

## LOUDSPEAKER PAGING SYSTEMS

### DESCRIPTION

Contents	Page
1. GENERAL .....	1
Definition .....	1
Types of Systems .....	1
2. SURVEYS.....	2
3. DESCRIPTION AND APPARATUS..	5
Fundamental Components .....	5
Announcing Stations .....	5
Music or Tones.....	5
Amplifiers.....	5
Area Selection Circuits.....	5
Loudspeakers .....	5
4. OTHER COMPONENTS .....	30

#### 1. GENERAL

##### Definition

1.01 This section covers the description and use of loudspeaker paging systems. The installation, maintenance, and connections for this system are given in detail in the following sections:

Installation C70.900.01  
Maintenance C70.900.02  
Connections C70.900.03

1.02 Paging systems are facilities designed to permit the transmission of speech from announcing stations to other areas by means of loudspeakers and their associated apparatus and wiring.

1.03 The following are four kinds of building blocks required to make a paging system:

(a) Input Circuits - Involve a transmitter or microphone and the associated apparatus and wiring. It may also involve a source of music or tone signal.

(b) Amplifiers - Strengthen the alternating current received from the input circuit sufficiently to drive the speaker.

(c) Output Circuits - Distribute the output from the amplifier to the loudspeakers.

(d) Loudspeakers - Transmit the sound in the desired area at the proper volume.

##### Types of Systems

1.04 Paging - Paging systems are designed primarily to amplify sound to such a point as to be suitable for reproduction by loudspeakers. Circuits have been developed to use a separate microphone, any type of telephone instrument, key telephone system, or switchboard as an announcing station. More than one announcing station may be used with any system, and circuits have been developed which will provide busy lamp, priority and exclusion functions when multiple inputs are used. In addition, the announcing station may page on premise or off premise, through the use of area selection keys, or by dialing a number associated with the desired area.

1.05 Paging and Music - The input circuits for paging systems have been designed so that the amplifiers and loudspeakers can be used to provide music coverage when not being used for paging. In all cases the paging announcement has priority over the music and automatically removes the music from the input of the amplifier during the period of announcement. The music source may be a wired music telephone line, a customer-owned record player, or tape recorder. The input of the amplifier may also be connected to a tone generator which can be used to provide start and stop work signals or warning signals. This tone generator may be manually operated, or automatically operated through the use of a customer-owned time clock.

## 2. SURVEYS

2.01 When the commercial department receives an inquiry for a loudspeaker paging system, a survey will usually be made by a commercial department representative and local district plant representative. If assistance is required, the plant representative will contact the Plant Exchange Transmission Staff group, or the Customer Equipment Engineering group. This is to determine the service requirements peculiar to the proposed installation, and to make a noise survey if necessary.

2.02 The Plant Representative should be guided by these practices in making the survey and in providing needed information to the commercial representative and the installation forces.

2.03 When in the judgment of the plant representative, the desired service requires the use of special equipment or circuit arrangements, this should be discussed with the salesman. If there is any question in the mind of the plant representative as to whether provision of the service as requested by the customer is permissible, including any special operating features, he should review the details with the salesman and request that such special features be adequately described in the service order. It is the responsibility of the commercial department to determine that all features of the service can be furnished under the tariff before accepting the order, and that features not included in standard practices are covered by the proper form for referral to the engineering department. If acceptable, such features will be covered by an engineering sketch.

2.04 At the time of his visit to the premises the plant representative should obtain the following information:

- (a) Location of announcing station or stations.
- (b) Type of announcing station or stations.
- (c) Special features, such as, exclusion or priority when two or more announcing stations are needed.
- (d) Busy lamps.
- (e) Areas to be covered by loudspeaker signals.

- (f) Prevailing noise levels at such locations.
- (g) Splitting of speakers into groups where desired.
- (h) Tone signals for time or alarm (key controlled).
- (i) Connection to customer-owned time clock.
- (j) Music connection (customer-owned music source).
- (k) Any other customer requirements.

2.05 The provision by the subscriber of, power outlets and conduit (when needed), problems concerning wiring runs, location or mounting of amplifiers, loudspeakers or other equipment should be discussed with the installation foreman and subscriber.

Note: We have no standard provision for emergency power supply.

2.06 For small or medium size paging systems, where the incidental noise is low and it is obvious to the plant representative that one amplifier will be adequate, room noise measurements need not be made.

2.07 When it is apparent, from the size and nature of the customer's premises, that more than one amplifier will be required, it is desirable to make a survey in which the noise level is measured in all areas to be covered by announcements. The average of noise peaks occurring at various locations should be noted on a plan drawing of the premises, usually obtainable by the salesman from the customer in advance. Any standard sound level meter may be used for these measurements. Other information should be consulted regarding their use.

2.08 When necessary it should be explained to the customer by the salesman that extremely high noise levels (of the order of 100 db or more) are difficult to override with ordinary loudspeaker equipment. If such speech levels are provided it may be altogether objectionable during any quiet intervals unless specially equipped with volume controls either key operated or automatic. It is also necessary, particularly if high noise levels are intermittent, for the customer to understand that announcements will only be intelligible when they do not coincide with extremely high noise peaks.

2.09 With this information and that given in Exhibit 1 the Plant Representative should determine the approximate number and location of loudspeakers and the approximate electrical power required to operate each at a power level which will cover the desired areas with an announcement volume approximately 5 db above average noise peaks.

2.10 Paging announcements can often be reasonably intelligible in the presence of noise of nearly equal level. In fact, if the noise is of a continuous and uniform nature, such as fans or blowers, speech

which is even slightly lower in volume than the noise, can be understood. For these reasons, when the character of noise may have a bearing on the required speech level, notations should accompany the measurements explaining the peculiarities, namely "fan-steady," or "drop-hammer - occasional peaks to 105 db."

2.11 Tentative speaker locations should be spotted and numbered on the plan drawing mentioned in Paragraph 2.07, together with notations of the speaker type and the power requirements of each. It is suggested that, for this purpose, the following symbols be used for loudspeakers:

EXHIBIT 1



KS-14704  
With KS-14705



IB8



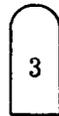
KS-12046



S-1



S-2  
or  
KS-14792-L1



S-3



S-4



S-5



RPH  
With SA-30



5A105  
With 710-3060



5A90  
With 710-3050



### 3. DESCRIPTION AND APPARATUS

#### Fundamental Components

3.01 Announcing Stations - The following are five different types of announcing stations that can be used in paging systems. The first type listed is the only one that is high quality. The others are of telephone quality. They are satisfactory, but are recommended only where the customer specifically requests them.

