Telephone Paging Systems

A How-To Guide to System Design

BOGEN

Contents

Profile On Bogen

Bogen Communications, Inc., is one of the most highly regarded names in telephone paging, commercial sound and engineered systems equipment in the United States and Canada. For more than 65 years, Bogen has remained one of the leading manufacturers and designers in the field of telephone paging, public address, intercommunications and background music systems. Product reliability, value, and an awareness of the customers' current and future needs have always been Bogen's strength in the marketplace.

Bogen's telephone paging product line offers the finest and most complete line of telephone paging equipment available in the industry. It is designed to be easy to use and compatible with all types of telephone systems. Bogen's product line has grown to include self-amplified and central-amplified speakers, paging amplifiers, modular zone paging equipment, and digital telephone peripheral equipment.

Bogen offers a full-line of self-amplified speakers and horns for small, low-level (24V) paging applications. For larger (70V) systems, we offer a choice of amplifiers, as well as a full-line of ceiling-mounted and wall-mounted speakers and horns. The choice of self-amplified or central-amplified systems lets you install the right system in the most cost-effective manner possible.

We are fully committed to our telephone paging program. The product line is supported by:

• **Dedicated Sales Management** — with a wealth of knowledge and experience in telephone and sound equipment.
• **Applications Engineers** — available to assist in the design of any paging system, no matter how complex it may be.
• **Telephone Engineers** — creating the most advanced products in the industry.
• **Representatives** — providing local support nationwide (23 regional offices) and throughout the world.

Why Sell Telephone Paging?

A voice paging system is the most popular add-on peripheral to a telephone system and one of the easiest to sell. This offers the potential to increase the size and profitability of every telephone system sale.

By including a telephone paging system in each one of your telephone system proposals, you are offering a complete value-added voice communications system. It helps you support the "one vendor" concept and enhances your image as a knowledgeable communications consultant.

A few of the benefits offered by telephone paging systems are:

Emergency alert
• Voice evacuation or standard alarm increases safety.
• Reduces liability — possible reduction on insurance costs.
• Night ringer provides a tone to alert personnel of incoming calls or of visitors at remote entrances.
• Optional tone generator for emergencies and code calling.

Broadcast announcing
• Gets information out quickly.
• Replaces trivial memos (lowering cost).
• Zone paging allows specific areas to hear selected announcements.

Locating people
• Increases productivity.
• Better customer service through greater accessibility to people.
• Professional image.
• Increased revenue (fewer lost orders).
• Reduces long-distance call backs.

Background music
• Increases productivity (major background music suppliers claim 15% rise).
• Increases conversation privacy.

Telephone paging systems are also recommended where internal communications are the customer's primary need, such as in warehouses, mail rooms, etc.

Choosing the Right System
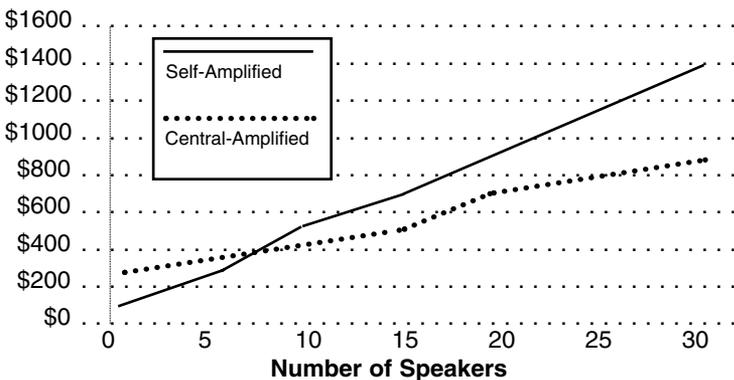
There are two types of paging systems:

- **Central-amplified systems** — Commonly referred to as high-power or 70-volt systems.
- **Self-amplified systems** — Known as low-power or 24-volt or distributed systems.

Both types are relatively simple and consist of three separate elements. These are:

- **Loudspeakers:** To reproduce the paging signal.

- **Amplifiers:** To amplify the voice and/or music signal. The amplifiers can either be small units mounted on the loudspeaker (self-amplified system), or larger units which are centrally located and drive a number of loudspeakers (central-amplified system).

- **Interface devices:** To interface or match the paging system to the telephone system (if required).

It is essential to become familiar with the two basic types of paging systems and their relative strengths and weaknesses in order to properly determine the right choice of paging system for your proposal. If you don't familiarize yourself with both systems and make the right choice, your competitors may gain a distinct price advantage over your proposals, especially on larger systems.

