

TM

**University
Sound**

**COMMERCIAL
SOUND AND
PUBLIC ADDRESS**

PAGING SYSTEM DESIGNS

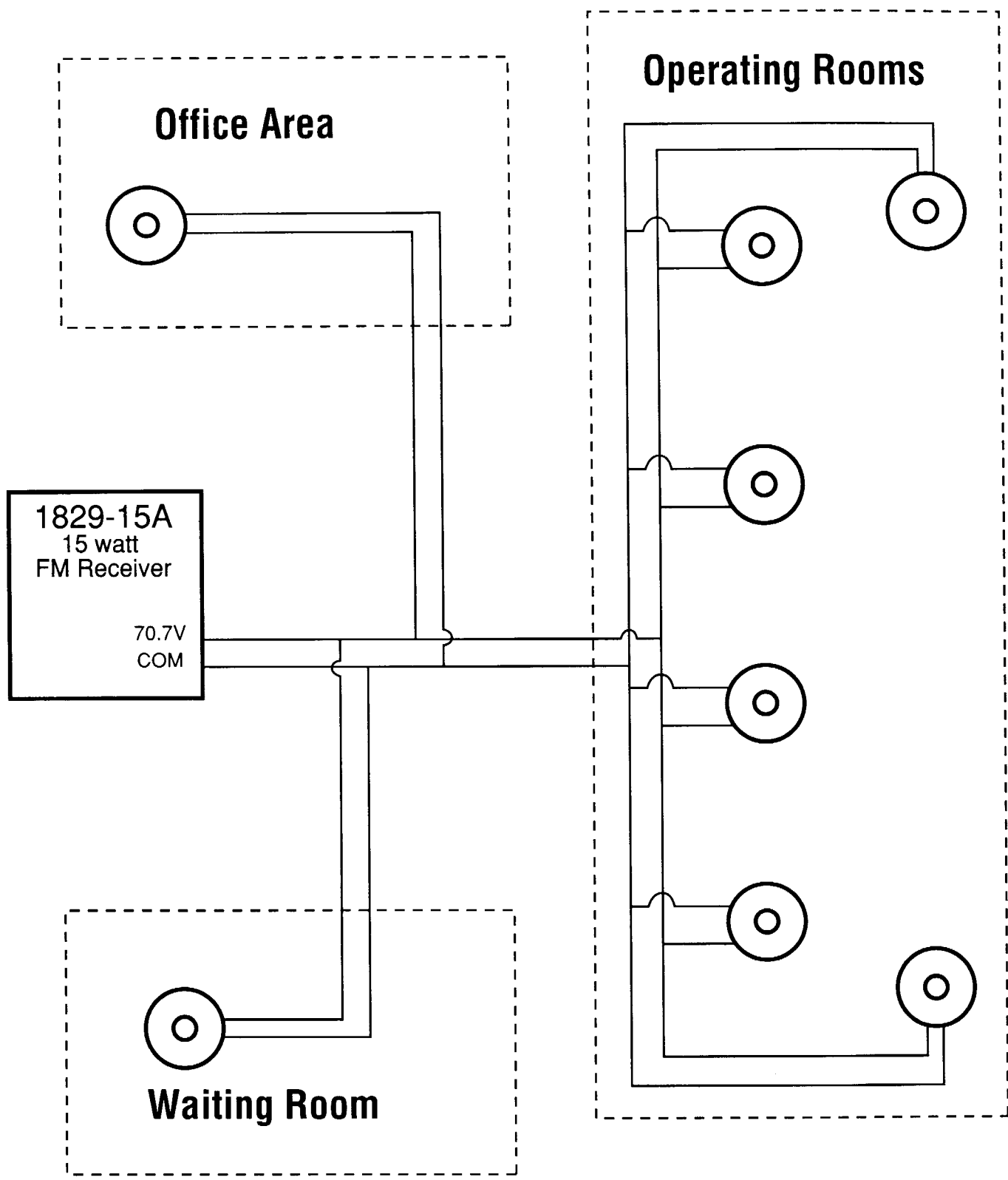
Introduction

This guide is intended to instruct you on the installation of different types of commercial sound systems. It starts with the most basic systems and works up to more complex, special situation systems. On each front page is a system diagram, and on the reverse is a short and easy-to-understand explanation of what the system does and how it works, as well as a form for filling in current retail prices to estimate the system's cost. Feel free to reproduce these pages to educate customers and clients on the operation and cost of the different systems. Only a few models in University's very extensive line are featured in this guide. This was done in the interest of simplicity. There are many other products in University's line that may be more suitable to a specific, real-life application.

University Sound commercial sound products may be purchased through authorized University Sound dealers located throughout the U.S.A., as well as in many foreign countries. Product line brochures and engineering data sheets are available at no charge from your University Sound dealer or directly from University Sound, 13278 Ralston Avenue, Sylmar, CA 91342.

Contents

System A	Basic Background Music
System B	Basic Paging
System C	Paging with Background Music
System D	Restaurant Paging & Music
System E	Stadium Paging & Music
System F	Phone Driven Paging
System G	Zone Paging
System H	Long Distance Paging
System I	Many-Building Paging



System A

Basic Background Music

All speakers are CS 810T's with tap @ 1 watt (8 watts total load)

System A – Basic Background Music

System Description

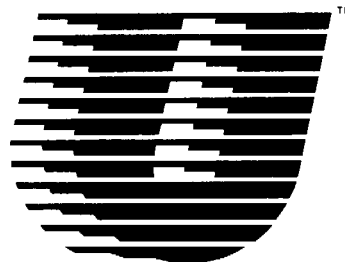
This is a very basic, low-power system that can provide radio background music in a variety of small-office situations. The installation in this case is a dentist's office. It uses the CS810T speakers from University, which are most often ceiling-mounted. Since the speakers are wired to the constant-voltage outputs of the amplifier, speakers can be added or removed so long as the total power load is at or under 15 watts. Consumer market amplifiers use constant-impedance lines (commonly 4 ohms and 8 ohms), which require speakers to be added in awkward series and parallel configurations so that the total speaker line impedance is equal to the amplifier's output impedance. Furthermore, speaker lines that are constant-voltage can be run much longer lengths than can constant-impedance lines. Since the voltage running through the speaker lines is less than 100 volts, the wires can be run without conduit and still comply with building codes.

It's not necessary to have all of the CS810T's tapped at 1 watt, or even to use the same model of speaker at each location. If there's a spot where coverage is weak, the output can simply be stepped up. However, the sound quality will be better if additional speakers at a lower power output are used instead.

