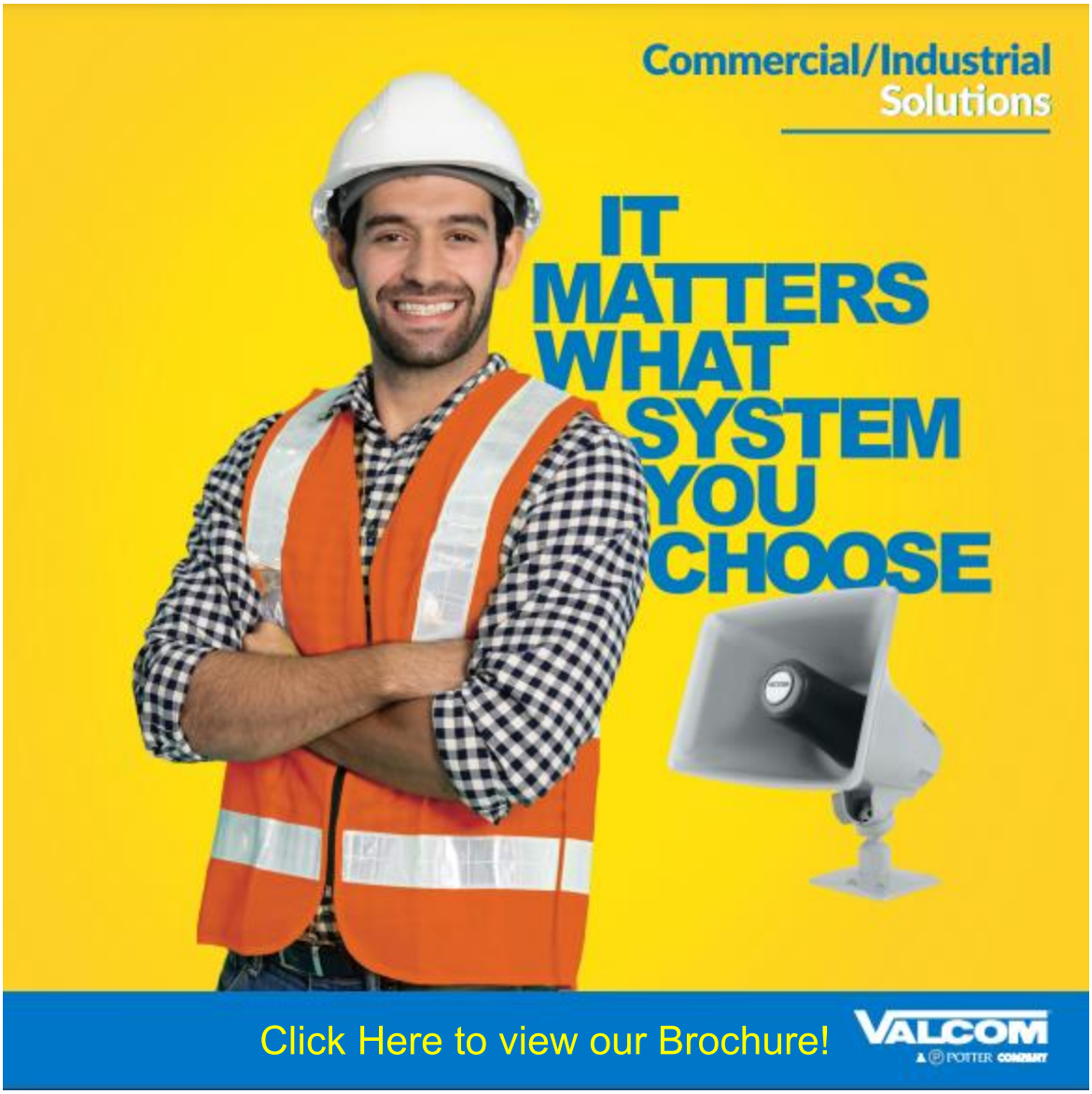
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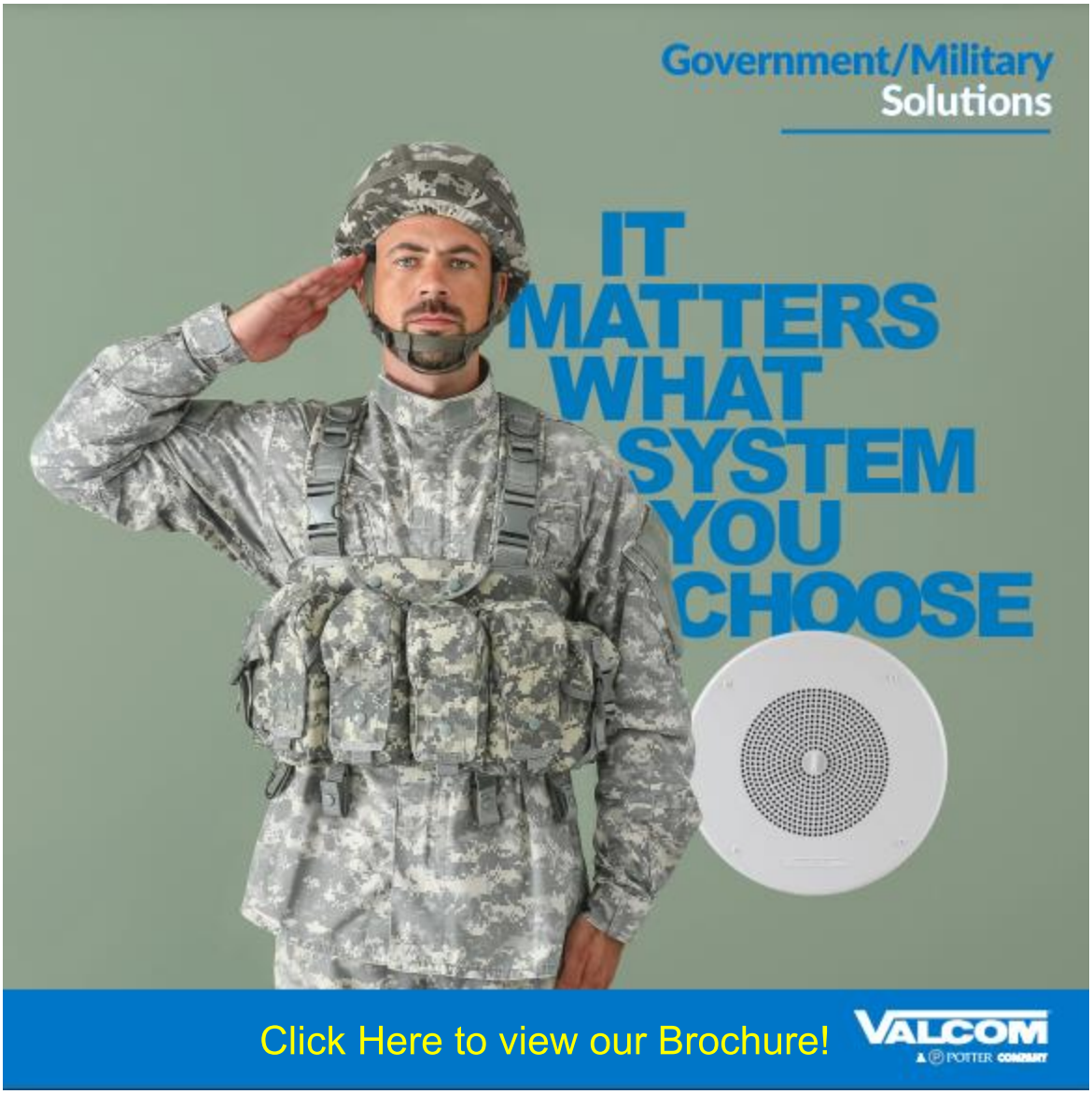