System Cost Comparison - Cone Type Loudspeakers

Legend:
- Self-Amplified
- Central-Amplified

X-axis: **Number of Speakers** (0, 5, 10, 15, 20, 25, 30)
Y-axis: $0, $200, $400, $600, $800, $1000, $1200, $1400, $1600
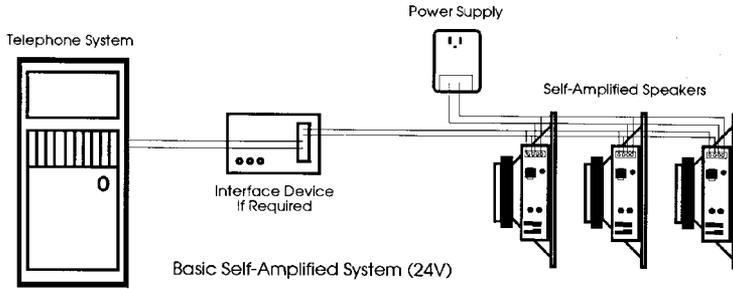
Self-Amplified (24V) Systems

In this type of system, each speaker has a small amplifier (either built-in or attached) which, when provided with an audio signal and 24V DC power, broadcasts sound. (Two pairs of wire for each - one audio, one DC.)
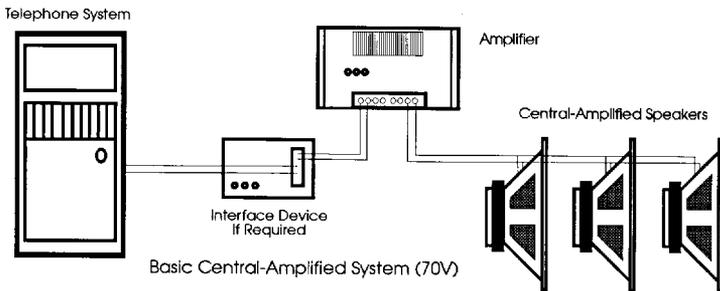
Advantages:

• This is the least costly approach for small systems (generally up to 6 speakers or 4 horns). In these small systems, the unit cost of the self-amplified speakers and horns is more economical than using a central amplifier and an equal number of centrally-amplified speakers and horns.

• It allows telephone cables and paging lines to be run in close proximity to each other, even in the same cable tray or in the same cable.

Disadvantages:

• In larger systems (generally more than 6 speakers or 4 horns), the high unit cost of amplified speakers and horns makes the self-amplified system more costly. That's where costs can skyrocket and make your proposals very uncompetitive!

• It does not perform as well in combined music and paging systems, since the built-in amplifiers are designed primarily for speech reproduction, and have a narrower frequency response. Some amplified horns have inadequate heat-sinking and are not recommended for constant music applications.

• It typically does not offer all of the more sophisticated features inherent in most central-amplified systems, such as tone control, automatic level control, etc.

• Requires twice the number of speaker connections.

Power Supply

Telephone System

Self-Amplified Speakers

Interface Device
If Required

Basic Self-Amplified System (24V)

Basic Self-Amplified System (24V)

Telephone System

Amplifier

Central-Amplified Speakers

Interface Device
If Required

Basic Central-Amplified System (70V)

Basic Central-Amplified System (70V)

Central-Amplified (70V) Systems

In this type of system, a central amplifier is used along with speakers and horns which have built-in transformers to match them to the 70V output of the central amplifier. These 70V speakers can be tapped at different wattage levels providing more or less power to the speaker, allowing it to cover areas of low to high noise.

Advantages:

• Lends itself to larger systems, as the significantly lower unit cost of central-amplified speakers and horns is much more economical than self-amplified speakers.

• Offers better sound in combined music and paging systems because of the central amplifier's superior performance characteristics.

• Provides features such as extra microphone inputs, tone control, automatic level control, automatic music muting during a page and "night ringer" signal distribution, not found in less sophisticated self-amplified systems.

Disadvantages:

• Not as cost effective in small systems.

• Some care must be taken in routing speaker lines, as they should not be in close proximity to telephone lines.

How To Design A Telephone Paging System

The most important thing to remember about surveying, designing, and quoting a telephone paging system is that there is no mystery or magic involved. The successful system design is one that combines good, old-fashioned common sense with a few rules-of-thumb and commonly practiced installation guidelines.

This "How To" section will not make you an expert at sound system design. However, it will give you the basic rules and practices of telephone paging system design to allow you to successfully survey and quote the majority of the jobs you will face — with the most competitive proposals.

So, Where Do You Begin?

Start with these steps:

Step 1. Does the phone system have a paging output?

Step 2. Is zone paging required?

Step 3. What are the sound pressure levels in the area?

Step 4. What kind of speakers are required and how are they mounted?