Equipment List and Cost Breakdown

Model #	Desc.	Qty.	Price	Total
1829-15A	15 watt FM receiver	1		
CS810T	8" 10 watt ceiling speakers w/ CV transformer	8		
Total Cost				\$ _____

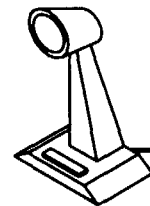
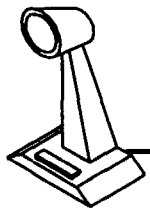
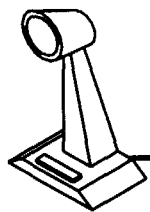
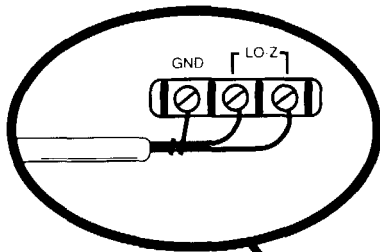
(Note: Price figures to be filled in by dealer)



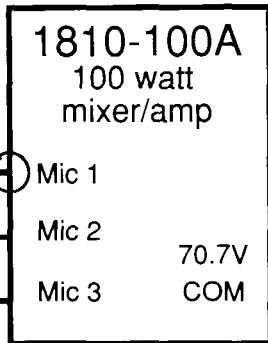
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Office Area

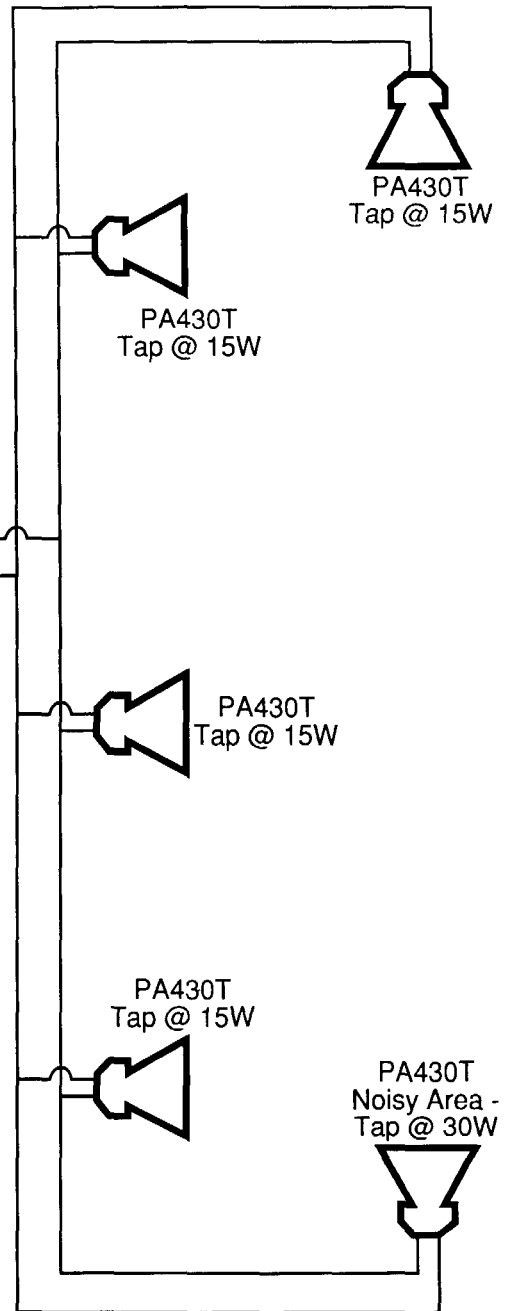


US621L
Microphones



Warehouse

Approx. 2000-6000 sq ft



To find speaker system load:
15 watts
15 watts
15 watts
15 watts
+ 30 watts

90 watts
Leaving a 10 watt
reserve between
amp & speakers

System B Basic Paging

System B – Basic Paging

System Description

This sort of system is useful for situations where an office or sales floor is physically separated from a large warehouse or factory area. A person pressing the talk button on any of the three microphones will broadcast a message over the system. Note that with this configuration, people in the office area will not be able to hear the page except for sound leakage through doorways, windows, and walls. The amount of this leakage, of course, depends on the architecture of the particular building.

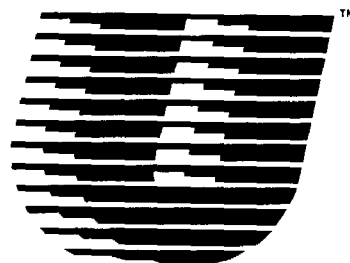
The microphones used in this installation have **low-impedance (lo-Z) balanced** outputs. This type of microphone must be used with an amplifier that has balanced inputs, or an input matching transformer must be used between the microphone and an amplifier with a hi-Z unbalanced input. The advantage to using lo-Z balanced lines is that the microphone cable can be run over 200 feet without appreciable loss of sound quality, whereas unbalanced lines should never exceed 15 feet in length. Since this configuration uses balanced lines, the three microphones can be placed at distant, convenient locations in the office area without worrying about poor sound quality. Note that balanced lines have three wires in the cable; they must be connected to the amplifier input as shown in the oval blow-up on the first mic input. Connecting the metal shield of the cable to the ground (marked "GND") provides noise rejection.

As was discussed in the last system description, the paging projectors in this configuration are tapped at different power outputs. In a noisy area, a loading dock or tooling area for example, the driver is wired at twice the output of the other drivers. The total speaker system load, though, is still less than the rated output of the amplifier.

Equipment List and Cost Breakdown

Model #	Desc.	Qty.	Price	Total
1810-100A	100 watt mixer/amp	1		
US621L	Lo-Z balanced mics	3		
PA430T	30-watt paging horn and driver	5		
Total Cost				\$ _____

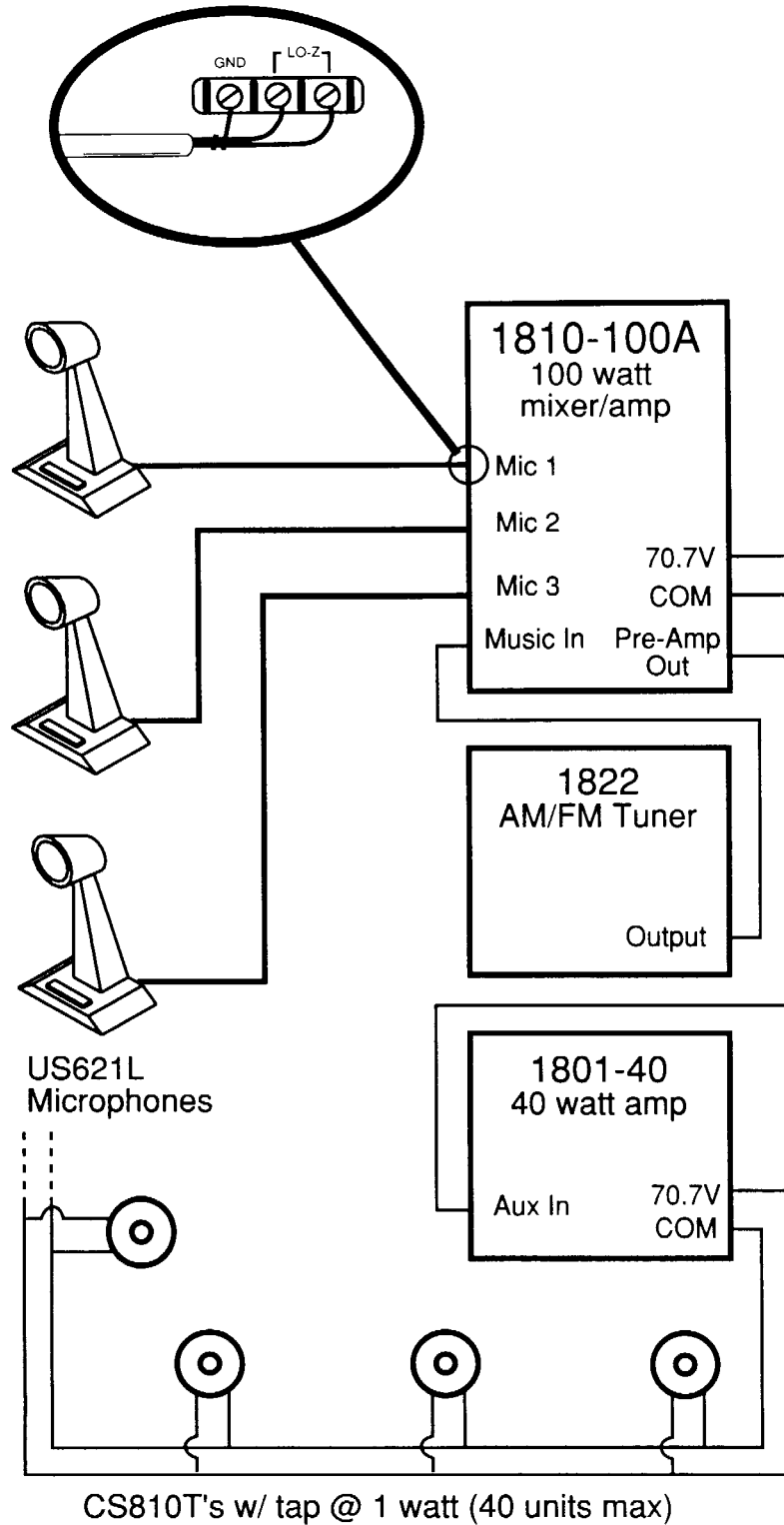
(Note: Price figures to be filled in by dealer)