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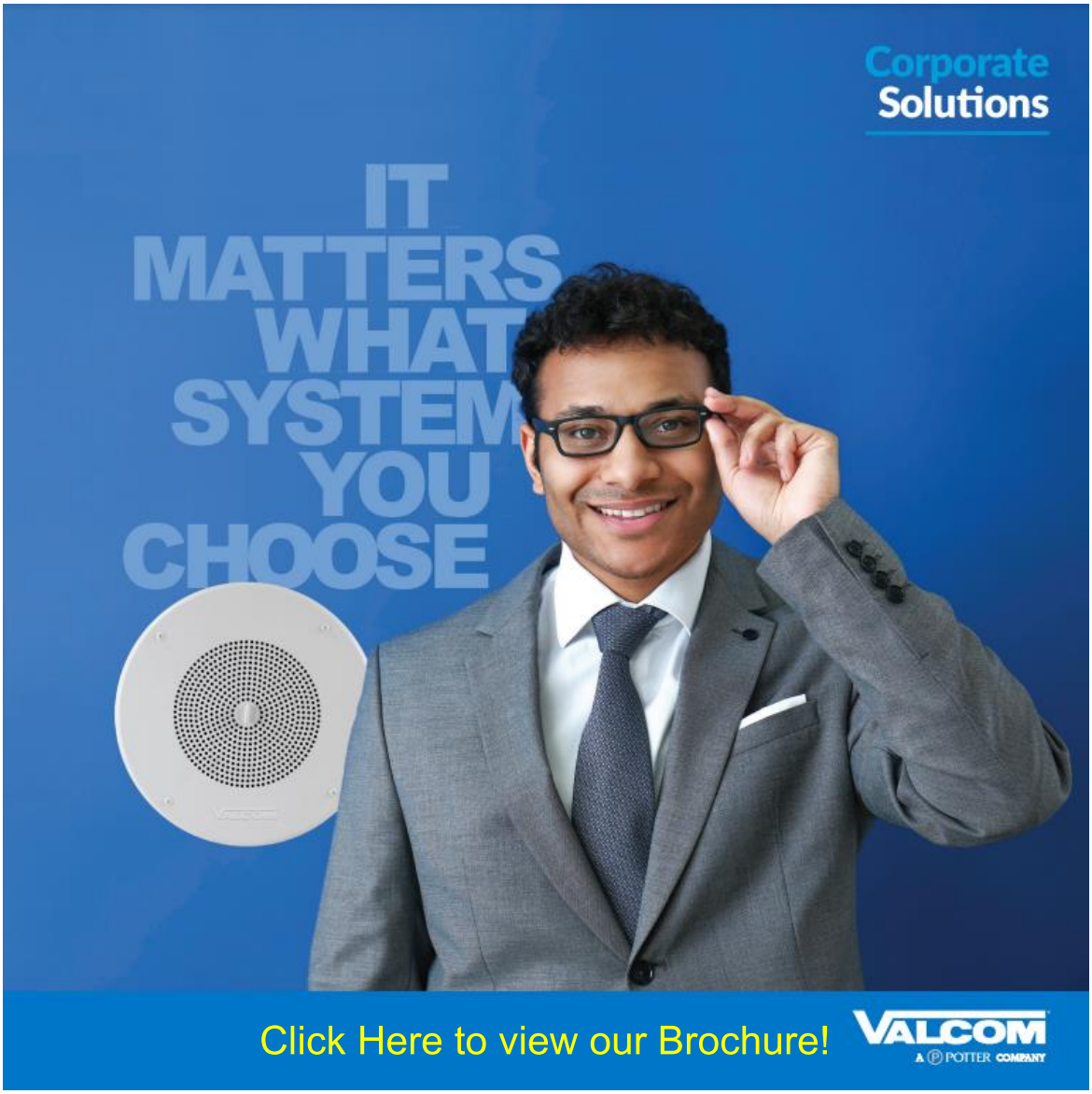
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