Step 5. How to determine the power taps and coverage per speaker.

Step 6. How to determine the appropriate amplifier.

Step 1. Does the phone system have a paging output?

If the answer is yes, then it is typically a simple two-wire connection. If the answer is no, a TAM-B interface is required. The TAM-B access module is compatible with standard telephone systems and interfaces with the paging system. The TAM-B is capable of either station port or trunk port operation. It interfaces with both PBX station lines and either loop start or ground start trunk ports and often cuts the interface cost by a factor of 10 to 20 times!!

Station line and PBX interface

(No external power supply needed.)

When a station line is used for paging, the user simply dials the extension number connected to the TAM-B and the paging circuit. The TAM-B recognizes the 90V ring signal, accepts the call and then completes the audio path to the paging system. Also included in the TAM-B are facilities to send, if desired, a tone signal to the party originating the call to "confirm" the call's completion and let the originator know the page circuit has been activated. The same tone signal can also be broadcast over the paging system as a "pre-announce" tone. At the conclusion of the page, the TAM-B automatically disconnects the paging system.

Model TAM-B

Trunk port paging is just as simple. It is accomplished by dialing the assigned access code number for the paging trunk. The TAM-B, in this mode, furnishes the PBX's trunk port with the current/signaling it needs to complete the circuit and provides the needed audio path to the paging system. It also provides for confirmation and pre-announce tones, if desired. The paging circuit automatically disconnects when the paging party hangs up. (Power supply required.)

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Centrex interface

Interfacing to a Centrex line is accomplished easily using a TAM-B access module. It connects directly to any Centrex line, and permits paging by simply dialing the extension number assigned to that line. In these systems, the TAM-B operates just as it did when connected to a PBX station line and paging is just as simple to perform. (No external power supply needed.)

Electronic Key System interface

Most Electronic Key Systems (EKS's) are equipped with a 600-ohm paging port which interfaces readily with most paging systems. All that is normally required is the 600-ohm isolation transformer built into all self-amplified speakers and horns and into our TPU Series telephone paging amplifiers. In these systems, paging is accomplished either by pressing the "page" button or dialing the access number assigned to the paging port.

Interfacing to EKS's station lines is usually not possible with the TAM-B or any other commercially available interface device due to the nonstandard station line circuitry used by most EKS manufacturers.

Additional Audio Inputs

One important feature of a centrally-amplified paging system is its flexibility. Most central amplifiers provide for multiple inputs of various types. Both line level input sources, like tuners, and sensitive low level sources, like microphones, are typically accommodated in these amplifiers. Each input source has an individual level to allow "balancing" the volume levels of the different inputs.

Many central amplifiers include other features to complement the multiple input capability. A typical feature is remote muting of inputs using an external contact closure. This type of function allows an emergency page microphone to be established. Any time the microphone's "push to talk" switch is activated, all other input sources are silenced so only the emergency announcement is heard.

Step 2. Is zone paging required?

If the answer is yes, you can use the PCM2000 Modular Paging/Zone Control System.

By integrating unique, multi-function modules, we have developed a system that offers both incredible flexibility and unlimited future expansion. Modular integration assures the installer that the system can be reconfigured and enhanced with minimal time and expense. Facility owners can be confident that the system can grow as their business changes now, and throughout the life of the facility.

The PCM2000 can perform simultaneous paging through self-amplified and central-amplified systems. The basic system supports up to three paging zones and consists of only three modules:

PCMCPU — Central Processor Unit
PCMTIM — Telephone Interface Module
PCMZPM — Zone Paging Module (3 zones)

Two additional zone modules (PCMZPM) can be added to the basic system to increase capacity to 9 zones. When more than 9 zones are required, a central processor module and up to 3 zone modules can be assembled as a satellite system along with a PCMPS Power Supply. Up to 9 satellite systems may be added to the original 9-zone system to bring the system capacity to 99 zones.

To add hands-free talk back to the system, simply add the PCMTBM Talk Back Module (only one needed per system) with standard 70V central-amplified systems.

The PCMTIM Telephone Input Module can be connected directly to PBX loop and ground start trunk ports, station lines, Centrex lines and, in some cases, PBX paging ports. However, many times PBX page ports will not allow DTMF touch tones to be produced. This makes zone paging impossible since there is no way to instruct the PCM2000 as to which zone to access.

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Step 3. What are the sound pressure levels in the area?

Knowing the ambient noise level present in the coverage area is important. This will help to determine what type of speakers/horns you will be using. If you don't have a sound pressure level meter (Radio Shack sells an economical unit), use the following chart to estimate it. Always overestimate if you are uncertain.