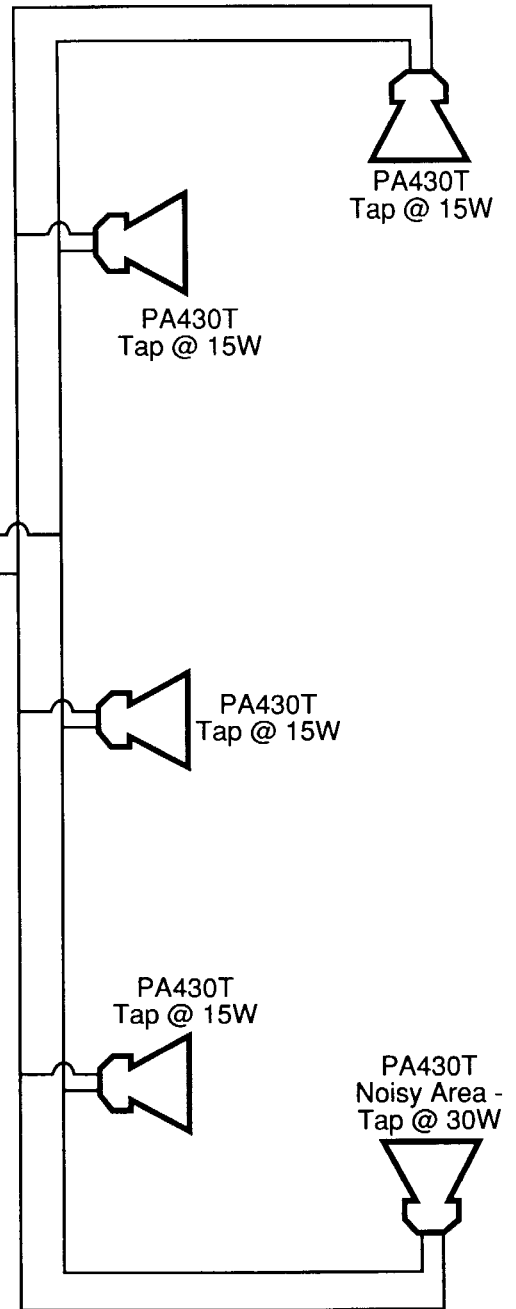
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Office Area



Warehouse Approx. 2000-6000 sq ft



To find speaker system load:
 15 watts
 15 watts
 15 watts
 15 watts
 + 30 watts

90 watts
 Leaving a 10 watt
 reserve between
 amp & speakers

System C Paging w/Background Music

System C – Paging with Background Music

System Description

This system is the same as System B, except that we've added background music and a speaker system in the office area to carry both the music and the paging messages.

The AM/FM tuner is connected to the music input of the 1810-100A, so that when someone uses any of the microphones to make a page, the voice-activated mute feature of the 1810 automatically silences the music while the person is speaking. The connection between the tuner and amp is a line-level unbalanced connection, so the two should be placed fairly close together.

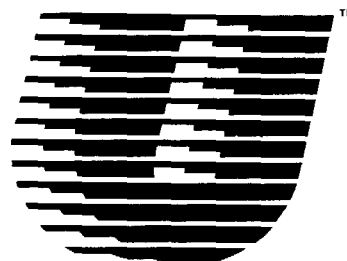
To support the use of CS810T ceiling speakers in the office area, we have added another amplifier to the system wired to broadcast the same signal as the first amplifier. Since the PA430T's use all but 10 watts of the 1810's rated output, it's not terribly safe to add more speakers to that speaker line. Instead, we take the pre-amp output of the 1810, which is the same signal as the 70.7V/COM line but unamplified, and feed it to the input of the 1801-40. This provides 40 more watts with which to drive the ceiling speakers. Using CS810T's tapped at 1 watt, we can install up to 40 speakers in the office area - enough to cover even large office areas.

It is possible to wire this system so that the office speakers only carry the background music and not the page. Instead of connecting the 1801 line input to the 1810 pre-amp out, connect it directly to the 1822 Tuner. In this case, both speaker systems will carry the music, but only the PA430T's will carry the page.

Equipment List and Cost Breakdown

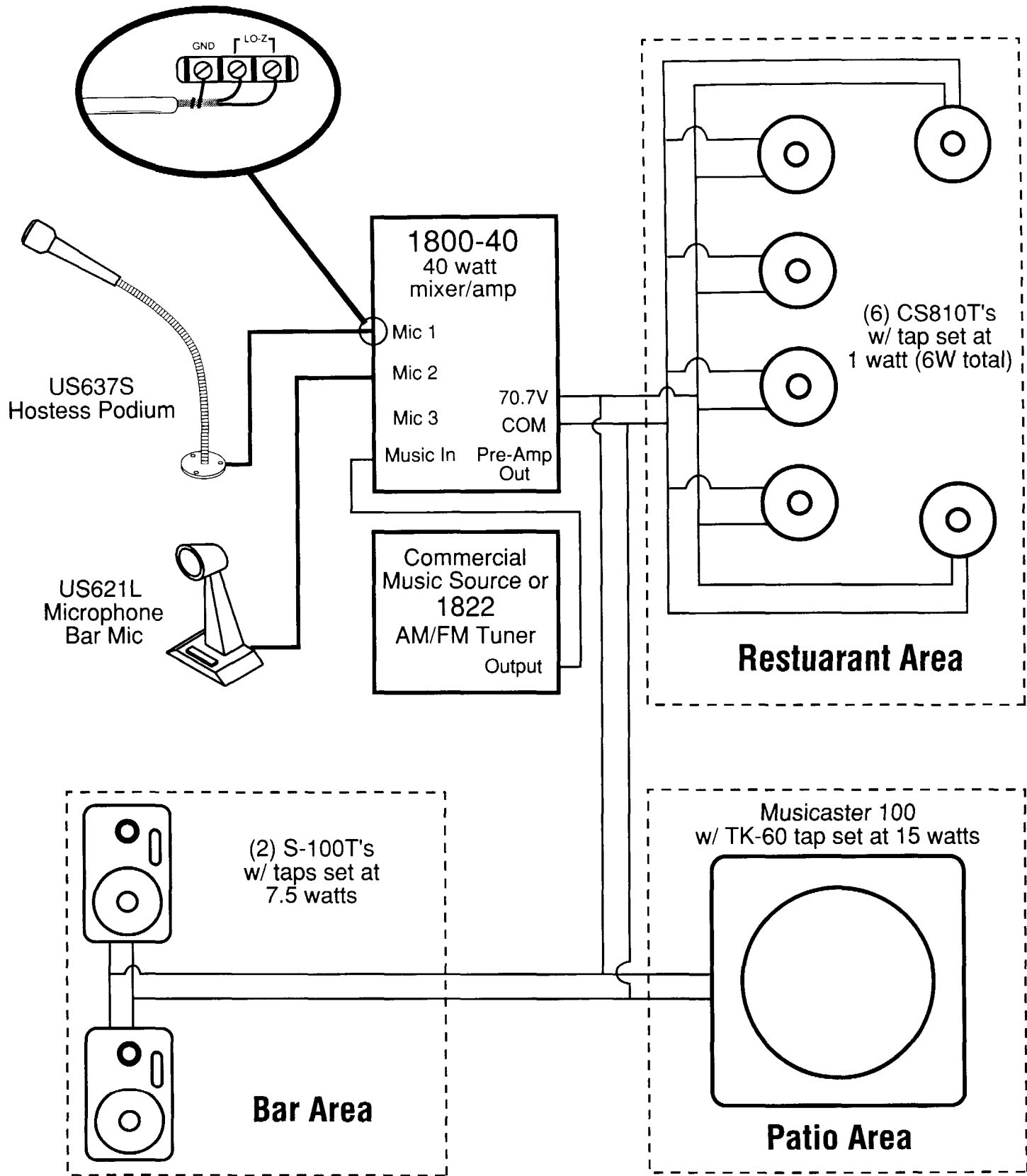
Model #	Desc.	Qty.	Price	Total
1810-100A	100 watt mixer/amp	1		
1801-40	40 watt amp	1		
1822	AM/FM Tuner	1		
CS810T	8" 10 watt ceiling speaker w/ CV transformer	10		
US621L	Lo-Z balanced mics	3		
PA430T	30-watt paging horn and driver	5		
Total Cost				\$ _____