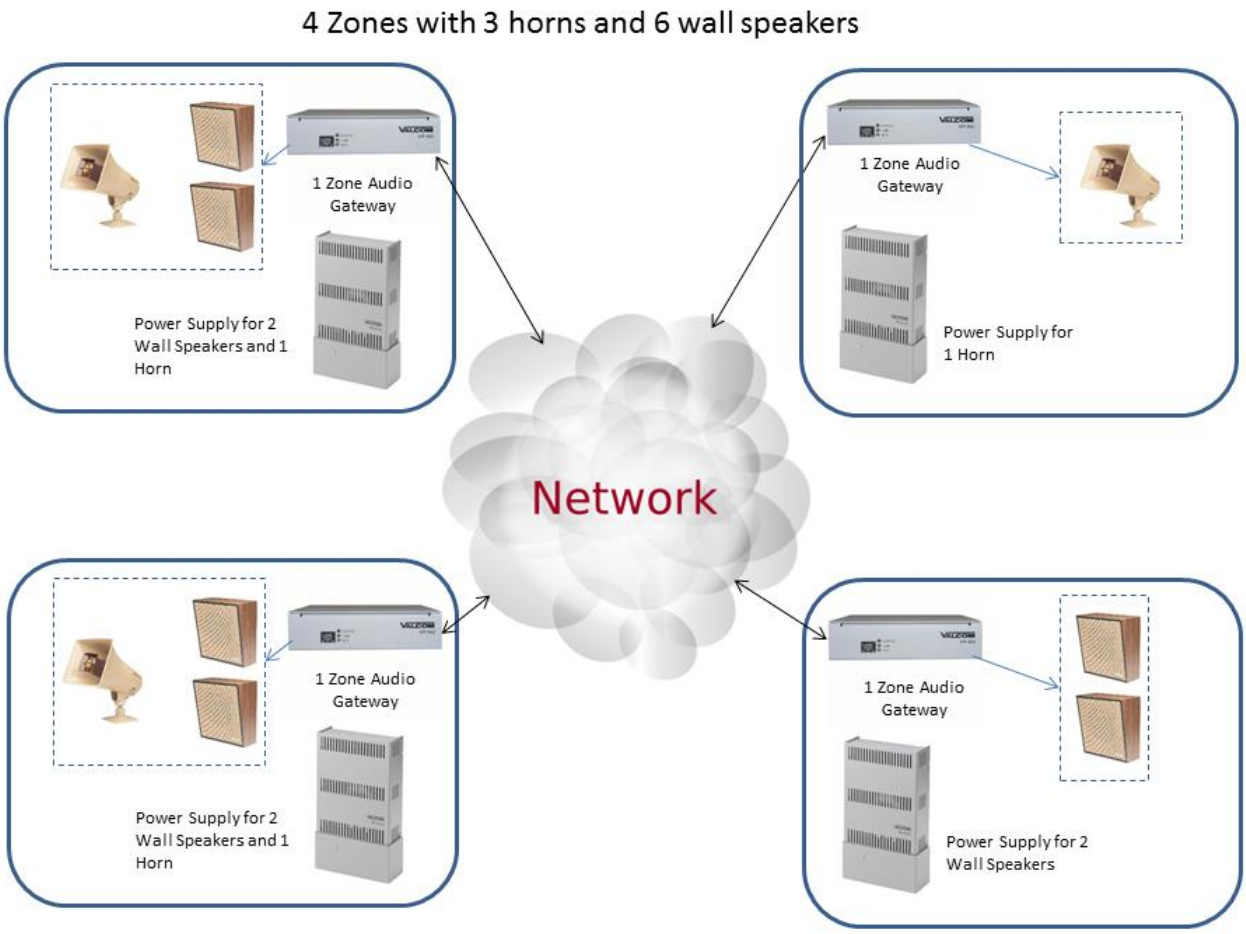
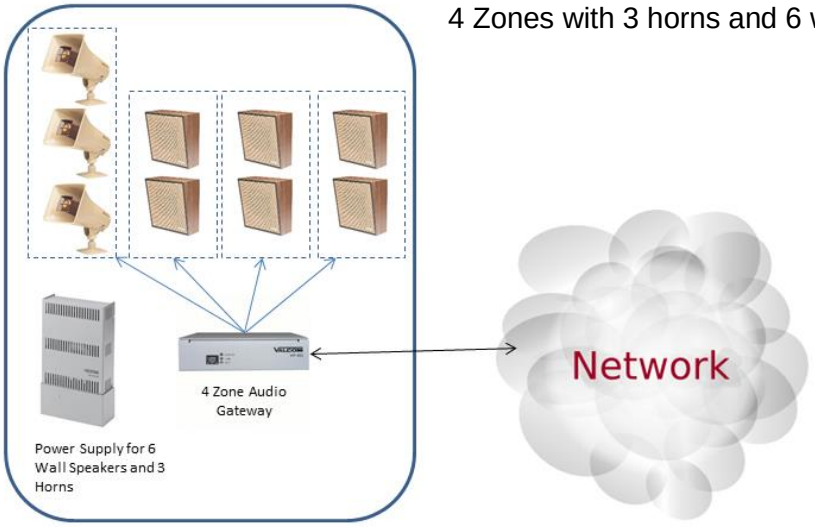
Let's Not Make Assumptions