- (a) Separate microphones.
- (b) Telephone sets.
- (c) Key telephone systems.
- (d) PBX switchboards.
- (e) Dial PBX.

3.02 Each type of announcing station requires slightly different circuitry to be connected to the input of the amplifier. The particular type used will depend on the customer's existing equipment and requirements. Whenever more than one announcing station is connected to the system, busy lamps or other special circuit features may be required.

3.03 Music or Tones - Three different types of equipment which may be used as music sources are as follows:

- (a) "Wired Music" telephone line.
- (b) Record player.
- (c) Tape or wire recorder.

Note: FCC regulations do not permit off-the-air pickup for use in our paging systems.

3.04 Paging system input circuits shall be arranged to automatically remove the music source during the period of announcement. The wired music program material is usually leased by the customer from an outside firm. If the customer desires to provide his own program material, he may use a record player, tape or wire recorder. In addition to using the tape or wire recorder as a music source, the customer may use it as a source of prerecorded announcements. Tone signals are usually used as "start" and "stop" work signals or as warning signals for fire or for civil defense purposes.

3.05 Amplifiers - The amplifiers have been divided into three groups depending upon the power they are required to deliver:

- (a) Up to 10 watts.
- (b) 10 to 50 watts.
- (c) Over 50 watts.

3.06 Area Selection Circuits - Area selection circuits allow the person using the paging system to select a particular loudspeaker, or group of loudspeakers, covering a specific area. Selection of the area to be paged is usually accomplished by depressing a key. In dial PBX installations, the desired area may be selected by dialing a predetermined local number.

3.07 Loudspeakers - Two different types of loudspeakers are used in loudspeaker paging systems. These are cone-type and horn-type loudspeakers. Cone-type loudspeakers are of the type used in commercial radio and television receivers. A typical cone-type loudspeaker is shown in Figure 1. Horn-type speakers will deliver greater audio output for a given electrical input than a cone-type speaker, and are usually used whenever the area to be covered is noisy or where a large area is to be covered with a single speaker.

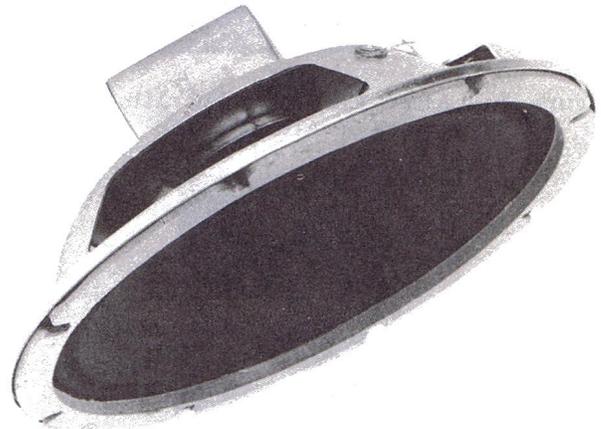


Figure 1 - Typical Cone-Type Loudspeaker

Announcing Stations

3.08 Separate Microphone - There are many different types of separate microphones suitable for use with loud-speaker paging systems. A few of the types which may be used are listed below:

- (a) Dynamic.
- (b) Crystal.
- (c) Controlled Reluctance.

3.09 The particular type of microphone used will usually depend upon the customer's requirements. That is, sometimes a single property such as appearance, portability or ruggedness may be the controlling factor from the customer's viewpoint. One type of microphone which may be used in these installations is the Altec-Lansing Model 632C shown in Figure 2. This is a rugged close talking, dynamic microphone with a frequency response from 100 to 10,000 cycles per second.

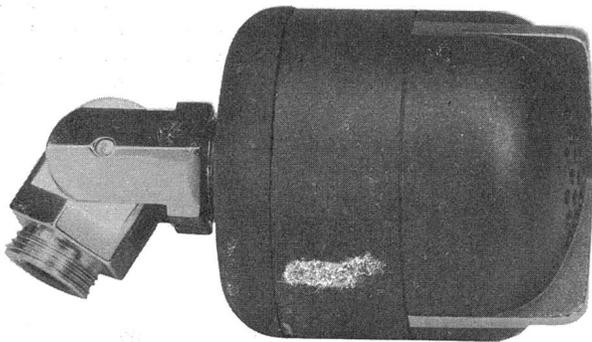


Figure 2 - Altec-Lansing 632C Microphone with 9-A Attachment



Figure 3 - Turner Model 58-A Dynamic Microphone

The Turner Model 58-A dynamic microphone is shown in Figure 3. This is a lavalier-type microphone and it comes with a support clip and neck cord. Frequency response is 60 to 13,000 cycles per second.

The Altec-Lansing D173437 transmitter consists of a L1 pressure unit mounted in a cap that screws on in place of the carbon transmitter in the F-type handset. It has a frequency response of about 100 to 10,000 cycles per second.

3.10 The separate microphone may be mounted in several different ways. These mountings are shown in Figures 4, 5, 6, and 7.

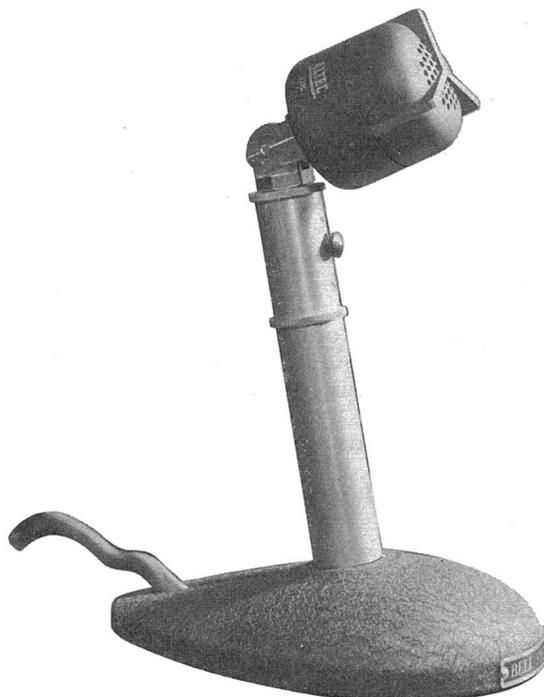


Figure 4 - Separate Pedestal or Desk Stand Mounting GB-1060A

The GB1060A microphone assembly is made up of the Altec 632C microphone, the 9-A swivel attachment, the GB-1014 microphone adapter kit, a 3-1/2 inch anodized aluminum adapter coded GB-947, the Altec 24C desk stand, and the GB-1204 cordage ten feet long.

