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Thank you for using our products.

**INSTALLATION INSTRUCTIONS
 SPEAKER AMPLIFIER**

Use this product according to this instruction manual. Please keep this instruction manual for future reference.

MODEL NUMBERS:

SA-70	4" SPEAKER WITH SQUARE, FLUSH GRILLE
SA-90	4" SPEAKER WITH ROUND, FLUSH GRILLE
SA-C8-A	8" SPEAKER WITH ROUND, FLUSH, PLASTIC GRILLE
SA-B4	4" SPEAKER IN A SURFACE MOUNT HOUSING

FCC REGULATIONS:


This equipment complies with Part 68 of the FCC Rules. On the back of this equipment is a label that contains, among other information, the FCC Registration Number and the Ringer Equivalence Number (REN) for this equipment. You must, upon request provide this information to your telephone company.

The REN is also useful to determine the quantity of devices that you may connect to your telephone line and still have all of those devices ring when your telephone number is called. In most, but not all areas, the sum of the REN's of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices that you may connect to your line, you may want to contact your local telephone company.

Should the equipment cause harm to the telephone network, the telephone company shall, if possible, notify the customer that temporary discontinuance of service may be required; however, where prior written notice is not possible, the telephone company may temporarily discontinue service without notice, if such action is necessary under the circumstances. The telephone company may make changes in its communication facilities, equipment and operations procedures, where such action is reasonably required in the operation of its business and is not inconsistent with the rules and regulations of the Federal Communications Commission.

Do not attempt to repair or modify this equipment. Repairs to this product will be performed by Wheelock Inc. 273 Branchport Ave, Long Branch, NJ 07740 in accordance with Wheelock Inc.'s published Terms and Conditions of Sale. This equipment should not be used on coin telephone lines. Connection to party line service is subject to state tariffs.

If trouble is experienced, disconnect this equipment from the telephone line to determine if it is causing the malfunction. If the equipment is determined to be malfunctioning, its use shall be discontinued until the problem has been corrected.

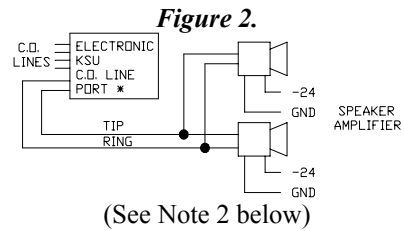
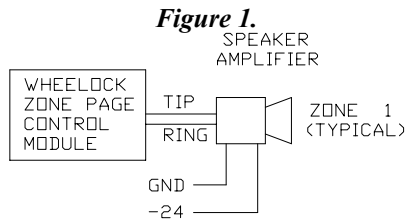
NOTE: All **CAUTIONS** and **WARNINGS** are identified by the symbol . All warnings are printed in bold capital letters.

WARNING: READ THESE INSTRUCTIONS CAREFULLY. FAILURE TO COMPLY WITH ANY OF THE FOLLOWING INSTRUCTIONS, CAUTIONS AND WARNINGS COULD RESULT IN IMPROPER APPLICATION, INSTALLATION AND/OR OPERATION OF THESE PRODUCTS IN AN EMERGENCY SITUATION, WHICH COULD RESULT IN PROPERTY DAMAGE AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.

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APPLICATION INFORMATION:

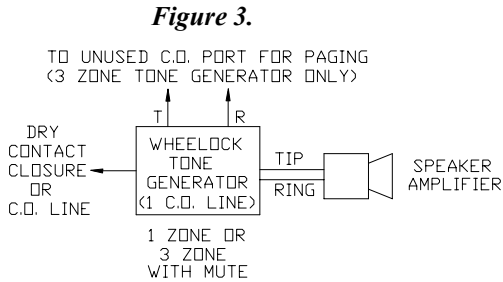
The Speaker Amplifiers are used in the following manner. Figure 1 shows a zone paging application used with Wheelock's Zone Page Control Module. The Speaker Amplifier can also be used to provide single-zone paging when connected directly to an unused C.O. line port, which can be programmed to function as a 600 OHM Audio Page Port. (i.e., does not require Talk Battery). See Figure 2.