Location	dB
Quiet Office	50
Hospital	55
Hotel Lobby	55
Doctor's Office	55
Conversational Speech	60
Bank/Public Area	65
Department Store	65
Restaurant	70
Noisy Office	70
Shipping/Warehouse	70
Transportation Waiting Room	75
Supermarket	75
Average Assembly Line	75
Printing Shop	80
Noisy Manufacturing	80
Machine Shop	90
Construction Site	100

Step 4. What kind of speakers are required and how are they mounted?

There are three kinds of speakers. They are:

• **Ceiling Speakers** — typically found in dropped ceilings in offices and stores.

• **Wall Baffles** — where ceiling height is prohibitive or ceiling speakers are not practical.

• **Horns** — for outdoors or noisy areas (e.g. warehouse, dock area).

Ceiling Speakers

Because of their cone-shaped spread of sound (referred to as dispersion), ceiling speakers cover more area when the ceiling height is greater. Given this fairly constant dispersion, increasing the speaker volume does not increase area coverage, although it does allow the system to overcome higher ambient noise levels. The area coverage factor remains about the same for all 8" ceiling speakers.

One simple to use rule-of-thumb will allow you to determine roughly the number of speakers to use in any single open area: Space speakers at twice the ceiling height distance.

It should be noted here that sound is quite forgiving and this is not a hard and fast rule. The "twice the ceiling height" rule provides smooth coverage that works well with both voice and music. The spacing can be increased to three times the ceiling height in most paging-only systems without any significant loss of coverage.

Use Chart 1 to determine speaker coverage in a single, open area utilizing ceiling speakers. The design goal for a ceiling speaker system is that the listener can hear sound at almost the same volume from anywhere on the floor. Common sense symmetry helps accomplish this goal, as shown in Chart 2.

It is recommended that ceiling speakers with volume controls be used whether installing a self-amplified or central-amplified system. This helps in fine-tuning the system in areas that are extremely quiet or a little noisier than others.

Chart 1

Combined Background Music & Paging

Ceiling Height (Ft.)	Room Spacing	Approximate Coverage (Sq. Ft.)
8	16	200
10	20	325
12	24	450

Chart 2
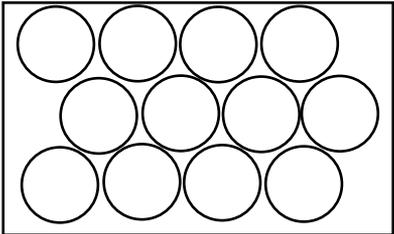
How Are They Mounted?

These speakers are normally mounted in suspended ceilings. We recommend the use of a tile bridge (Model TB8) for added support to the ceiling tile, and an acoustic enclosure (Model RE-84) to protect the speaker.

Wall Baffles

Wall baffles are used where ceiling height is prohibitive, or where ceiling speakers are not practical. Wall baffles, too, have fairly constant dispersion of sound and the rules for layout and placement are basically the same. However, because they are designed to project forward, square footage coverage ratings are less applicable with wall baffles. Forward coverage and spacing are more important. Whenever possible, it is best to aim all wall baffle speakers in the same direction, as this provides for both better coverage and higher intelligibility. Fortunately, most spaces have pillars or posts that simplify the mounting and determine the spacing of these types of speakers. Chart 3 provides basic guidelines to follow.

Chart 3

Combined Background Music & Paging

Mounting Height (Ft.)	Forward Coverage	Spacing (Ft.)
8	25	20
12	35	25
16	45	30

As with ceiling speakers, wall baffle speakers with volume controls should be used to offer greater flexibility in fine-tuning the paging system.

If center posts or support posts are available, utilize them for speaker mountings, as shown in Chart 3A, and follow the spacing recommendations in Chart 3. When suitable pillars aren't available and distance coverage needs necessitate wall baffle mounting on two opposing walls, you should stagger the speakers as in Chart 4.

Chart 3A

Forward Coverage 25 Feet

20 Feet

20 Feet

15

Chart 4
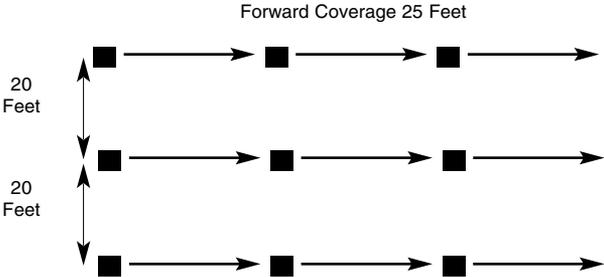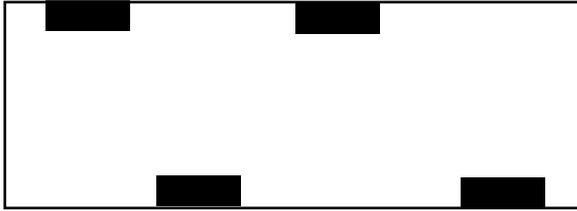
Horn Loudspeakers

We discussed horn application areas in general terms earlier, now we will discuss the specifics.