(Note: Price figures to be filled in by dealer)



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System D

Restaurant Paging/Music System

System D – Restaurant Paging/Music System

System Description

This configuration chiefly illustrates the use of different types of speakers and microphones in different types of applications. In this case, the installation is in a restaurant, but the principles apply wherever a system must provide input and output in a variety of environments.

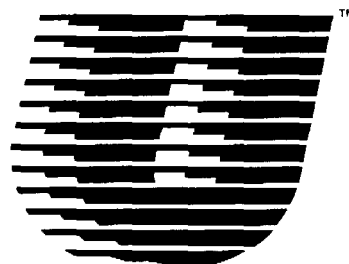
The US637S is a gooseneck microphone that can be bolted down to a podium or desk for security and convenience. It is also a lo-Z balanced microphone, so that the amplifier can be a long distance from the microphone itself.

CS810T's are ceiling mounted in the restaurant area and tapped at low outputs for a quieter atmosphere. The smaller bar area, where sound levels are usually higher and sound quality is more important, is covered by two S-100T's tapped at 7.5 watts each. The S-100T's have a contemporary look, are very rugged, and can be bracket-mounted in a variety of ways. The outdoor patio area is served by a Musicaster 100 tapped at 15 watts. Outdoor areas, since they lack the reflective surfaces of walls and ceilings, generally require more power than indoor areas to achieve the same sound levels. The Musicaster 100 is weather-resistant and is available in a forest green color for easy concealment in bushes or trees. The power levels of each speaker subsystem can and should be adjusted to meet the needs of the individual building; the settings shown here are only starting point suggestions.

Equipment List and Cost Breakdown

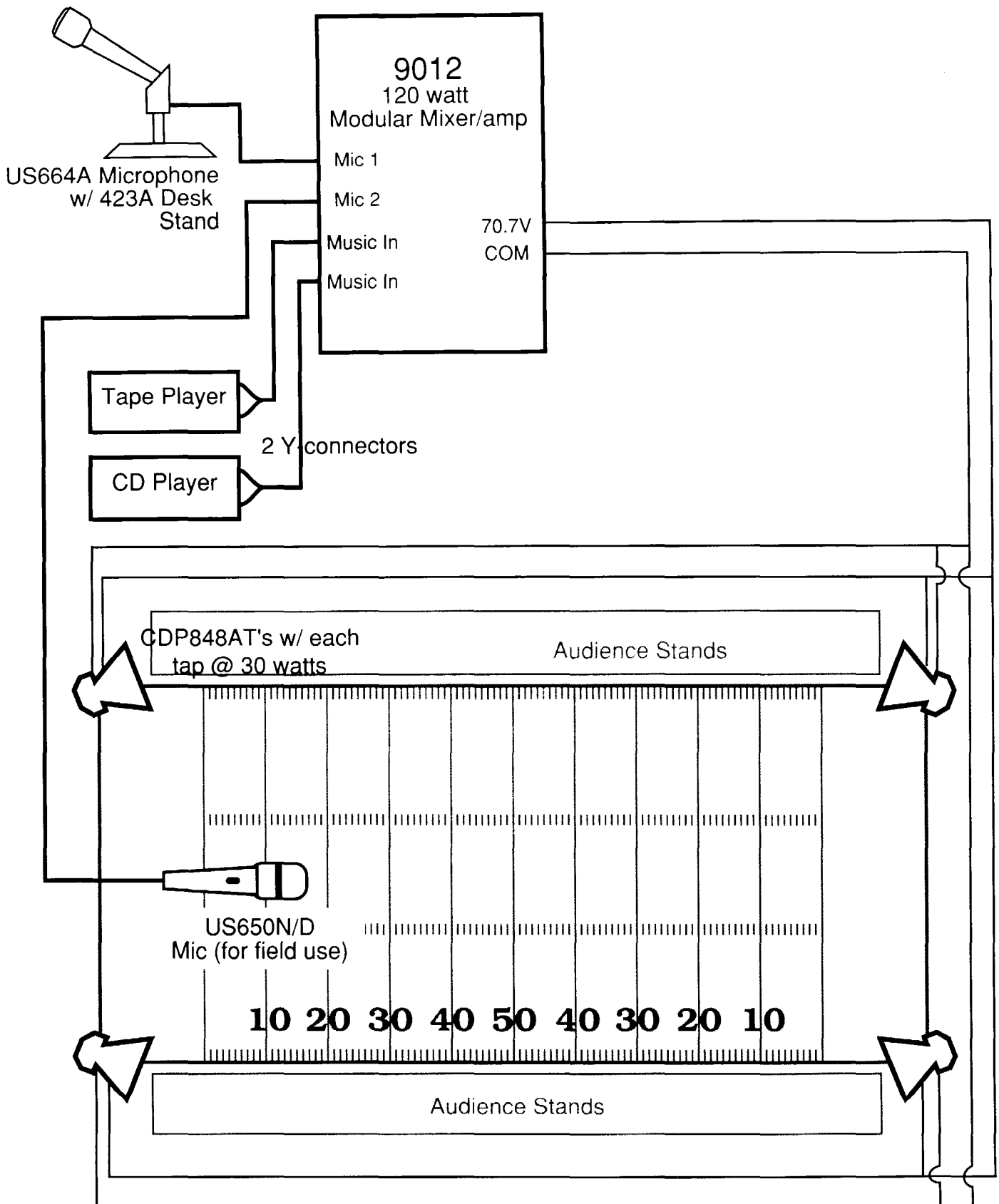
Model #	Desc.	Qty.	Price	Total
1810-100A	100 watt mixer/amp	1		
1822	AM/FM Tuner	1		
US621L	Lo-Z balanced mic	1		
US637S	Lo-Z balanced gooseneck mic	1		
CS810T	8" 10 watt ceiling speakers w/ CV transformers	6		
Musicaster 100 w/ TK-60	Indoor/Outdoor 60 watt speaker in enclosure	1		
S-100T	2-way, high-fidelity 30 watt speaker	2		
Total Cost			\$	_____

(Note: Price figures to be filled in by dealer)



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System E

Stadium Paging/Music System

System E – Stadium Paging/Music System

System Description

Most athletic stadiums are larger outdoor situations, and so require more power than any of the systems we've illustrated thus far. System E should be sufficiently powerful for most high-school and small college stadiums.