We want to provide you with an accurate equipment list and design.

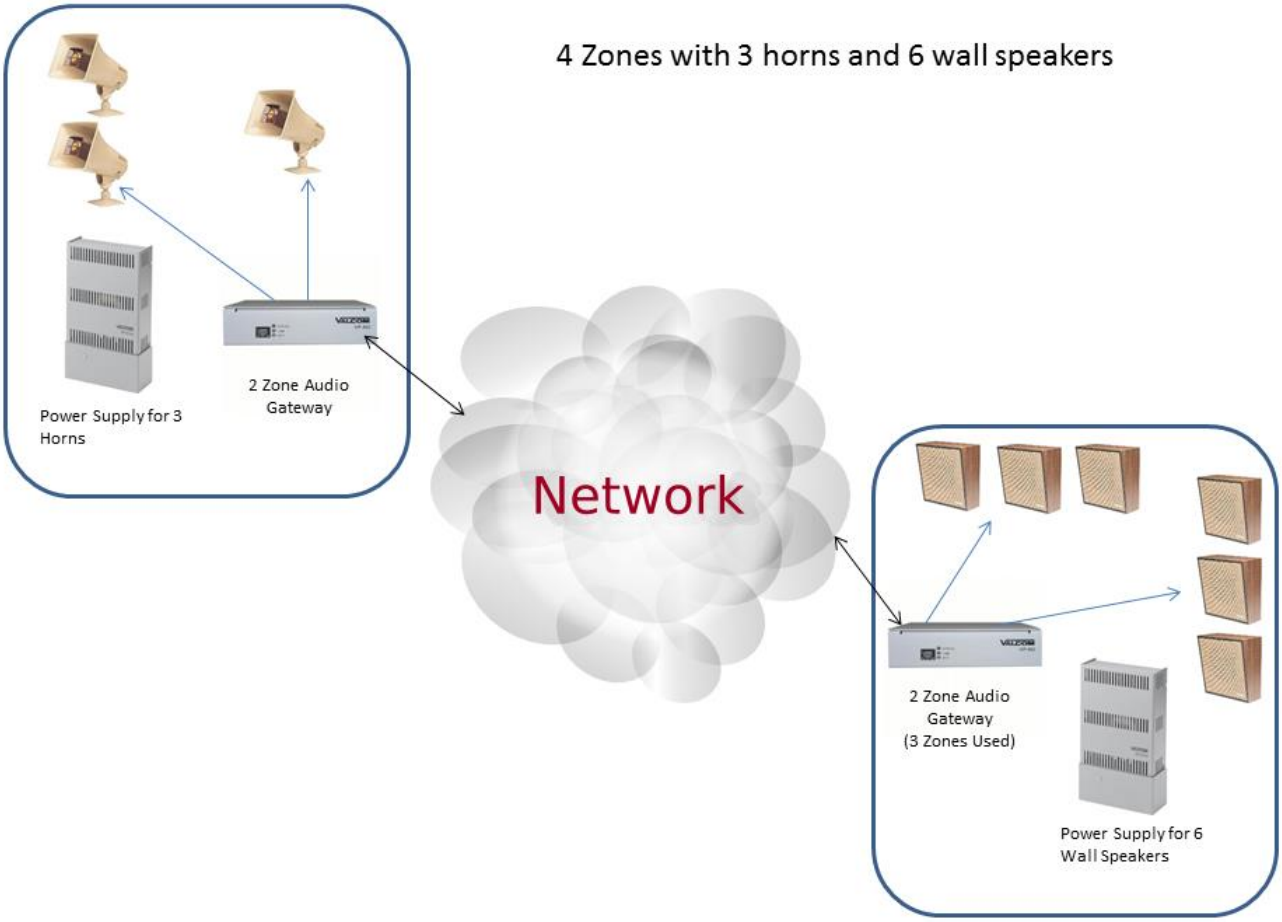
With minimal information, we must make assumptions. Assumptions can cost you money. For example, if you only tell us that you need a 4 zone IP based system with 3 horns and 6 wall speakers, look at 3 possible designs that result.