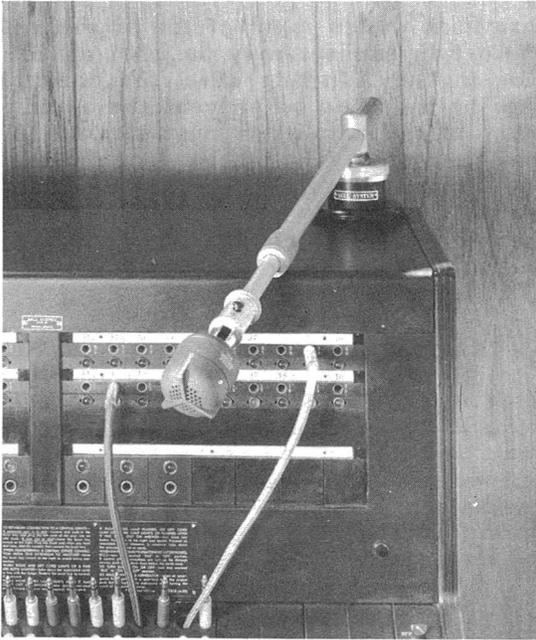


Figure 5A - The Graybar Telescoping Microphone Arm, GB-1065



Figure 6 - MP111 Dazor Arm



Figure 5B - The Graybar Telescoping Microphone Arm, GB-1064



Figure 7 - Altec-Lansing 632C Microphone Attached to a 22C Floor Stand with the 9A Swivel Attachment

Figure 5A - The GB-1065 telescoping microphone arm consists of the Altec 632C microphone, the 9A swivel attachment, the GB-1014 microphone adapter kit, two tubes, one which slides within the other, a ball-joint swivel in a special flared base, and the GB-1204 cordage ten feet long.

Figure 5B - The GB-1064 telescoping microphone arm is the same as the GB-1065 except it is arranged for vertical mounting.

Figures 6 and 7 - The Altec 632C microphone and 9A swivel attachment are shown on the MP111 Dazor arm or on the Altec 22C floor stand.

3.11 Telephone Set - Where the customer specifically requests a separate telephone (carbon) transmitter, the hanging type or the desk type may be used. The 500-series set is the only one recommended for use as an announcing station. This is due, primarily, to the extended frequency response of the T1 Transmitter. Where the F1 transmitter of the 300- and 400-series sets is used, annoying peaks exist in the frequency spectrum. It should be noted also, that the transmitters presently available for use in operator's headsets will not provide the transmission quality available from an announcing station equipped with a G-type handset.

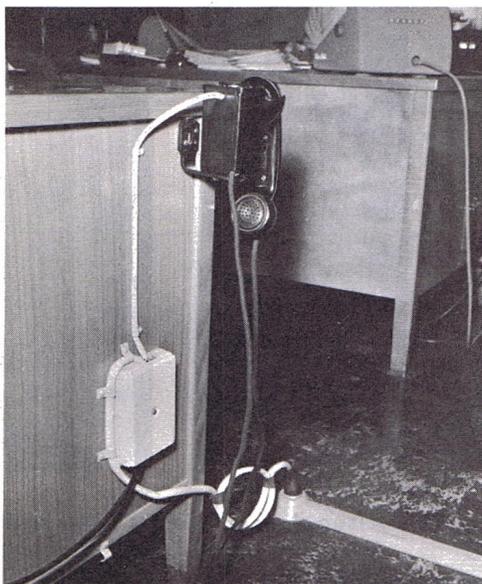


Figure 8 - G2B-3 Handset Microphone Input

3.12 Station systems - A paging system may be terminated on any type of key telephone system. The battery supply circuit to the telephone set is terminated on a pickup key, and a separate nonlocking key is used to actually close the telephone

transmitter to the input of the amplifier. A push-to-talk handset may be used as the nonlocking key. In this case, the pickup key has to be modified to prevent the accidental closure of the amplifier input circuit. A signaling-type key in the base of the telephone set may also be used as the nonlocking key. If space is not available in the telephone set key strip for the signaling-type key, a separately mounted 551A or 6017M key may be used.

3.13 PBX Switchboards - Single or multiple position switchboards of either dial or manual PBX's may be connected to a loudspeaker paging system. In some cases, it may be desirable to connect the operator's telephone set to the amplifier input through a separate nonlocking key. This allows the operator or any station on a manual system to be connected to the paging system.

3.14 Dial Selection - Any station of a dial PBX system may be connected to the input of the paging system through the use of a dial selection applique unit. In this system, a station may dial a predetermined local number for access to the paging system. If the paging system is being used by another station, the dialing party hears the busy tone. If the system is not in use, the announcement may be made as soon as the ringing tone has stopped.

3.15 In some installations it may be desirable to limit the use of the paging system to only a few stations. When this is the case, a separately mounted control key is used at each station having access to the system. Restricted use of the system may also be desirable in some installations where it is necessary to locate the loudspeakers in the same room with the stations. Whenever the loudspeaker is located too close to the transmitter, some of the sound from the speaker may be fed back into the transmitter. This sound is then amplified by the amplifier and sent out through the speaker at a higher volume. The sound enters the transmitter again at a higher level, and the entire process is repeated until a loud, shrill howl is all that can be heard. This phenomenon is known as acoustical feedback, and may place an operating restriction on some of the stations in a dial input system. The problem of acoustical feedback can be eliminated by installing a relay to cutoff the adjacent loudspeaker when that telephone is used. A volume limiting amplifier is recommended to compensate for

the normal differences in input levels caused by the use of different types of telephone sets or the differences in the voice levels of the people using the system. A dial applique unit installation is shown in Figure 9.