NOTES

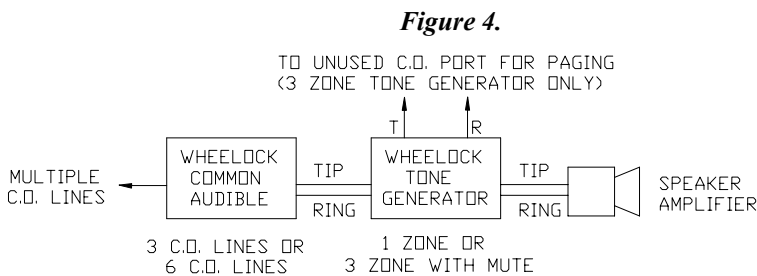
1. Some telephone systems require that the C.O. trunk port (loop start) or C.O. line port be equipped with a trunk card, page card or other equipment. Consult the telephone manufactures system manual for equipment or programming required.
2. If unused C.O. port requires talk battery to pass audio (most do), then a Wheelock Zone Control is required as an interface for Zoned Paging Systems. For Single-Zone Paging a Wheelock PRM-150 Pre-amplifier with an RPS-2406 Power Supply is required as an interface.

Figure 3 shows a speaker amplifier connected to a tone generator for telephone alerting or night ringing, with paging.



NOTE
If unused C.O. port requires talk battery, to pass audio (most do), then a Wheelock Zone Control is required as an interface.

Figure 4 shows the same tone generator and speaker amplifier activated by a common audible.



NOTE
If unused C.O. port requires talk battery, to pass audio (most do), then a Wheelock Zone Control is required as an interface.

The speaker amplifier can be used to amplify the tone of a telephone as shown in Figure 5. It can also be used to expand the capability of 25 or 70 volt paging systems. Up to 125 speaker amplifiers may be connected to each transformer using the 1/4W tap. See Figures 6 & 6A.

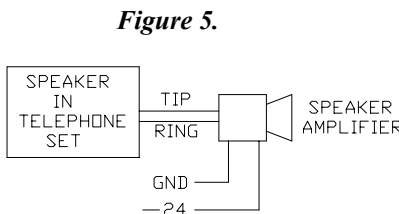


Figure 6.

CONNECTIONS FOR 25V OR 70V LINE MATCHING
TRANSFORMER HAVING A TAPPED PRIMARY WINDING

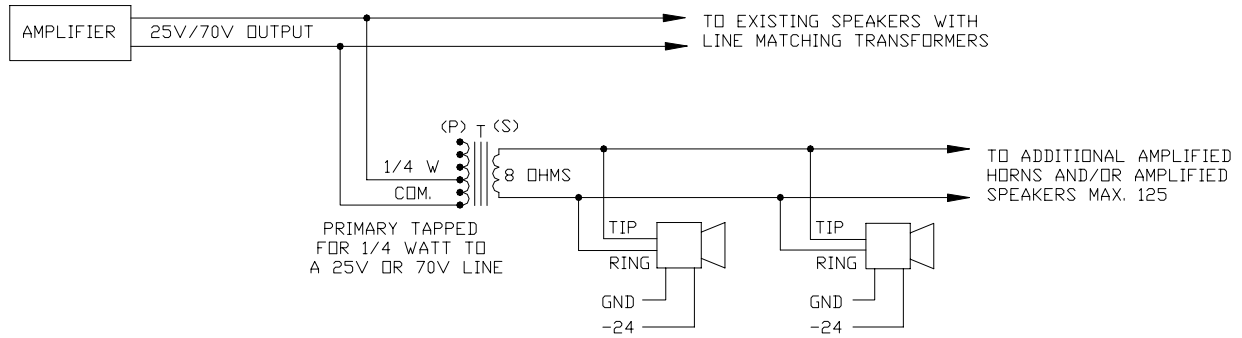


Figure 6A.

CONNECTIONS FOR 25V OR 70V LINE MATCHING
TRANSFORMER HAVING A TAPPED PRIMARY WINDING

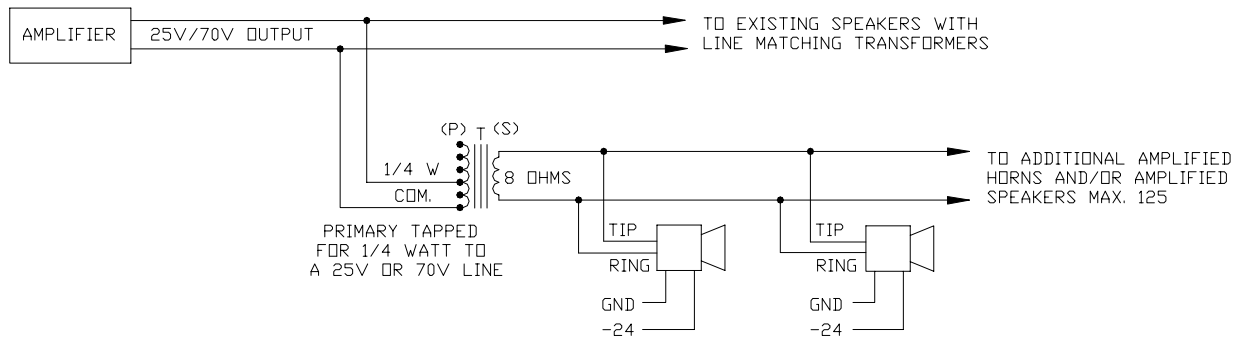
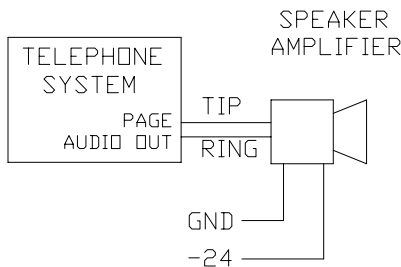