4 Zones with 3 horns and 6 wall speakers



4 Zones with 3 horns and 6 wall speakers



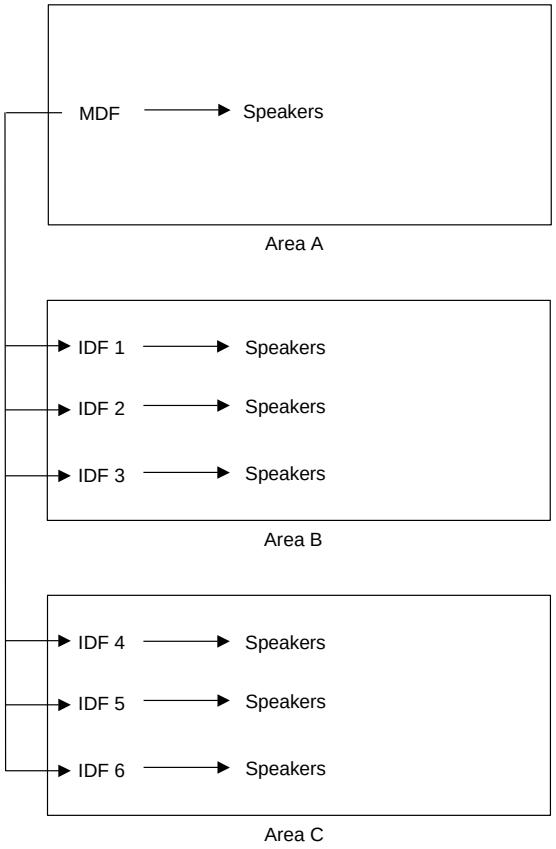


Figure 1

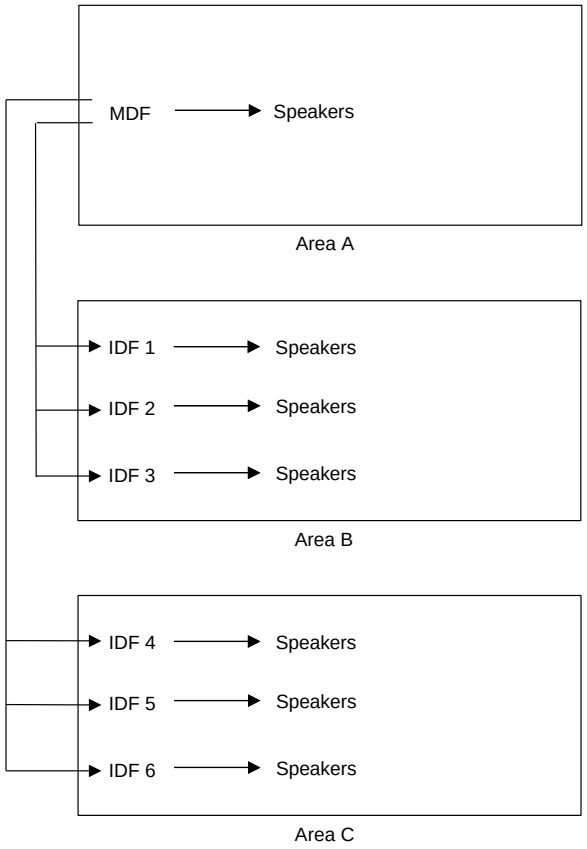


Figure 2

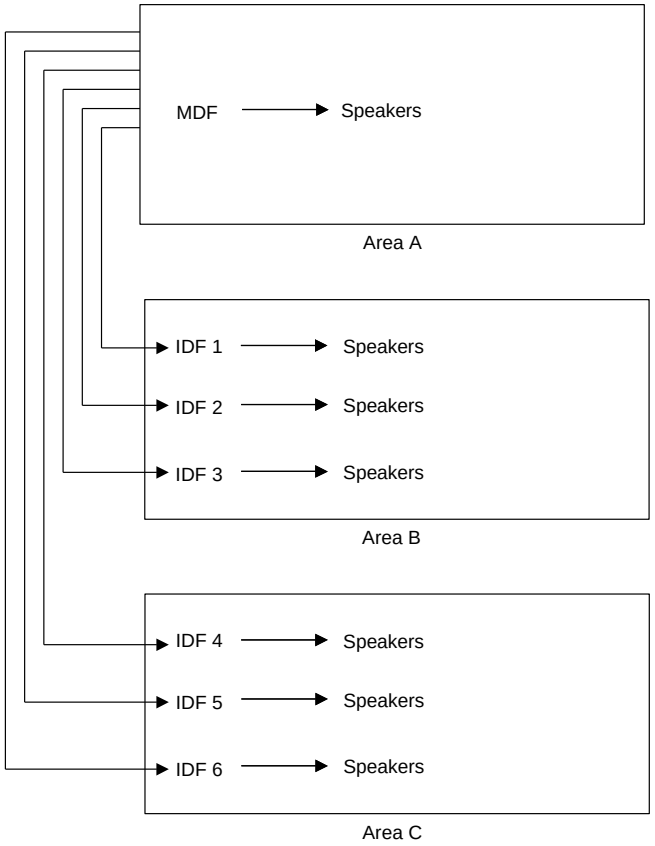


Figure 3

When designing a public address/intercom system with limited information such as speaker & clock counts, speaker & clock types and the total number of zones for each area, you have to make assumptions. Assuming that all of the control equipment will be physically located in one location (MDF) will typically result in a less than ideal design.

The diagrams above represent designs with one zone, two zones and six zones respectively with all of the control equipment located in the MDF. Determining the equipment lists for these would be very simple, however, since all speakers and clocks are being powered from the MDF, your installation costs would increase due to the need for more, and often heavier gauge, cabling.