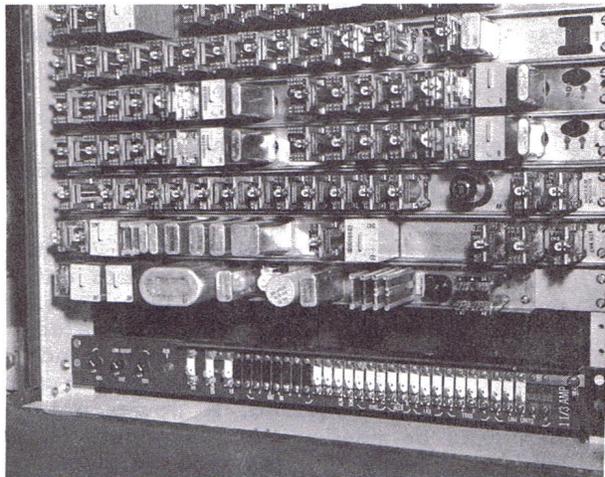


Figure 9 - Installation of a Dial Applique Unit in a 755 PBX

3.16 Multiple Inputs - When more than one station, switchboard, or microphone is connected to the input of the paging system, the following circuit adaptations may be required:

- (a) Busy Lamps - A lamp at each announcing station that is illuminated whenever any other microphone or station is using the system.
- (b) Exclusion or Lock-Out Circuits - A circuit arrangement which excludes or locks out any other microphone or station from the paging system whenever the system is in use.
- (c) Priority Equipment - This is a circuit arrangement that gives one microphone or station priority over all others connected to the system. Whenever this microphone or station seizes the system, it automatically cuts off all other announcing stations. Varying degrees of priority between announcing stations can also be provided.

## Music or Tones

3.17 Wired Music - Wired music lines may be equalized or nonequalized depending upon the length of line and the quality of the music provided to the customer. An equalized line is usually terminated in a 23A equalizer or a 111C repeating coil or both. These terminations "equalize" the cable losses so that the frequency-response curve of the music at the amplifier input is essentially flat.

3.18 Tone Signal Equipment - The 102A frequency generator consists of capacitors, a resistance and transformer assembled in a metal case. The case measures 5-1/2" long, 4-5/16" wide, and 4-5/16" deep. This generator operates on 105-125 volts, 60 cycles. It has an output rating of 60 milliwatts and a frequency output of approximately 540 cycles. At a nominal input of 115 volts, the normal output voltage at no load is as follows:

Volts	Between Terminals
.7 (Approx. zero level)	2-3
1.6	3-4
2.2	1-2
2.9	1-3
4.5	1-4

3.19 The GB-3614 mounting bracket is an L-shaped bracket for mounting the 102A frequency generator on a backboard. It is 14-gauge metal and measures 5-1/2" in width. The back plate is 4-1/2" long and has four 3/16" holes for mounting on a backboard. The bottom plate protrudes 4-1/2", and is drilled for mounting holes, cord, and terminal clearance. It comes with 4 bolts, 4 nuts, and 4 lockwashers.

3.20 The DuKane 15U20 signal generator supplies a steady 700-cycle tone or a varying warble tone between 500 and 700 cps. The warble tone varies at such a rate that it sounds similar to a siren. The 700-cycle tone is usually used for time signals and the warble tone for emergency, fire, or civil defense warnings. Local modification can be made to shift the 700-cycle frequency upward or downward to provide differing tones. A maximum of two volts across a 56,000-ohm load may be obtained from the generator and can be controlled by a built-in volume control. The unit measures 8" long, 2-7/16" wide, and 3-3/4" high.

3.21 Figure 10 shows a typical installation. The DuKane power supply model 17U20 is usually used with this unit. It is rack-mounted and measures 19" wide, 4-3/8" high, and 7-3/4" deep. It operates from 110-125 volts, 60 cycles and consumes 50 watts. It supplies 235 volts dc at 30 ma and 6.3 volts at 5 amperes.

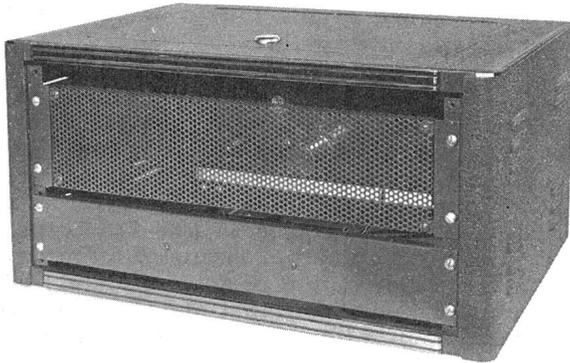


Figure 10 (Front) - DuKane 15U20 Signal Generator and 17U20 Power Supply Mounted in a Premier DRK 80 Cabinet.

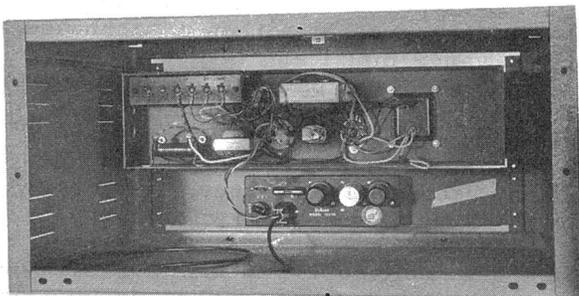


Figure 10 (Rear)

In Figure 10 the power supply (top) and tone generator are mounted in a Premier DRK 80 Rack cabinet. The time or warning signals may be turned on manually through the use of a separately mounted key or automatically through the use of a customer-owned time clock.

3.22 Time Clocks - Time clocks are not provided by the company, but inter-connection between the customer's clock and the paging system is permissible where

control functions must be performed automatically. Special circuits for these applications will be designed for the specific job by the chief engineer's department.