Where are they used?

• Outdoors.

• Any weather/environment exposed area, i.e., outdoors, in freezers, and in heat-affected areas.

• Indoors where high ambient noise exists.

• Indoors where large area coverage is necessary and where aesthetics do not require decorative ceiling or wall baffle speakers.

How are they mounted?

All Bogen horns can either be strap mounted to beams and pillars, using standard 1/2-inch industrial strapping, or mounted with screws, nails or bolts through the base mounting holes.

Desired mounting height, barring obstructions, is 15 to 20 feet, with the speakers angled downward towards the listening area.

An exception is the unique Model BDT30A Bi-Directional Horn. This horn is designed for aisle/corridor-type applications where long and straight sound projection is required. The benefit of this horn is that only one device is required to be installed, and it performs like two back-to-back 15-watt horns. It is ideal for use in warehouse applications, where shelves or bins create aisles. One BDT30A is also less costly to install than two 15-watt horns.

How to space horn loudspeakers

To simplify horn loudspeaker layout and tap selection, refer to the Horn Loudspeaker Selection Guide on the next page.

Calculate the square footage covered and the tap selection required and use common-sense to equally space the horns to cover the desired area.

Important guidelines

Always try to mount all horns facing the same direction, rather than toward each other, as shown in Chart 5. The correct pattern of speaker mounting will ensure maximum intelligibility to the listener as only one primary sound source hits the ear at any time. Whenever possible, it is best to stagger the horns as in Chart 6.

Chart 5

Correct Pattern

Incorrect Pattern
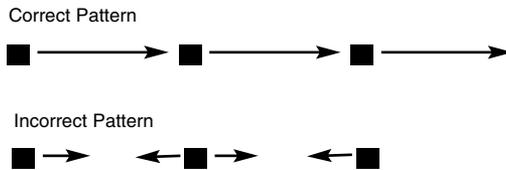
Chart 6
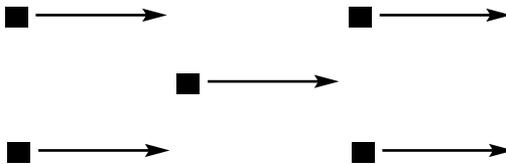
Horn Loudspeaker Selection Guide

Noise Level	Self-Amplified Horns & Effective Coverage	Central-Amplified 70V Horns Forward Coverage	Tap* & Effective Forward Coverage
Very High 85-95dB	AH15A - 25 Ft.	SPT30A BDT30A	15W - 25 Ft. 30W - 50 Ft.
High 75-85dB	AH5A - 50 Ft. AH15A - 75 Ft.	SPT15A BDT30A	5W - 50 Ft. 15W - 75 Ft. 30W - 150 Ft.**
Medium 65-75dB	AH5A - 75 Ft.	SPT15A BDT30A	5W - 75 Ft. 7.5W - 150 Ft.**
Low 55-65dB	AH5A - 100 Ft.	SPT5A*** SPT15A BDT30A	5W - 75 Ft. 5W - 100 Ft. 7.5W - 200 Ft.**

*   Tap setting (in watts) is for design purposes only; actual installation setting may vary.

** BDT30A is a bi-directional horn; forward coverage is for both directions.

***SPT5A is a cone-type speaker in a horn enclosure suited for paging/background music applications in low noise areas.

Typical Noise Levels

Very High: Conversation Difficult or Impossible
- Factory • Machine Shop • Printing Plant

High: Conversation Difficult
- Assembly Line • Factory

Medium: Voice Must Be Raised To Be Understood
- Transportation Terminal • Shipping Department • Loading Dock

Low: Conversation Easily Understood
- Warehouse

Other Design Considerations

Because sound travels basically like light waves through the air, when these waves are broken up or blocked, sound coverage is severely compromised. As a result, some other considerations must be taken into account.

• Offices
Does the user want paging in individual offices? Many executives prefer to have no paging in their offices. When desired, a wall-mounted volume control can be used to control the page volume. The Bogen AT10A or AT35A attenuators are recommended for use with central-amplified type systems.

• Conference rooms
Does the user want paging in conference rooms? If so, a single wall-mounted volume control for each room is a good recommendation.