Figure 7 shows speaker amplifiers connected to a PABX or EKSU which provides one or more audio page ports.

Figure 7.



- (A) 8 OHM, Amplified (1-3 Watts) page port: Maximum capacity is 125 speaker amplifiers.
- (B) 600 OHM, low power page port: Maximum capacity is 10 speaker amplifiers (See System Capacity below). If a PRM-150 preamplifier is used, then maximum capacity is 150 speaker amplifiers.

SYSTEM CAPACITY:

In each application (except Figures 6, 6A and 7), a maximum of 10 speaker amplifiers may be used, based upon a minimum audio input signal of -15dBm (0.1VRMS) at each speaker amplifier to obtain rated power output. Depending upon the paging system's configuration, and the available audio output signal from the host telephone system, the audio input signal may be less. If additional volume is required, use the Wheelock PRM-150 Preamplifier. Applications with up to 150 speaker amplifiers also require the PRM-150 Preamplifier.

SPECIFICATIONS:

Speaker-

Cone Diameter:	4" (Models SA-70, SA-90 & SA-B4)	
	8" (Model SA-C8-A)	
Voice Coil Impedance:	45 Ohms	
Sound Pressure Level (On Axis, @ 1W, @ 1KHz):	<u>SA-70, SA-90, SA-B4</u>	<u>SA-C8-A</u>
	1M. - 95	98
	4FT. - 93	96
	10FT. - 85	88

Amplifier-

Signal Input Impedance:	600 Ohms
Signal Input Level:	-15 dBm (@ 0.1Vrms) to +10 dBm (2.4Vrms)
Nominal Power Input Voltage:	24VDC (18VDC minimum; 28VDC maximum)
Nominal Input Current:	45 mA (@ 24VDC)
Maximum Input Current:	170 mA (@24VDC)
Power Output Rating:	1.0 Watt

Terminals-

4 Screw Terminal Clamps

INSTALLATION INFORMATION:

A. SA-C8-A, SA-70, and SA-90 Ceiling Mount Speakers

Ceiling mounted speakers should be spaced at a distance equal to twice the ceiling height. Because of their cone shaped sound projection (dispersion), ceiling speakers cover more area as the ceiling height increases. These factors are illustrated in Tables 1, 2, and Figure 8.

Table 1:
Ceiling Speaker Spacing And Coverage

<u>Ceiling Height (ft.)</u>	<u>Speaker Spacing (ft.)</u>	<u>Coverage per speaker (square ft.)</u>
8	16	250
10	20	400
12	24	575

Table 2:
Speaker Coverage In Square Feet

Ceiling Height (Feet)

No. Of Speakers	8	9	10	11	12
1	250	325	400	485	575
2	500	650	800	970	1,150
3	750	975	1,200	1,450	2,300
4	1,000	1,300	1,600	1,930	2,875
5	1,250	1,625	2,000	2,410	3,450
6	1,500	1,950	2,400	2,890	4,025
7	1,750	2,275	2,800	3,370	4,600
8	2,000	2,600	3,200	3,850	5,175
9	2,250	2,925	3,600	4,330	5,750
10	2,500	3,250	4,000	4,810	6,325

***Figure 8.
Ceiling Speaker Spacing And Coverage***

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Note that increasing volume results in the speaker being louder in its covered area, but does not increase the area covered by the speaker.

The design goal of speaker placement is to allow people to hear just about the same volume from anywhere in the room. The goal is accomplished with a symmetrical layout of the ceiling speakers which achieves edge-to-edge area coverage, as shown in Figure 9.

***Figure 9.
Typical Ceiling Speaker Layout***

B. SA-B4 Surface Wall Mount Speakers:

Surface wall mounted speakers are used where it is not practical to mount ceiling speakers. Forward sound projection and spacing are important, and Table 3 provides a guide line.