### Amplifiers

3.23 Amplifiers fall into two categories:

- (a) Preamplifiers with approximately 50 to 100 db gain to raise the low level of high-quality microphone outputs up to "line" level (zero VU), and not intended for driving loudspeakers.
- (b) Power amplifiers with 60 to 70 db gain and from 10 to 165 watts output capacity for driving loudspeakers. Power amplifiers are often integrated or assembled with preamplifiers, and this combined "high gain" amplifier may be all that is required. A power amplifier may be used without a preamplifier when a telephone transmitter serves as the announcing station. It may also be located at a remote point and driven by a signal at "line" level from a preamplifier or other source.

3.24 Preamplifiers - Preamplifiers are installed between the sound source and the power amplifier whenever the output from the sound source is too weak to drive the amplifier to full rated output. The dynamic microphone, record players, and tape recorders are all items which might require the use of a preamplifier. Individual manufacturer's types of preamplifiers are discussed in the following paragraphs.

3.25 The DuKane P2A40 preamplifier is shown in Figure 11. This preamplifier provides 96 db gain and has input terminations for three microphones and one phonograph. The output impedance is 600 ohms. The input circuits are normally high impedance, and if a low impedance source is used, matching transformers must be used. The DuKane input transformers listed below are terminated in an octal pronged base, and may be plugged into an existing socket on the pre-amplifier chassis.

Type of Input	Changes Preamplifier Input Impedance To	DuKane Number
Microphone	50 ohms	3A25
Line	600 ohms	3A65

Power consumption is 40 watts, 117 volts, 50-60 cycles ac. It measures 16-3/8" wide, 10-1/2" deep, and 8-3/4" high. Approximate weight is 25 pounds.



Figure 11 (Front View) - DuKane P2A40 Preamplifier



Figure 11 (Rear View) - Shown with 99A122 Modification Kit

3.26 The Bogen RP-2 preamplifier is shown in Figure 12. The RP-2 has two high impedance inputs, one for a microphone and one for a phonograph. Separate volume controls are provided for each input. The gain of this preamplifier is 76 db on the microphone input and 35 db on the phonograph input. Two output terminations are

also provided. One low impedance 600-ohm output is provided for telephone line termination, and one high impedance output so the unit can be used as a driver for power amplifiers. A cover for the preamplifier must be ordered separately for each installation. The cover shown with the VU meter is called a CAGVU-2 cage. The power consumption is 20 watts, 117 volts, 50-60 cycles ac. It measures 11" wide, 5-1/4" high, and 7-3/8" deep (excluding knobs); with cage, height is 6-1/2", weight is 7 pounds.

Type of Input	Changes Preamplifier Input Impedance to	Bogen Number
Microphone	50 ohms	T157
Microphone	200 ohms	T155
Microphone	500 ohms	T156



Figure 12 - Bogen RP-2 Preamplifier

3.27 The Western Electric Company 141A amplifier is shown in Figure 13. This preamplifier is designed for use with the 142- and 143-type amplifiers described in 3.34 and 3.38 of this section. The maximum gain of this preamplifier is 70 db when terminated in a 600-ohm load. Three input impedances of 30, 250 or 600 ohms are available. It requires 6.3 volts ac or dc, 0.9 amperes filament and 275 volts, 15 ma dc plate power. It measures 5-3/16" long, 4-7/16" wide, 4-1/2" high, and weighs 3 pounds.

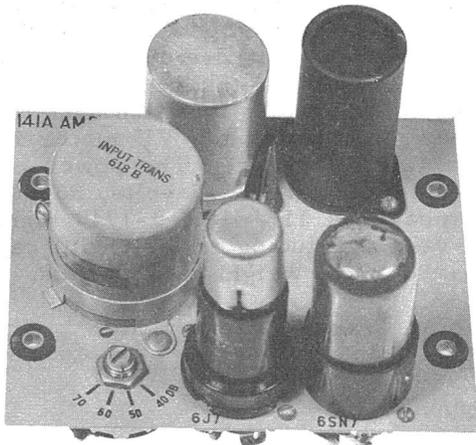


Figure 13 - Western Electric 141A Preamplifier

3.28 The Altec-Lansing 1510A amplifier is shown in Figure 14. This preamplifier is designed for use with the 1530A Altec amplifier. The maximum gain of this preamplifier is 47 db when terminated in a 100,000-ohm load. Source impedances of 30/50, 125/150, 250/300, and 500/600 ohms are available. It requires 6.3 volts ac at 0.45 amperes and 300 volts dc at 5 ma. It measures 5-3/16" high, 4-7/16" wide, 5" deep, and weighs 2-3/4 pounds.

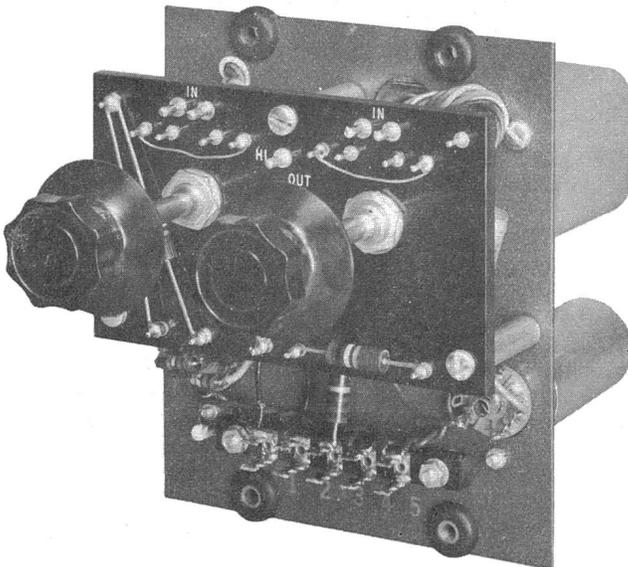


Figure 14 - Altec-Lansing 1510A Preamplifier

3.29 A specialized type of preamplifier is the Altec 438-A which is described under Paragraph 3.44, Compressor Amplifier.

3.30 Power Amplifiers - Power amplifiers are rated in watts of audio power that they are capable of delivering to the loudspeakers. These amplifiers are subdivided into three separate groups of 10 watts, 10 to 50 watts, and over 50 watts. DuKane, Altec-Lansing, and Western Electric Amplifiers are typical of the amplifiers suitable for paging system installations. These amplifiers are discussed below.