• Open areas
Are there areas which are typically not occupied by personnel? If so, speakers in these areas may not be absolutely necessary. Generally, this is the case and, as a result, system price can be more economical.

• Work stations
Given a normal symmetrical speaker layout, are there any work stations or desks which are directly under speaker devices? Can the speakers be conveniently rearranged to accommodate these areas?

• Segmented areas
Are walls, bins, racks, etc. in places which may tend to require individual speakers for that particular area? Horn speakers are quite directional and won't carry very well over dividers and through bins, etc. For aisle-type situations, a bi-directional horn may provide better coverage.

• Mounting limitations
Earlier, the difference between ceiling speaker and wall baffle mounting was discussed. In addition to suspended ceiling versus wall mounting, the surveyor needs to consider the surfaces and positions available for actual speaker mounting. But, whatever situation is encountered, there is a speaker designed to meet that need.

Step 5. How to determine the power taps and coverage per speaker.

Sq. Ft.	Self-Amp. Model	No. Req.	Power Factor (pf)	Central-Amp. Model	No. Req.	Wattage Tap	Noise Level
5,000	AH5A	1	8	SPT15A	1	.9W	Low Noise
	AH5A	1	8	SPT15A	1	3.8W	Med. Noise
	AH15A	2	20	SPT15A	2	7.5W	High Noise
	AH15A	3	20	SPT15A	3	15W	Very High
10,000	AH5A	1	8	SPT15A	1	.9W	Low Noise
	AH5A	1	8	SPT15A	1	3.8W	Med. Noise
	AH15A	5	20	SPT15A	5	7.5W	High Noise
	AH15A	5	20	SPT15A	5	15W	Very High
15,000	AH5A	2	8	SPT15A	2	.9W	Low Noise
	AH5A	3	8	SPT15A	3	3.8W	Med. Noise
	AH15A	5	20	SPT15A	5	7.5W	High Noise
	AH15A	8	20	SPT15A	8	15W	Very High
20,000	AH5A	2	8	SPT15A	2	.9W	Low Noise
	AH5A	4	8	SPT15A	4	3.8W	Med. Noise
	AH15A	7	20	SPT15A	7	7.5W	High Noise
	AH15A	10	20	SPT15A	10	15W	Very High
25,000	AH5A	3	8	SPT15A	3	.9W	Low Noise
	AH5A	5	8	SPT15A	5	3.8W	Med. Noise
	AH15A	8	20	SPT15A	8	7.5W	High Noise
	AH15A	18	20	SPT15A	13	15W	Very High
30,000	AH5A	3	8	SPT15A	3	.9W	Low Noise
	AH5A	5	8	SPT15A	5	3.8W	Med. Noise
	AH15A	8	20	SPT15A	8	7.5W	High Noise
	AH15A	18	20	SPT15A	13	15W	Very High
35,000	AH5A	4	8	SPT15A	4	.9W	Low Noise
	AH5A	6	8	SPT15A	6	3.8W	Med. Noise
	AH15A	12	20	SPT15A	12	7.5W	High Noise
	AH15A	18	20	SPT15A	18	15W	Very High
40,000	AH5A	4	8	SPT15A	4	.9W	Low Noise
	AH5A	7	8	SPT15A	7	3.8W	Med. Noise
	AH15A	14	20	SPT15A	14	7.5W	High Noise
	AH15A	20	20	SPT15A	20	15W	Very High
45,000	AH5A	5	8	SPT15A	5	.9W	Low Noise
	AH5A	8	8	SPT15A	5	3.8W	Med. Noise
	AH15A	15	20	SPT15A	15	7.5W	High Noise
	AH15A	23	20	SPT15A	23	15W	Very High
50,000	AH5A	5	8	SPT15A	5	.9W	Low Noise
	AH5A	9	8	SPT15A	9	3.8W	Med. Noise
	AH15A	17	20	SPT15A	17	7.5W	High Noise
	AH15A	25	20	SPT15A	25	15W	Very High
55,000	AH5A	6	8	SPT15A	6	.9W	Low Noise
	AH5A	9	8	SPT15A	9	3.8W	Med. Noise
	AH15A	18	20	SPT15A	18	7.5W	High Noise
	AH15A	28	20	SPT15A	28	15W	Very High
60,000	AH5A	6	8	SPT15A	6	.9W	Low Noise
	AH5A	10	8	SPT15A	10	3.8W	Med. Noise
	AH15A	20	20	SPT15A	20	7.5W	High Noise
	AH15A	30	20	SPT15A	30	15W	Very High
65,000	AH5A	7	8	SPT15A	7	.9W	Low Noise
	AH5A	11	8	SPT15A	11	3.8W	Med. Noise
	AH15A	22	20	SPT15A	22	7.5W	High Noise
	AH15A	33	20	SPT15A	33	15W	Very High
70,000	AH5A	7	8	SPT15A	7	.9W	Low Noise
	AH5A	12	8	SPT15A	12	3.8W	Med. Noise
	AH15A	24	20	SPT15A	24	7.5W	High Noise
	AH15A	35	20	SPT15A	33	15W	Very High

Step 6. How to determine the appropriate amplifier.