The 9012 mixer-amplifier has six available inputs, four of which are used in this configuration. The 9012 is a modular input amplifier, meaning that each input can be tailored to the user's needs with the use of different input modules. This configuration requires two CRH-01X modules for the microphone inputs, and two CRX-01R modules for the Tape Player and CD Player. The "Y-connectors" used on the stereo outputs of the tape and CD players are easily obtained from your local electronics supplier. For *higher-quality sound reproduction*, resistive mixing of the stereo outputs should be used. Each module can individually be set to mute or mix when priority paging takes place. With two inputs still available, there is still means for expansion of the system to include, for instance, an organ, or the sub-mix of a marching band.

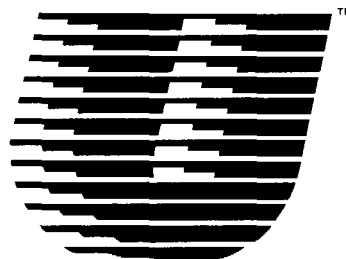
The cable run down to the field will be longer than 15 feet, so the field mic must be a dedicated lo-Z balanced mic, such as the US650N/D. Since the US650N/D is dynamic, it doesn't require phantom powering, and thus the possibility of electric shock in inclement weather is eliminated.

The CDP848AT paging projectors can be mounted on support beams, wood poles, and a number of other ways. They are built for indoor or outdoor operation, so that the projectors can be placed in unprotected areas to suit the coverage needs of the stadium. The Compound Diffraction design of the horns and drivers are particularly well-suited to even coverage over long distances.

Equipment List and Cost Breakdown

Model #	Desc.	Qty.	Price	Total
9012	120 watt modular mixer/amplifier	1		
CRH-01X	Mic-level input module	2		
CRX-01R	Aux-level input module	2		
US664A w/ 423A	Hi-Z/Lo-Z mic on 423A desk stand	1		
US650N/D	Lo-Z Balanced mic	1		
848AT	Compound Diffraction 30 watt horn and driver combination	4		
Total Cost				\$ _____

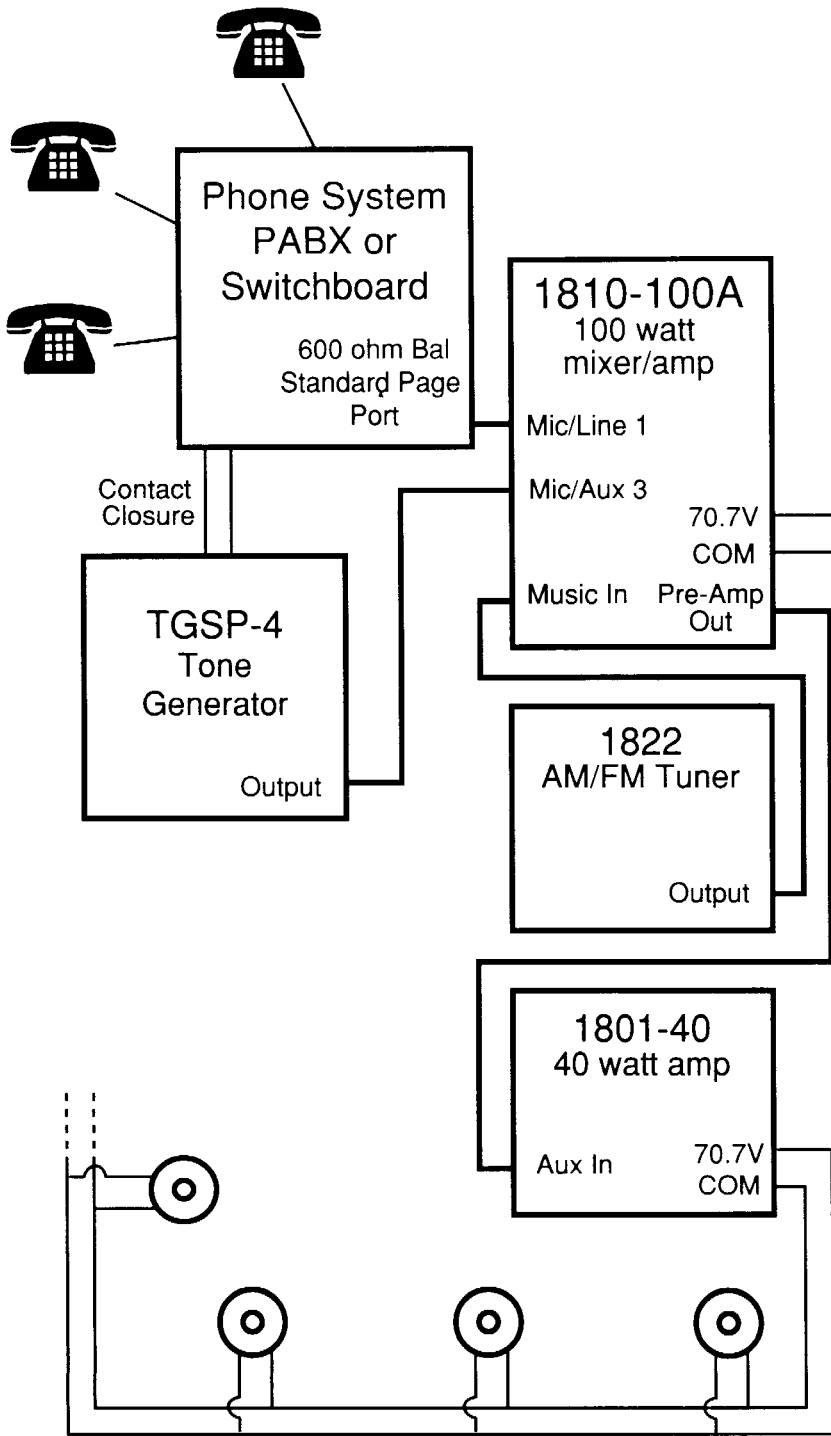
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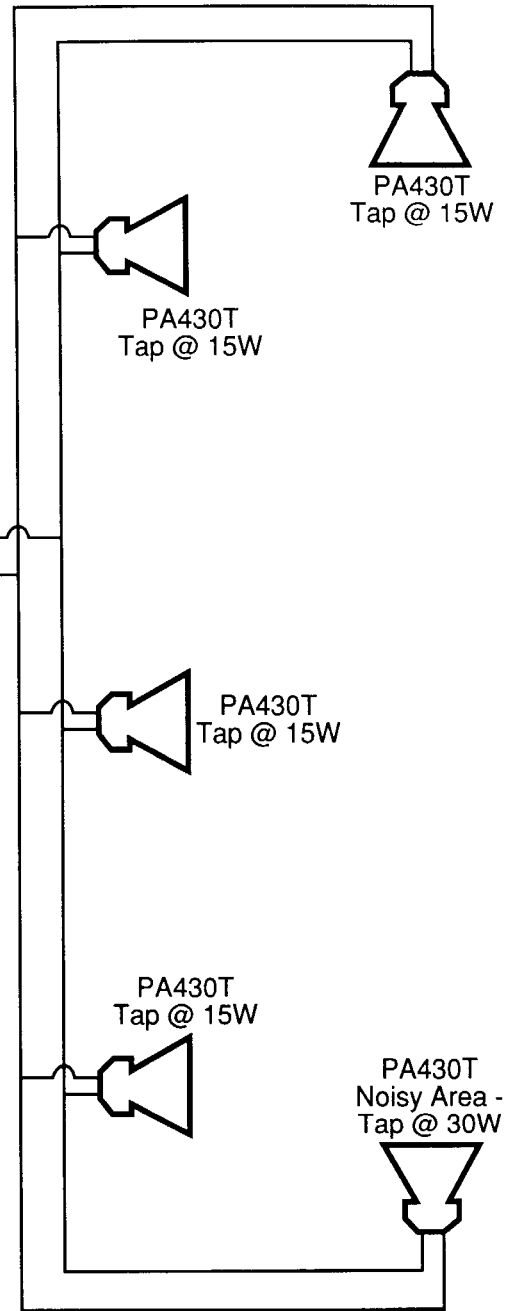
Office Area