Table 3:
Wall Speaker Forward Projection And Spacing

<u>Mounting Height (Ft.)</u>	<u>Forward Projection (Ft.)</u>	<u>Spacing (Ft.)</u>
8	30	20
12	35	25

Wall speakers should be mounted on the same wall, as long as they are not required to project sound more than shown in Table 3 above. Figure 10 is typical for a required 30 foot sound projection (speaker mounted 8 feet high).

Figure 10.
Wall Speaker Layout
Speakers Mounted On One Wall

Whenever possible, wall mounted speakers should be aimed in the same direction, when required to project further than 30 or 35 feet. Pillars or posts are often available to facilitate this type of installation. Although the pillar locations will vary, Figure 11 provides a useful guide. Note that a stagger pattern should be maintained.

Figure 11.
Wall Speaker Layout
Speakers Mounted On One Wall And Pillars

If pillars or posts are not available, then wall speakers can be mounted on opposing walls, and a stagger pattern must be maintained as shown in Figure 12.

Figure 12.
Wall Speaker Layout
Speakers Mounted On Opposing Walls

Insert volume control shaft and set the volume approximately mid-way. (see Figure 13 and 14). As the system is put into service readjust as necessary. If you want to prevent tampering of the control, simply pull out the volume control shaft. With the shaft removed, volume can still be adjusted using a 5/64" hex drive. Shaft can be reinstalled later if necessary.

MOUNTING INFORMATION:

The SA-B4 is designed to mount on the surface of a wall. Remove the top cover by pushing the latch at the bottom of the housing base with a small screwdriver, see Figure 14. Disconnect the speaker wires by unplugging them from the P.C. Board pins P1 (red) and P2 (black). Figure 15 is the mounting template. Simply locate the template at the desired location and mount the base to the wall with the screws provided. Connect wires as specified in "WIRING INFORMATION" on page 9, and then snap cover back onto base. Be sure that the base sides line up between the cover sides and the 4 fingers on the cover sides, see Figure 16.

Figure 13.
SA-C8-A, SA-70, SA-90

Figure 14: SA-B4

Figure 15.

Figure 16.

The SA-70 and SA-90 are designed to mount flush in a wall or in the ceiling. For ceiling mounting, a speaker support bracket is available (Wheelock's Model Number SSB-4), see Figure 17. For wall or ceiling mounting, use a 4" square by 1-1/2" deep backbox with a 4" square 1-1/2" deep extension ring, see Figure 19.

The SA-C8-A is designed to mount flush in the ceiling. A speaker support bracket, (Wheelock's Model Number SSB-8) and a backbox (Wheelock's model number CBB-8) are available. See Figure 18.

Figure 17.

Figure 18.

Figure 19.

WIRING INFORMATION:

Use "D" type station wire (24 AWG) or other suitable wire. Table 4 is a guide for the number of speaker amplifiers per audio pair run, and Table 5 is a guide for the number of speaker amplifiers per power pair run.

Table 4:
Number of Speaker Amplifiers per Audio Pair*

Wire Run (Ft.)	Number of Speaker Amplifiers	
	22 AWG	24 AWG
100	150	120
200	150	120
400	100	60
800	50	30
1600	25	15
* Based upon using Wheelock's PRM-150 Pre-amplifier		

Table 5:
Number of Speaker Amplifiers per Power Pair

Wire Run (Ft.)	Number of Speaker Amplifiers	
	22 AWG	24 AWG
100	*33	*20
200	*20	*13
400	10	6
800	5	3
1600	2	1
* Maximum of 12 Speaker Amplifiers when using Wheelock RPS-2406 600 mA Power Supply.		

Although speaker amplifiers may be powered from a 24VDC unfiltered "B" battery, Wheelock's RPS-2406 Power Supply ("A" battery) is recommended.

Connect the audio lines to the terminals designated as T and R. Connect the 24VDC power lines to the terminals designated as GND and -24VDC.

TROUBLESHOOTING CHART:

Problem	Possible Cause and Correction
No sound	1) Is the volume control turned up (clockwise). 2) Check presence and polarity of -24VDC and GND at the speaker. 3) Check audio level on T and R at speaker, and if necessary also at the audio source.
Low volume	1) Check that volume control is turned up. 2) Check for the sufficient audio level on T & R at the speaker. 3) Be sure at least -18VDC is present at the speaker during operation.
Loud squeal (Feed back)	1) Lower volume setting of speaker. 2) Move the phone farther from the speaker. 3) Install confidencer in phone if necessary.

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CAUTION: These devices are not intended for use in hazardous locations as defined by the National Electrical Code (NEC) and by the National Fire Protection Association (NFPA).

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