• Central-Amplified (70V) Systems:

In central-amplified systems, selecting the size of the amplifier is as simple as totaling the speaker power taps using the worksheet below. Since future expansion and unexpected SPL changes frequently occur, we recommend the selection of an amplifier with 20% more power than the aggregate amount of the speaker taps; thus, the 20% safety/future growth allowance factor seen on the worksheets.

Central-Amplified Speaker System Worksheet

Bogen Model No. & Description	Power Tap (in watts)	x Quantity Needed	=Power Required
S86T725PG8W - 8" speaker with XFMR on white grille	_____	_____	_____
S86T725PG8WVK - Same as above, with knob volume control	_____	_____	_____
WBS8T725 - 8" speaker with XFMR in wall baffle	_____	_____	_____
WBS8T725V - Same as above, with volume control	_____	_____	_____
SPT15A - 15 watt horn speaker	_____	_____	_____
SPT30A - 30 watt horn speaker	_____	_____	_____
BDT30A - Bidirectional horn speaker	_____	_____	_____
Nominal Power Required			_____
+20% Safety/Expansion Factor			_____
Total Power Required			_____

Amplifier	Power Available
TPU15A	15 watts
TPU35B	35 watts
TPU60B	60 watts
TPU100B	100 watts

Note: In background music applications, tap speakers for 1 W minimum.

• Self-Amplified (24V) Systems:

Selecting the proper size power supply for amplified speaker systems has been simplified by assigning a power factor (pf) to each speaker or horn. Simply use the worksheet below to determine the appropriate power supply.

Self-Amplified Speaker System Worksheet

Bogen Model No. & Description	Nominal Power Factor (pf)	x Quantity Needed	=Total Power Factor (pf)
• Self-amplified cone loudspeakers			
ASWG1 - 8" speaker on white grille	1	_____	_____
ASWB1 - 8" speaker in wall baffle	1	_____	_____
• Self-amplified horn loudspeakers			
AH5A - 5 watt horn loudspeaker	4	_____	_____
AH15A - 15 watt horn loudspeaker	12	_____	_____
• Access/zone control modules (if required)			
TAM-B - Access Control Module	3	_____	_____
PCM2000 -Zone Control Module	Use 1 PCMPS per PCMCPU		

Nominal Power (pf) Required	_____
+ 20% Safety/Expansion Factor	_____
Total Power (pf) Required	_____

Power Supplies
PRSASAC - 24VDC
PRS624DA - 24VDC
PCMPS - 12VDC (use with PCM2000)

Note: If the total power (pf) required equals or exceeds the power (pf) of one size power supply, using the next larger supply (or of two supplies) is recommended.

Bogen Telephone Paging System Products

TPU Series Telephone Paging Amplifiers

Specifically designed for telephone paging, the TPU Series offers a choice of 15, 35, 60, and 100 watt outputs.

- Compact wall-mount design.
- 600-ohm balanced telephone paging input.
- Low-impedance balanced microphone input.
- Night ringer via contact closure/90V ring current.
- Separate background music input.
- Signal-activated music muting.
- Built-in automatic level control.

DFT-120 Digital Feedback Terminator

- Record/play unit designed to eliminate feedback in paging systems.
- Selectable pre-page alert tone and pre-page delay.
- Activation by contact closure, audio sensing (VOX) or DTMF tone.
- Supervisory contacts for external functions.

GA2 Amplifier

Designed to feed music-on-hold to a telephone system in cases where the system cannot accept a direct tuner input, the GA2 also serves as a booster for large self-amplified systems.

- 1.5 watts for MOH or amplified horn audio line boost.
- 600-ohm or 8-ohm output.
- Phone jack and screw terminal input.
- Compact, wall-mountable.
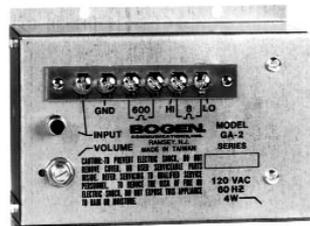
TAM-B Telephone Access Module

The TAM-B is an excellent telephone/paging system interface. It allows connection to ground or loop start trunk ports, to station lines that have 90 volt ring current, to Centrex station lines and to CO line positions. The TAM-B also provides pre-announce and confirmation tones and a background music input port.