CS810T's w/ tap @ 1 watt (40 units max)

Warehouse

Approx. 2000-6000 sq ft



To find speaker system load:
 15 watts
 15 watts
 15 watts
 15 watts
 + 30 watts

90 watts
 Leaving a 10 watt
 reserve between
 amp & speakers

System F Phone-Driven Paging

System F – Phone Driven Paging

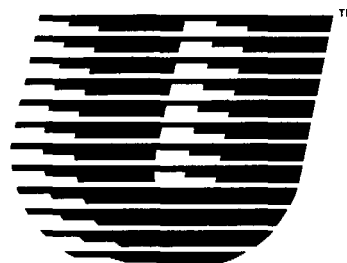
System Description

This configuration is identical to System C, except that the three microphones have been replaced by a central phone system and page-alert tone generator. Most modern switchboards (PABX-type or otherwise) have a standard page output that is balanced and has an impedance of 600 ohms. Using one of the line inputs on the 1810, the switchboard can be directly connected to the amp. Depending on the design of the switchboard, the paging operator and/or other phone operators can access the paging port by dialing a code or pressing a dedicated page button. Some switchboards produce their own paging alert tone, carried through the paging port itself. Other models, however, do not produce their own tone, in which case, it's convenient to use the muting contact closure on the switchboard to activate the TGSP-4 tone generator. The TGSP-4's output is connected to the third input (mic/line level) of the 1810 to produce an alert tone when the paging port of the switchboard is accessed. On older paging amplifiers, music muting was accomplished manually by contact closure across two terminals on the amplifier itself. Since the 1810 has voice-activated muting, the contact closure of the switchboard is available to activate the TGSP-4.

Equipment List and Cost Breakdown

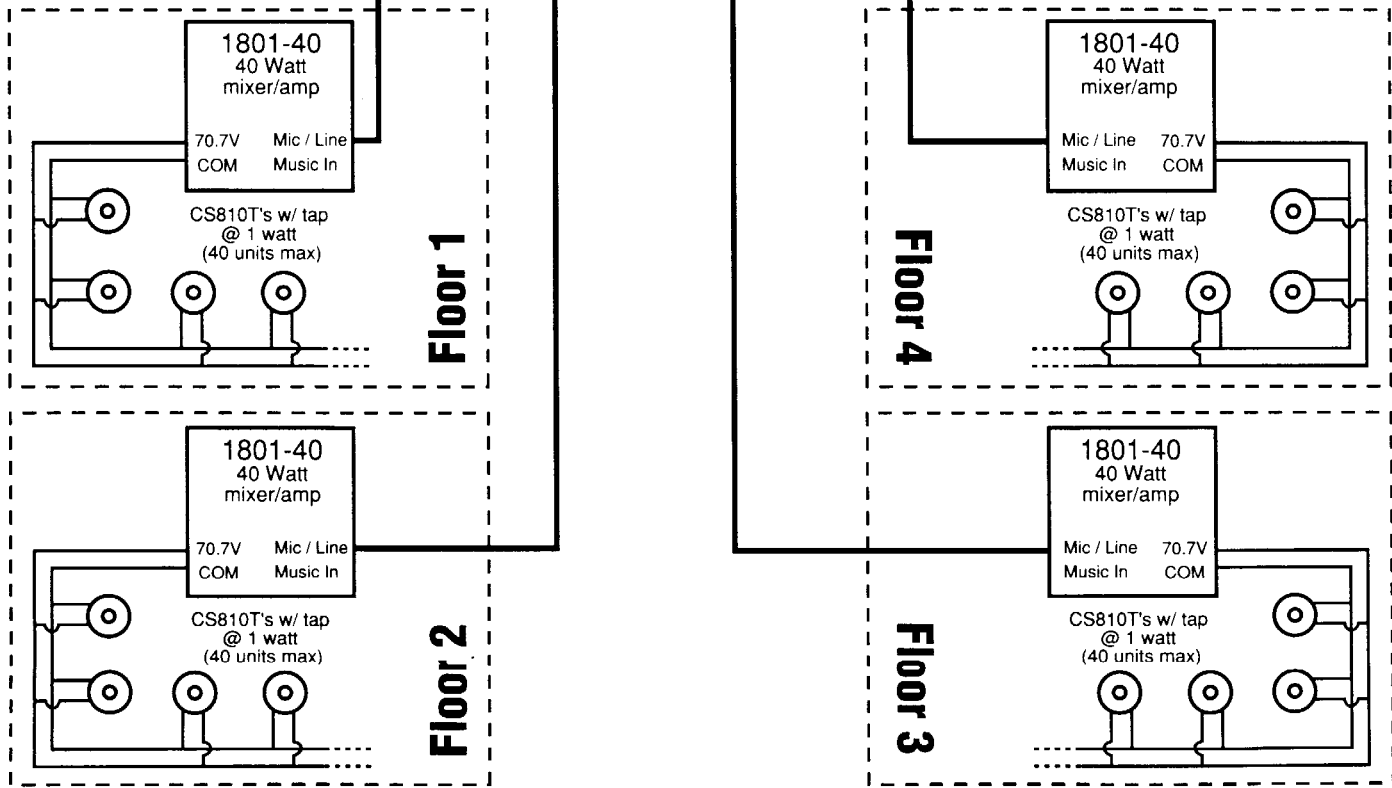
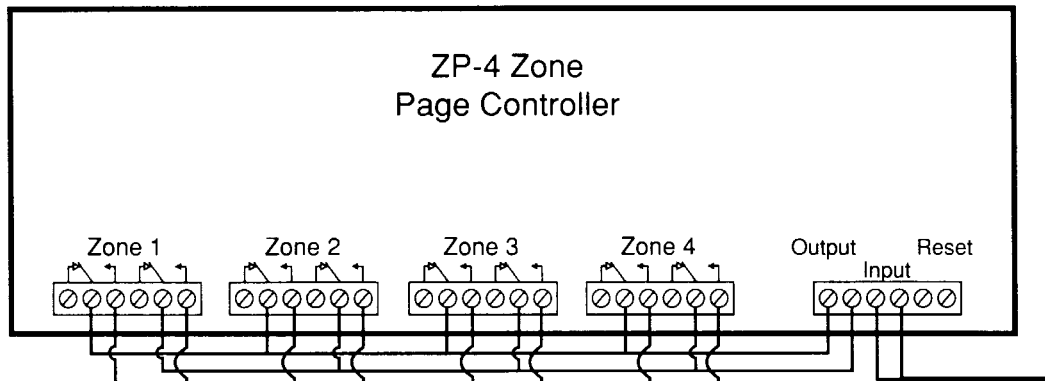
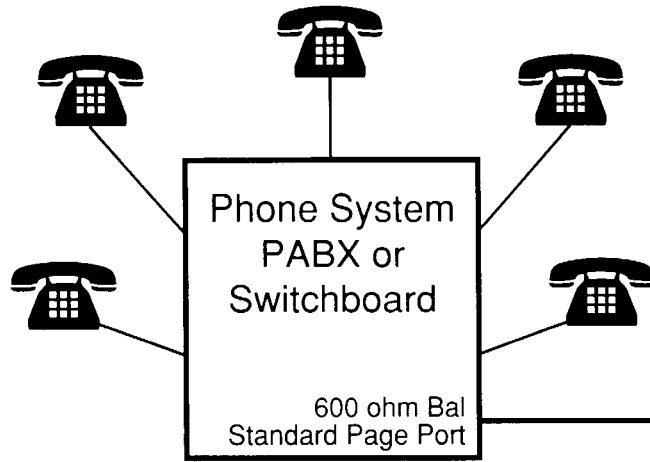
Model #	Desc.	Qty.	Price	Total
1810-100A	100 watt mixer/amp	1		
1822	AM/FM tuner	1		
1801-40	40 watt amplifier	1		
TGSP-4	Tone generator	1		
PA430T	30 watt paging horn and driver	5		
CS810T	8" 10 watt ceiling speaker w/ CV transformer	10		
Total Cost				\$ _____