3.31 Ten Watt Amplifiers - The DuKane PlA385 amplifier is shown in Figure 15. Three input terminations provided on these amplifiers are as follows:

- (a) High impedance, high gain microphone.
- (b) Plug-in transformer, low impedance microphone, high gain input.
- (c) Plug-in transformer, low gain auxiliary.

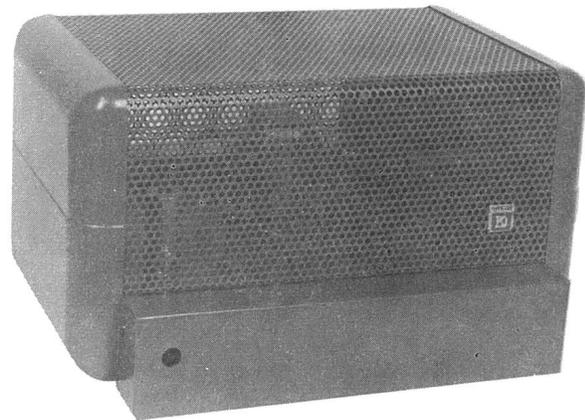


Figure 15 (Front View) - DuKane PlA385 Amplifier



Figure 15 (Rear View) - Shown With  
99A120 Modification Kit

The plug-in transformer inputs come equipped with shorting plugs which connect them as high impedance. Lower impedance inputs may be provided by ordering separately one of the following transformers:

DuKane Transformer Number	Input Impedance In Ohms
3A25	50
3A55	150-200
3A65	600

All inputs have separate volume controls. Additional information on these amplifiers is shown below:

Power Output: 10 Watts

Frequency Response:  $\pm 1$  db, 30 to 30,000 cps

Gain: Mic. 112.5 db  
Aux. 72.5 db

Input Impedance: Mic. High Impedance or Transformer: 50, 150-200, 600 Ohms

Aux. High Impedance or Transformer: 50, 150-200, 600 Ohms

Output Impedance: 4, 8, 500 Ohms, 70 Volts

Power Consumption: 90 Watts, 105-127 Volts, 50-60 Cycles ac

Dimensions: 14-3/4" Long, 8-1/2" High, 11-1/2" Deep

Weight: 15 Pounds

3.32 The Western Electric 1140A amplifier, shown in Figure 16 consists of a 140A amplifier mounted in a KS-13678 cabinet. This is a single input amplifier designed for use as a telephone line or bridging amplifier. Additional details are shown below:

Note: This information is for maintenance use only.

Power Output: 10 Watts

Frequency Response:  $\pm 1$  db 50 to 10,000 cps

Gain: 60 db For Line Input  
40 db For Bridging Input

Input Impedance: 1200 Ohms Line  
7200 Ohms Bridging

Output Impedance: 4, 8, 250, 1000 Ohms and 70 Volts

Power Consumption: 140 Watts, 105-125 Volts ac or dc

Dimensions: 12-3/4" Long, 8-1/2" Deep, 9" High



Figure 16 - Western Electric 1140A Amplifier

3.33 Ten to Fifty Watt Amplifiers - The DuKane P1A460 amplifier is shown in Figure 17. The P1A460 is designed for shelf mounting. This amplifier comes equipped with three high impedance microphone inputs and one high impedance auxiliary input for phonographs. Any of these inputs can be converted to low impedance by the use of the following plug-in transformers:

DuKane Transformer Number	Input Impedance In Ohms
3A25 (Mic.)	50
3A65 (Line)	600

Input Impedance: See Above

Output Impedance: 4 and 8 Ohms, 25 Volt and 70 Volt

Power Consumption: 150 Watts, 105-127 Volts, ac

Dimensions: 19-1/4" Long, 8-1/2" High, 10" Deep

Weight: 25 Pounds

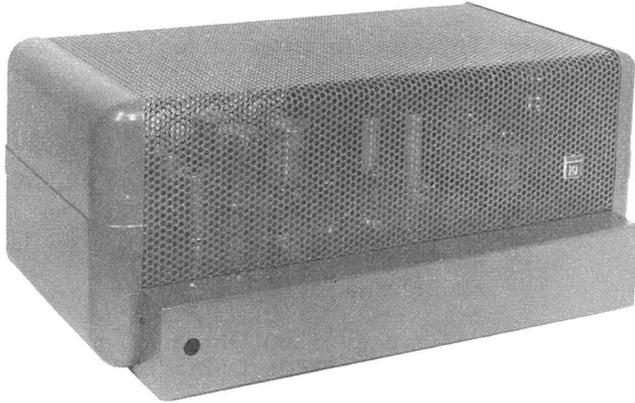


Figure 17 (Front View) - DuKane P1A460 Amplifier

3.34 Western Electric 142-Type Amplifiers -

There are four types of Western Electric 142 amplifiers. They are the 142A, 142B, 142C, and 142D. The primary difference between these amplifiers is in their input arrangements. All use the same basic 142A power amplifier chassis capable of delivering 25 watts. The following characteristics are common to all 142-type amplifiers:

Note: This information is for maintenance use only.

Power Output: 12 Watts as Delivered From Factory, 6L6 Output Tubes. 25 Watts, With Modified Output and W.E. 350-B Tubes

Frequency Response: + 1 db, 50 to 15,000 Cycles

Output Impedance: 2, 4, 8, 12, 24, 200, 400 Ohms and 70 Volts

Power Consumption: 185 Watts, 105-125 Volts, 60 Cycles ac

Dimensions: 19-3/4" Wide, 11-1/2" High, 10-1/4" Deep

Weight: 26-40 Pounds

3.35 Variations between the 142-type amplifiers are listed below:

Number	Type of Input	Input Impedance	Gain	Add
142A	Grid	0-250,000 Ohm	50 db From Unit	Basic
			600 Ohms	
142B	Low Level Trans.	30,250 or 600 Ohms	115 db	141A Preamplifier
	Grid	0-250,000 Ohm	50 db From Unit	
			600 Ohms	



Figure 17 (Rear View) - Shown With 99A121 Modification Kit

All inputs are provided with individual volume controls. Additional technical information on these amplifiers is shown below:

Power Output: 30 Watts

Frequency Response: + 1 db, 20-20,000 cps

Gain: Mic. Input: 120 db, Phono. Input 72 db

<u>Number</u>	<u>Type of Input</u>	<u>Input Impedance</u>	<u>Gain</u>	<u>Add</u>
142C	Line Level Trans. Grid	37.5, 150 or 600 Ohm 0-250,000 Ohm	69 db 50 db From 600 Ohms	713A or B Apparatus Unit
142D	Low Level Trans. Line Level Trans.	30,250 or 600 Ohm 37.5, 150 or 600 Ohm	115 db 69 db	141A Pre-amplifier 713A or B Apparatus Unit

The Western Electric 142A, B, or C is shown in Figure 18.