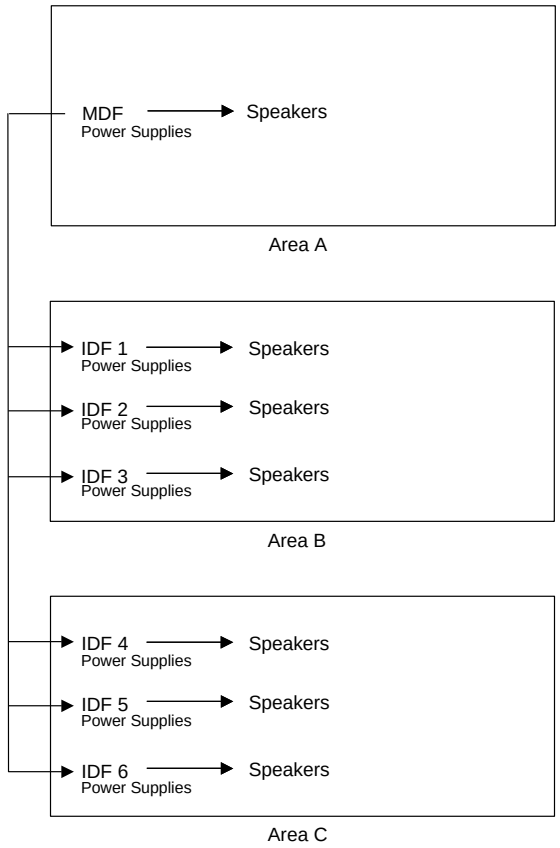


Figure 4

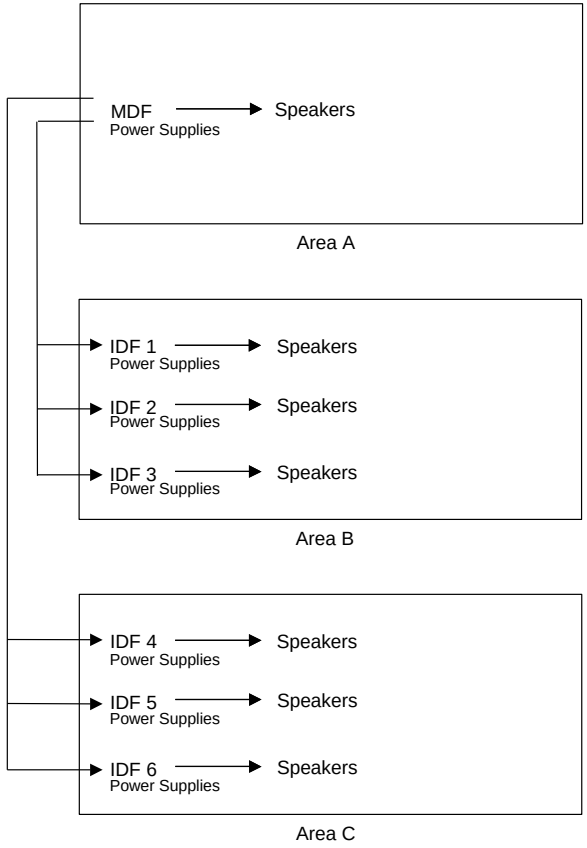


Figure 5

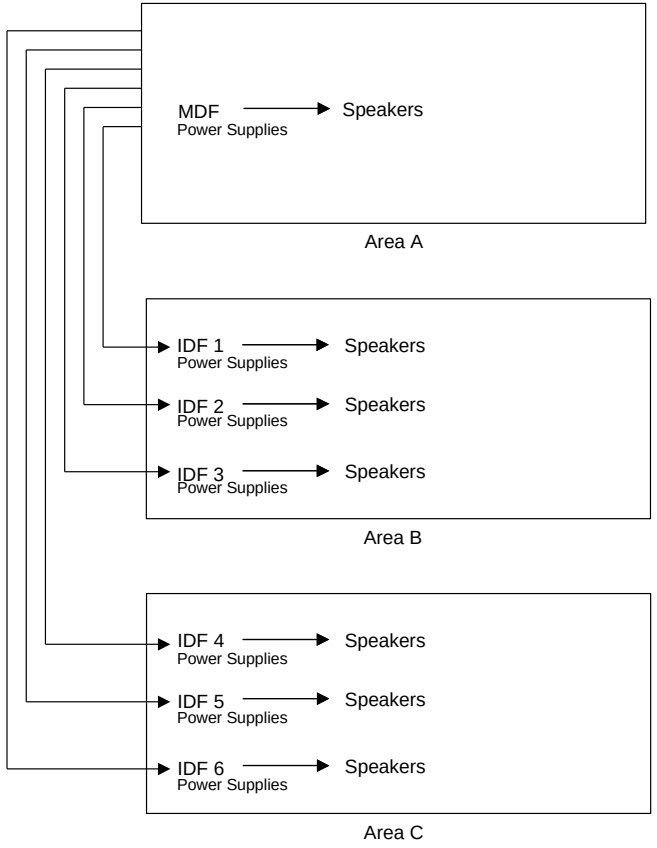


Figure 6

A better design would involve knowledge of each IDF's required speaker & clock quantity, speaker & clock type and zone count. This way, it's possible to design so that control & support equipment may be selected on a "per IDF" basis.

This reduces cost by minimizing required cable gauge and the number of MDF distribution cables.