(Note: Price figures to be filled in by dealer)



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System G

Zone Paging – Individual Amps

System G – Zone Paging w/ Individual Amps

System Description

In some installations, there may be separate floors or areas (collectively called "zones") that must be paged separately or as a whole. This configuration illustrates such a system. The heart of the system is the ZP-4, which uses the tones of a standard touch-tone phone to activate up to four different zones. The person paging would first gain access to the switchboard/PABX paging port, then by pressing 1,2,3,4, or 0, gain access to one or all of the zones and begin speaking. The 0 code accesses all zones simultaneously. The ZP-4 provides its own alert tone, which can be defeated if the switchboard has its own alert tone.

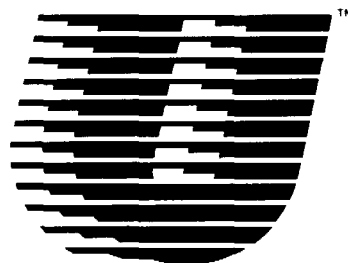
Wiring each individual relay on the ZP-4 may seem like a pain, but this open wiring scheme is what gives the ZP-4 its extreme versatility. For instance, instead of using four separate amplifiers, one can use a single amplifier to drive the outputs of the four relays. This can be accomplished by triggering the input of the ZP-4 with the pre-amp out from the amp and wiring the center poles of each relay to the power output of the amp. The only limitation on this method is that the relays should not carry more than 20 watts each.

The relays aren't limited to use with audio signals. Some contractors have used the ZP-4 to allow the paging operator to open and close security doors from the switchboard or other phone. One could also operate outdoor security lights.

Equipment List and Cost Breakdown

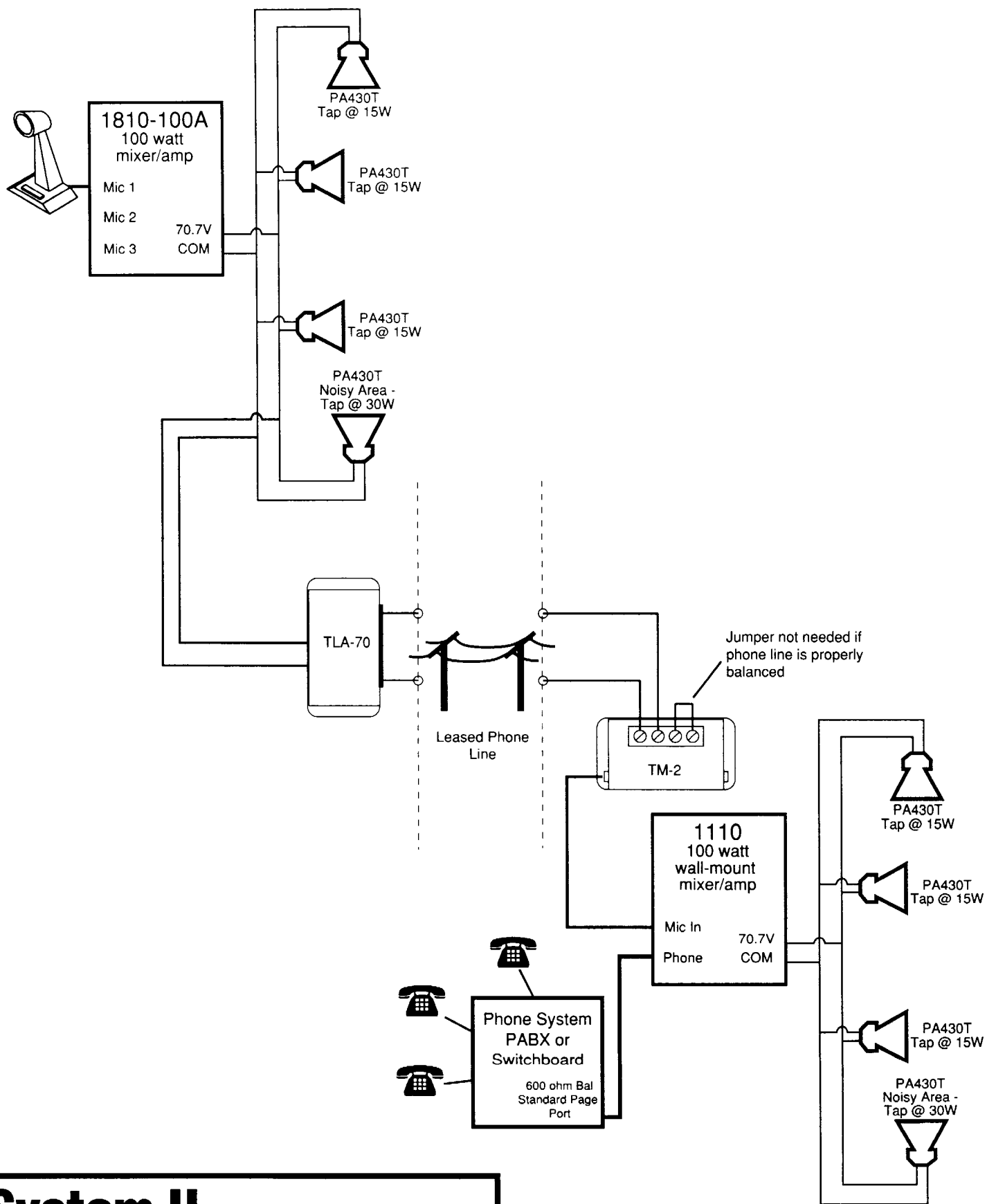
Model #	Desc.	Qty.	Price	Total
ZP-4	Zone paging controller	1		
1801-40	40 watt mixer/amp	4		
CS810T	8" 10 watt ceiling speaker w/ CV transformer	40		
Total Cost				\$ _____

(Note: Price figures to be filled in by dealer)



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System H

Long Distance Paging

System H – Long Distance Paging

System Description

This system shows an effective, low-cost way to transmit paging messages over very long distances with little loss in sound quality. Using 70.7V constant voltage lines of 10-gauge copper wire, 25 watts can be delivered a little over a mile with a 0.5 dB loss in sound pressure level. The method illustrated in System H can extend this transmission distance to over 40 miles, with negligible loss in sound pressure level.