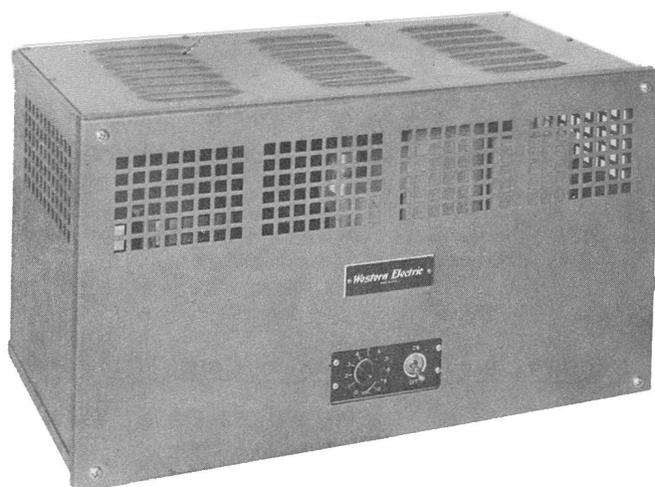


Figure 18 - Western Electric 142A, B, or C Amplifier

3.36 Amplifiers Rated Above Fifty Watts -  
The Altec-Lansing 1530A 70-watt amplifier is shown in Figure 19.

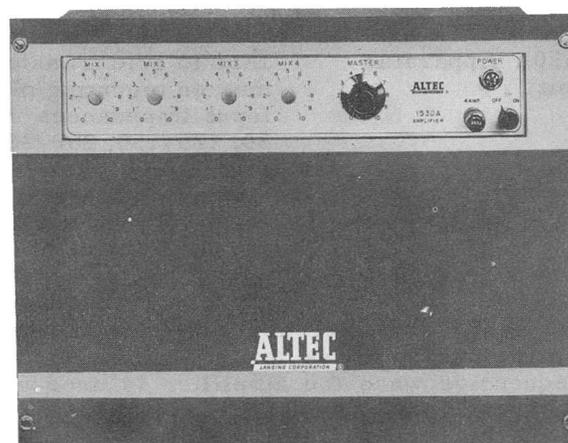


Figure 19 - Altec-Lansing 1530A Amplifier

The control panel has facilities for mounting two 1510A preamplifiers, two 1511A preamplifiers, two 1550A apparatus units, or any combination of two of these units. These units provide a wide range of input terminations as described below:

<u>Unit</u>	<u>Description</u>
1510A Preamplifier	Two input channels with individual gain controls. Input impedances 30/50, 125/150, 250/300, 500/600 ohms. 47 db gain into a 100,000 ohm load.
1511A Preamplifier	Two input channels, one equalized for variable reluctance phono pick-up, one with flat response. Separate treble and base tone controls, 43 db gain into 100,000-ohm load on input no. 1.

<u>Unit</u>	<u>Description</u>
1550A Apparatus Unit	Line to grid transformer on mounting plate. Input impedances 30/50, 125/150, 250/300, or 500/600 ohms. Maximum operating level +8 dbm. $\pm$ 1 db, 10-300,000 cps. No gain.

Power Consumption: 335 Watts, 105-125 Volts, 60 Cycles ac

Dimensions: Relay Rack Mount 18-13/16" Long, 12-1/8" Wide, 8-1/2" High (12-1/4" Panel Space)

Cabinet Mount Graybar (GB-143A) 22-1/8" Wide, 17-1/8" High, 10-3/4" Deep

The 1530A amplifier has a master volume control and facilities for attenuating the low frequencies when the amplifier is used with the horn-type loudspeakers requiring low frequency protection.

3.37 The 1530A amplifier may be mounted on a standard 19" relay rack or in a GB-143A cabinet. Additional data on this amplifier are shown below:

Power Output: 70 Watts

Frequency Response:  $\pm$  2 db, 10-20,000 cps

Input Impedance: 100,000 Ohms Without 1510A, 1511A, or 1550A

Output Impedance: 4, 8, 16 Ohms and 70 Volts

Power Consumption: 280 Watts, 105/115/125 Volts, 60 cps ac

Dimensions: 14" High, 19" Wide, 9" Deep

Weight: 60 Pounds

3.38 The Western Electric 143 series amplifiers are coded 143A, 143B, and 143C. A 143-type amplifier is shown in Figure 20. All of these amplifiers use the same basic 143A chassis with the following characteristics:

Power Output: With W.E. 350B Tubes (not furnished), 75 Watts. may be reconnected for commercial receiver-type tubes (not furnished), 50 Watts.

Frequency Response:  $\pm$  1 db, 50 to 15,000 cps

Output Impedance: 2, 4, 8, 12, 24, 66.7, 170 Ohms and 70 Volts

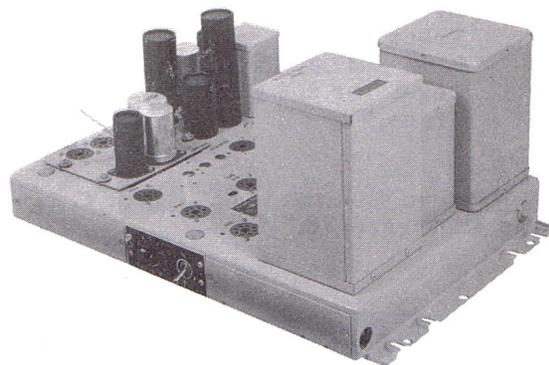


Figure 20 - Western Electric 143-Type Amplifier

3.39 Variations between the 143-type amplifiers are listed below:

<u>Number</u>	<u>Type of Input</u>	<u>Impedance</u>	<u>Gain</u>	<u>Wt.</u>	<u>Add</u>
143A	Grid	0-250,000 Ohms	52 db From 600 Ohms	47	Basic Unit
143B	Low Level Trans. Grid	30,250 or 600 Ohms	117 db	50	141A Preamplifier
143C	Line Level Trans. Grid	37.5, 150 or 600 Ohms	68 db	50	713A or B Apparatus Unit