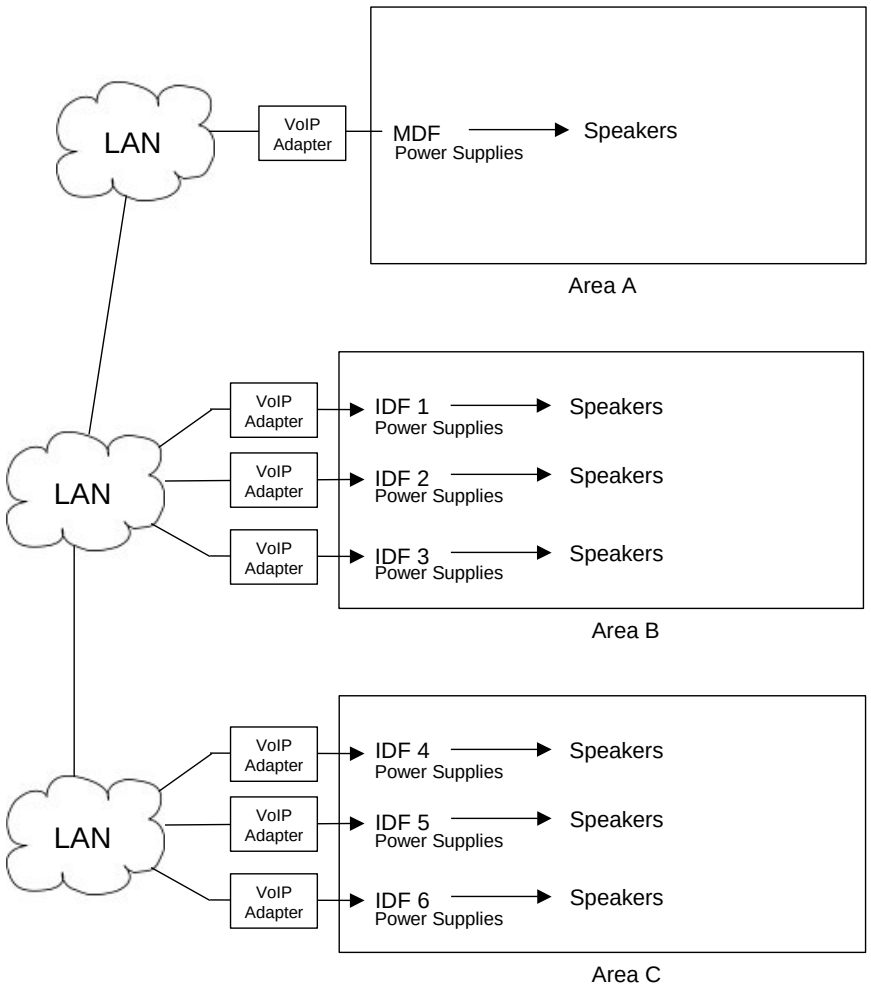


Figure 7

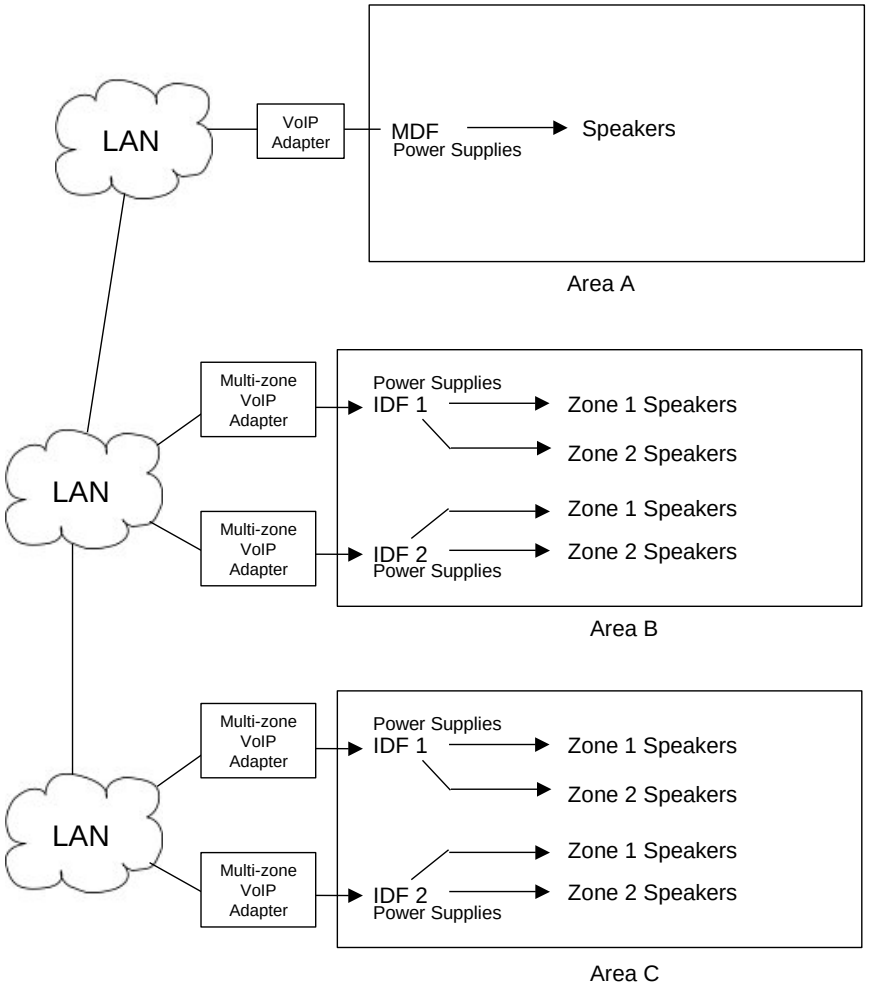


Figure 8

Sometimes analog designs involve using Ethernet to distribute audio. This may be accomplished by using VECPU6-EXP cards, VoIP audio gateways, and/or IP speakers. If the design has only one zone per IDF, as shown in Figure 7, then we'll need to know how many IDFs will be involved, and the quantity and types of speakers & clocks that will be connected to each.

If the design involves multiple zones per IDF, as shown in Figure 8, then you will need to know how many IDFs will be involved, the quantity and types of speakers that will be connected to each *and* how many zones each IDF will serve.

It's common to have both single zone IDFs and multi-zone IDFs in the same design.