The trick lies in converting the speaker line level to a level that can be sent over a 600 ohm phone line. Phone lines can be leased from the phone company for this purpose, and the cost is often much less than the contractor running the wire himself. On the receiving end, the 600 ohm signal is converted to an amplifier input level or fed to an amp that has a 600 ohm input. This means that the receiving end can also use the paging message in a number of different ways, choosing the input configuration and output power of the remote amp. Background music could be added at the remote location, for example, while the original signal would have only a paging message.

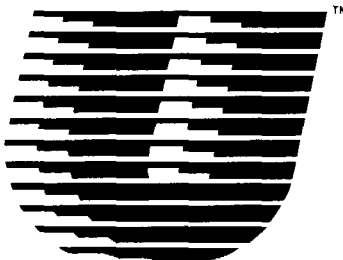
To accomplish this 600 ohm conversion, we use the TLA-70 70.7V-to-600Ω transformer on the transmitting end, and a TM-2 600Ω-to-47KΩ(hi-Z) transformer on the receiving end to feed to an amplifier input. The TM-2 transformer has both mic and aux level outputs; the mic output was used in this illustration for simplicity's sake. Inquire with your area's phone company about the availability and cost of leasing phone lines.

If your installation requires more than one long distance connection, refer to system I.

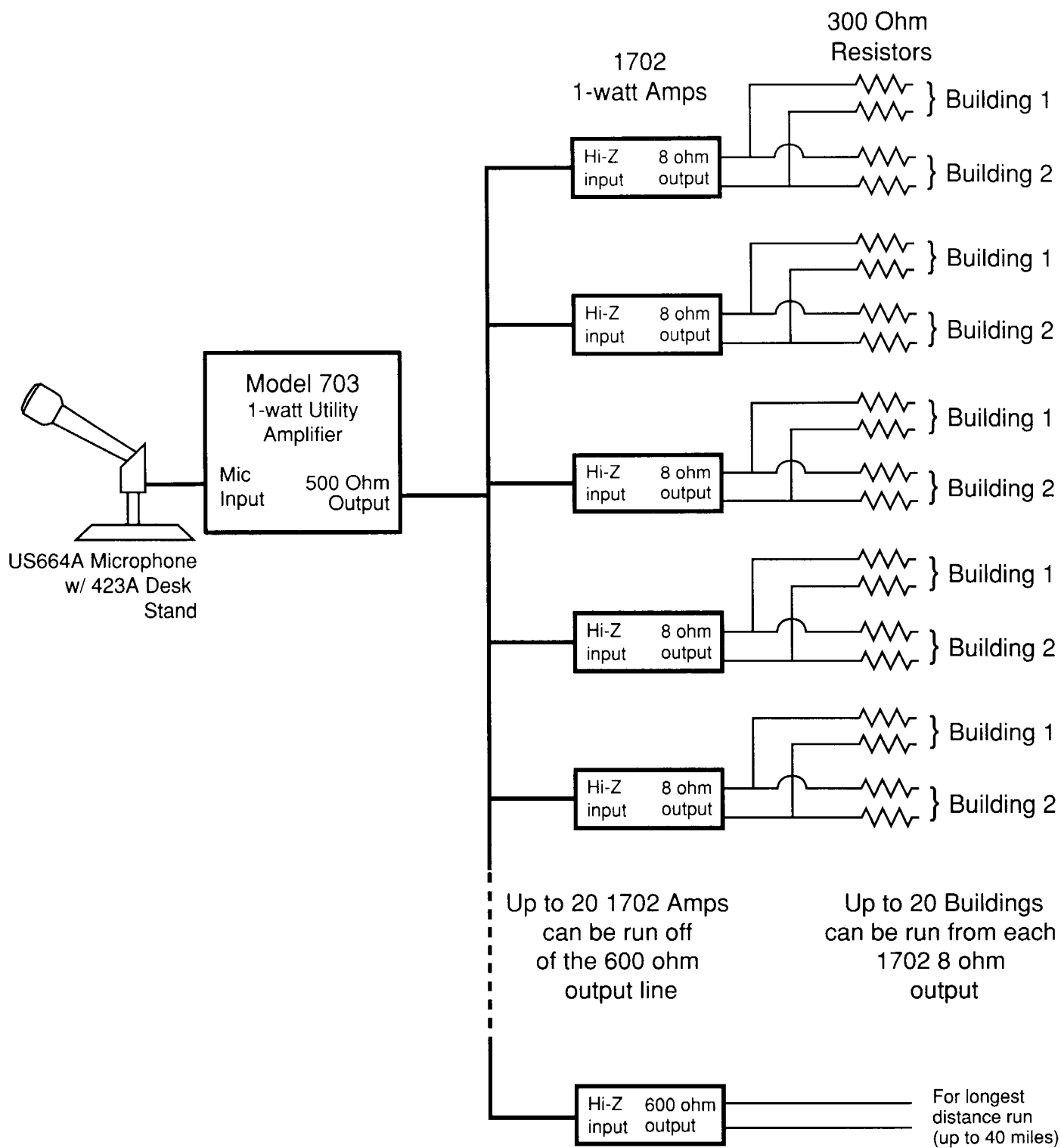
Equipment List and Cost Breakdown

Model #	Desc.	Qty.	Price	Total
US621L	Lo-Z balanced mic	1		
1810-100A	100 watt mixer/amp	1		
1110	100 watt wall-mount amplifier	1		
PA430T	30-watt paging horn and driver	8		
TLA-70	70.7V to 600Ω xfmr	1		
TM-2	600Ω to aux/mic level transformer	1		
Total Cost				\$ _____

(Note: Price figures to be filled in by dealer)



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System I

Many-Building Distribution

System I – Many Building Paging

System Description

This system is an expansion of System H, showing how to run long distance paging signals to a large number of locations at once. From the input of one microphone, up to 400 remote locations can be driven on 600 ohm lines. The receiving locations can use TM-2 transformers to convert the signal back to mic/aux levels as in System H, or can be fed directly to amps having 500/600 ohm inputs.

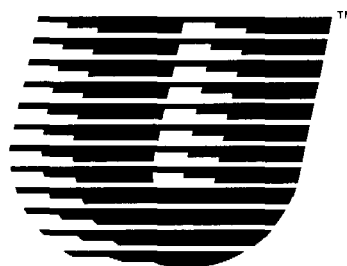
The connection between the 703 amp and the group of 1702 amps works because the input impedance of the group of 1702s is greater than the output impedance of the 703. The 1702 amps must be wired in parallel to achieve this effect, and it is advisable to use no more than twenty 1702s in this configuration. With the use of 300 ohm resistors, the same technique can be used in connecting the outputs of the 1702 amps to the inputs of the individual remote locations. Up to 20 remote locations can be driven from each 1702 output.

Equipment List and Cost Breakdown

Model #	Desc.	Qty.	Price	Total
703	1 watt 8/500Ω output utility amplifier	1		
US664A w/423A	Hi-Z/Lo-Z mic on 423A desk stand	1		
1702	1 watt 8/500Ω output utility amplifiers			

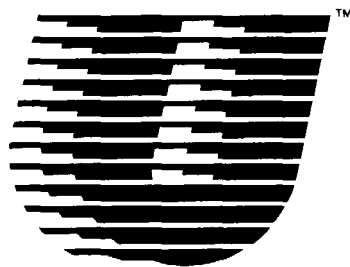
Total Cost\$ _____

(Note: Price figures to be filled in by dealer)



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