• Eliminates the need for costly circuit packs on PBX's & "hybrids".
• Compatible with PBX, 1A2 Key, "Hybrid" PBX, and Centrex systems.
• Station or trunk port access — when trunk port (24/48V) terminals are powered, TAM-B automatically goes into trunk port operation.
• User-selected tones — a pre-announce tone that sounds in both the telephone earpiece and over the speakers, and a confirmation tone that sounds only in the telephone earpiece.
• Three paging release methods: voice-operated disconnect, loop-current interruption detection, and default disconnect timer.
• Normally-open contact closure — enables TAM-B to be compatible with ground start trunks; in all other applications provides control of functions (such as background music muting), or external equipment (such as tone generator).

PCM2000 Modular Zone Page Control System

• Simultaneous high and low power paging.
• Zone group paging (32 zone groups, each with up to 99 zones).
• Built-in talk back amplification (with PCMTBM module).
• Background music assigned per zone. Local BGM sourcing.
• Night ringer zone group.
• Emergency zone group.
• Emergency all-facility page override.
• Eight daily time-triggered events (with PCMTBM module).
• Pattern & echo code calling capability.
• Master clock synchronization.
• Relay driver.
• Aux contacts.

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NR-100 Night Ringer Module

- Provides night bell service via the auxiliary input of a paging amplifier.
- Eliminates need for expensive night bells.
- Electronic night bell signals sounds throughout the paging system.
- Accepts and operates from either 90V ring signal or contact closure.
- Automatically mutes music.

TP30D Tuner

- Hi-Fi quality, AM/FM tuner for background music and/or music-on-hold.
- Excellent sensitivity, image rejection and frequency response.
- Low hum, noise and distortion.
- Two outputs for background music and MOH.
- AFC switch for better lock on desired station.
- Tuning and signal strength indicators.

FMR Tuner

- Economical background music/music-on-hold source.
- 1-watt output or line output.
- Automatic frequency control.
- Wall-mounting, compact design.
- External antenna terminals.

TG4C Tone Generator

- Four signals to choose from: steady, pulsed, chime, or slow whoop.
- Continuous or double burst (except for steady tone) tone selection.
- Output level and pitch control are adjustable.
- Excellent source for alarm and pre-announce tones in telephone paging systems.
- Accepts high-level input from tuner, cassette player, etc., then maintains precedence over program material for the duration of contact closure.

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24V & 48V DC Power Supply

• 48V DC power. Recommended power source for the TAM-B, when used in trunk access mode.
• 24V DC Power Supplies
• Model PRSASAC powers smaller amplified low-level speaker systems.
• Model PRS624DA provides increased power for large amplified speaker systems.
• Both models supply loop current for use with loop start trunks without need for the TAM-B access module.

ANS-500 Ambient Noise Sensor

• Automatically adjusts the level of page announcements.
• Shapes frequency response for greater intelligibility.
• Up to 4 microphones per unit, wired in parallel.
• Wire runs up to 2,000 feet.

Loudspeakers

Central-Amplified (70V) Speakers

Ceiling Mount Assemblies

Assemblies consist of S86 cone speaker, T725 transformer and white PG8W grille.

S86T725PG8W	Speaker/Transformer/Grille
S86T725PG8WVR	S86T725PG8W with recessed volume control
S86T725PG8WVK	S86T725PG8W with knob volume control
S86T725PG8WBR	S86T725PG8W with terminal strip
S86T725PG8WBRVR	S86T725PG8WBR with recessed volume control
S86T725PG8WBRVK	S86T725PG8WBR with knob volume control

Wall Baffle Assemblies

Assemblies consist of S86 cone speaker, T725 transformer and walnut finish WB-8 baffle.

WBS8T725	Speaker/Transformer/Baffle
WBS8T725V	WBS8T725 with volume control
WBS8T725BR	WBS8T725 with terminal strip
WBS8T725BRV	WBS8T725BR with volume control

Horn Speakers

SPT15A - 15 watt for medium ambient noise area music or paging.

SPT30A - 30 watt for high ambient noise areas where conversation is hindered.

BDT30A - 30 watt for high ambient noise areas where long aisle/corridor-type area exists. A single 30 watt twin horn is less costly to buy and install than two 15 watt horns.

Self-Amplified (24V) Speakers

AS1	Cone speaker/1 watt amplifier with volume control.
ASWG1	AS1 mounted on white ceiling grille.
ASWB1	AS1 in walnut finish wall baffle.
AH5A	Horn speaker/5 watt for low/medium ambient noise areas.
AH15A	Horn speaker/15 watt for medium/high ambient noise areas.