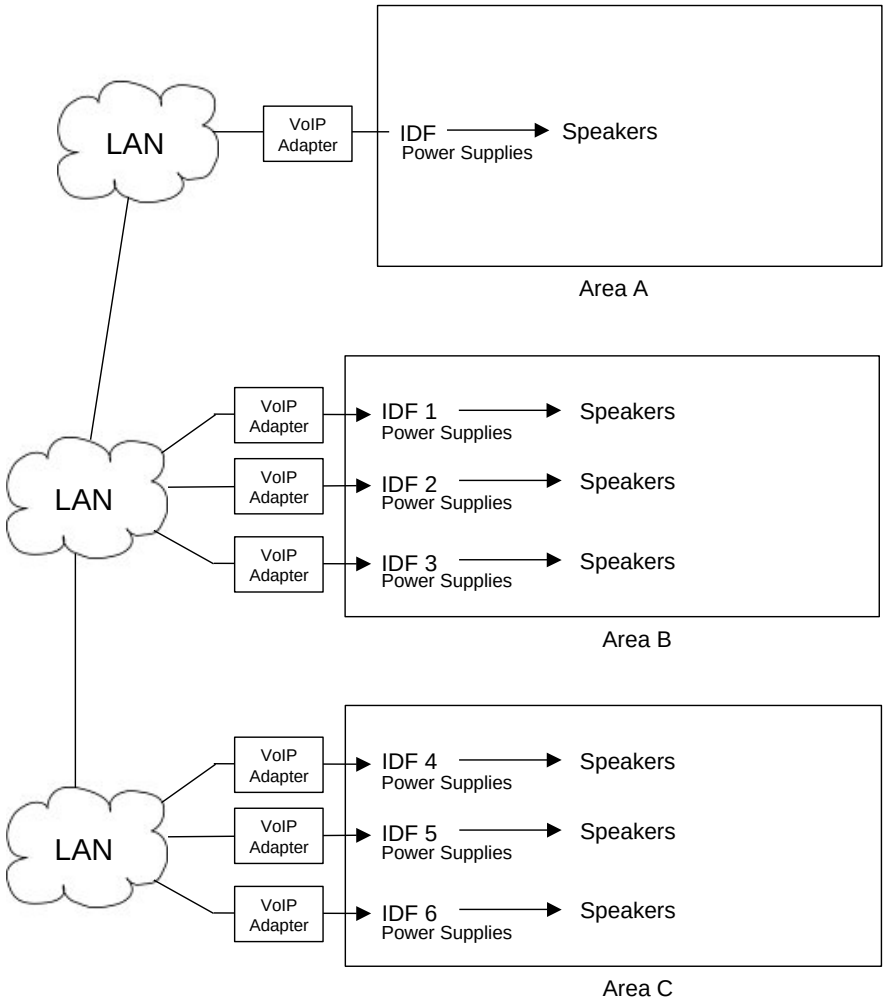


Figure 9

If a design is fully IP based, meaning every speaker and horn is an endpoint on the network, then you just need total speaker counts per type. **Full IP systems are, by far, the easiest type to design and implement.**

If a design is IP based, but involves audio gateways to analog speakers, then the same questions will apply:

If the design has only one zone per IDF, as shown in Figure 9, then you need to know how many IDFs will be involved, and the quantity and types of speakers that will be connected to each.

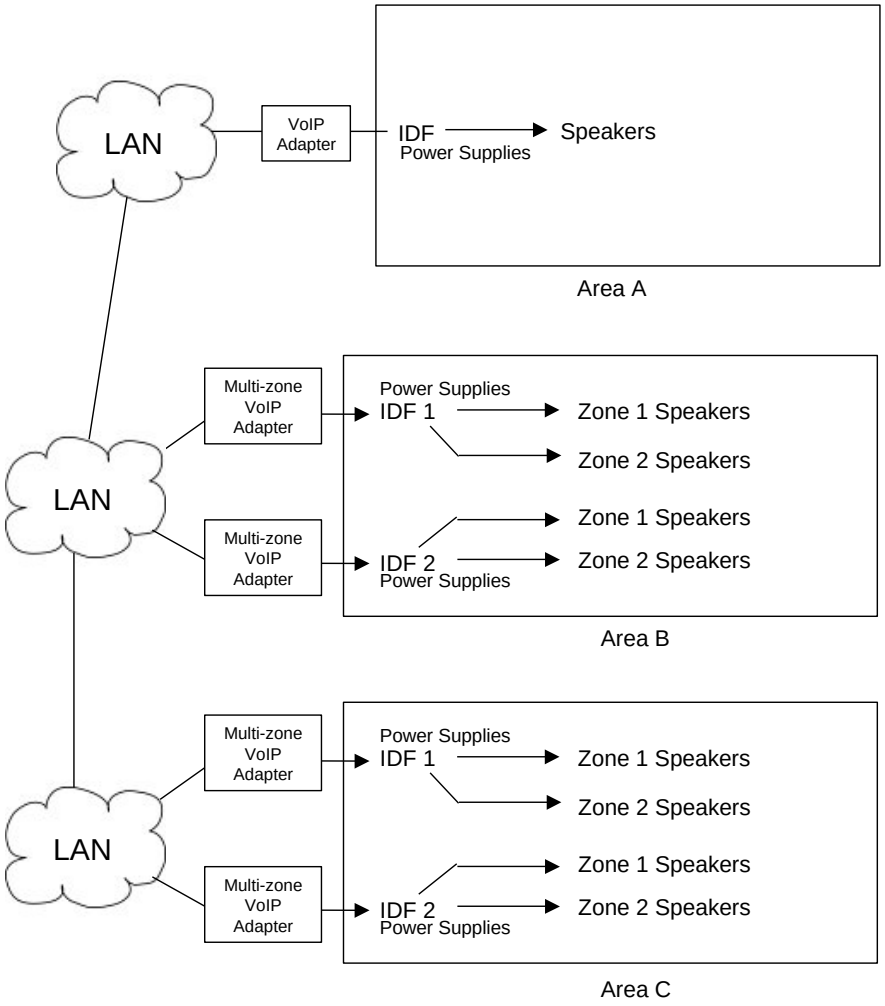


Figure 10

If the design involves multiple zones per IDF, as shown in Figure 10, then you simply need to know how many IDFs will be involved, and the quantity and types of speakers that will be connected to each *and* how many zones each IDF will serve.

Disclaimer

Note that any applicable standards by official regulatory agencies or ANSI/TIA/EIA/IEEE should always be observed. In the case of conflicting information, these standards shall prevail.

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We'd like to hear from you!

Valcom, Incorporated

5614 Hollins Rd

Roanoke, VA 24019 U.S.A.

1-540-563-2000

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