3.40 The Altec-Lansing 1569A power amplifier is shown in Figure 21.

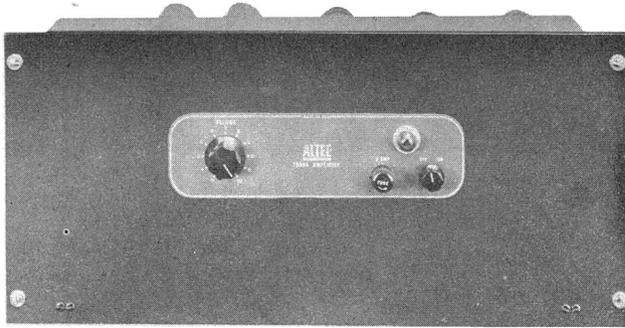


Figure 21 - Altec-Lansing 1569A Power Amplifier

The 1569A amplifier is a rack-mounted power amplifier. Its relatively small size makes it desirable where several amplifiers are mounted together on the same rack. This amplifier has a nominal rating of 80 watts. Additional data on this amplifier are shown below:

Power Output: 80 Watts

Frequency Response:  $\pm 1$  db, 5-30,000 cps

Input Impedance: 70,000-Ohm Potentiometer

Source Impedance: 30/50, 125/150, 250/300, 500/600 Ohms  
With 15095 Plug-In Transformer

Output Impedance: 4(18V), 8(25V), 16(36V), 62(70V) Ohms Un-grounded

Power Consumption: 240 Watts, 117 Volts, 60 Cycles ac

Dimensions: 19" Wide, 8-3/4" High, 8" Deep

Weight: 27.5 Pounds

3.41 The GB-9205 amplifier cabinet is a protective cover that fits on the amplifier chassis. It measures 19" long, 8-3/4" wide, 8-3/4" high, and weighs 5 pounds.

3.42 The Altec-Lansing 1570A power amplifier is shown in Figure 22.

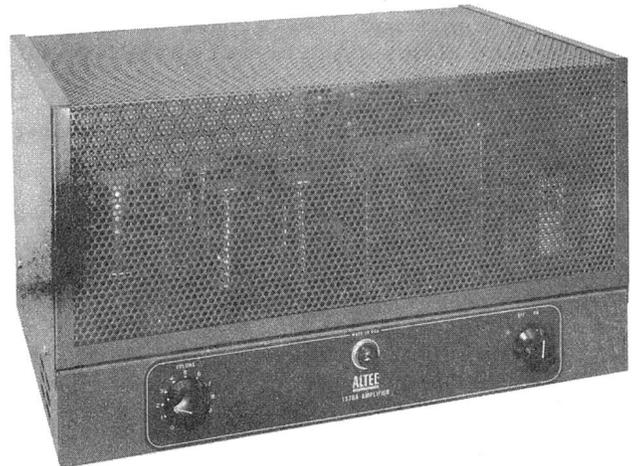


Figure 22 - Altec-Lansing 1570A Power Amplifier

This amplifier has a nominal rating of 165 watts.

3.43 The 1570A amplifier is arranged for shelf and cabinet mounting, or it may be rack mounted by attaching the Altec 12442 rack mounting assembly. Additional data on this amplifier are shown below:

Power Output: 165 Watts

Frequency Response:  $\pm 1.0$  db, 10-50,000 cps

Gain: 72 db

Input Impedance: 100,000-Ohm Potentiometer

Source Impedance: 30/50, 250/300, 500/600 Ohms With 15095 Plug-In Transformer

Output Impedance: 8, 16, 32 (70-Volt Line) Ohms

Power Consumption: 350 Watts, 117/125 Volts, 60 Cycles ac

Dimensions: 17" Wide, 9-3/8" High, 13-3/4" Deep

Weight: 58 Pounds

3.44 Compressor amplifiers are strongly recommended as a part of the system in the following types of installations:

- (a) Hospital or similar installations where high volume would be intolerable.
- (b) Dial selection input installations where type of telephones having access, cannot be controlled, or used by different subscribers' employees.
- (c) Installations in high noise level areas where the noise must be overridden but excess level produces reverberation.
- (d) Installations requiring amplifier powers where more than one unit of 75 watts output or more is required.

3.45 Three models of compressor amplifiers are available for telephone application, coded 436A, 438A, and 439A. (Figures 23A & B and 24). All three hold output level to the same point, are mechanically interchangeable, and differ only in input impedances and gain. The amplifiers measure 19" wide, 3-1/2" high, and 6" deep. They may be either rack mounted or mounted in the Graybar GB-9200 or GB-9201 cabinets. (Figures 25 and 26). They require 20 watts, 117 volts, 60 cycles ac. Output impedances of all three may be connected for 150 or 600 ohms. The power output is plus 19 dbm at 30 db of compression.

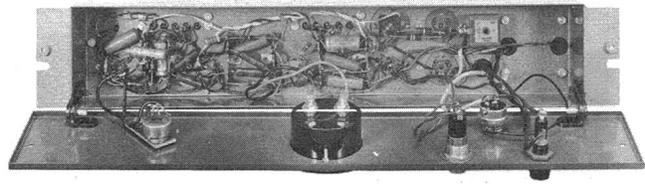


Figure 24 - (Inside view) Altec-Lansing 439A Compressor Amplifier

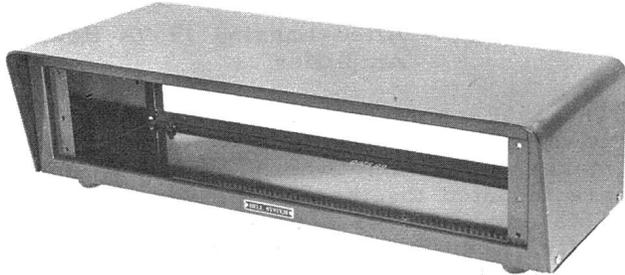


Figure 25 - Graybar GB-9200 amplifier cabinet

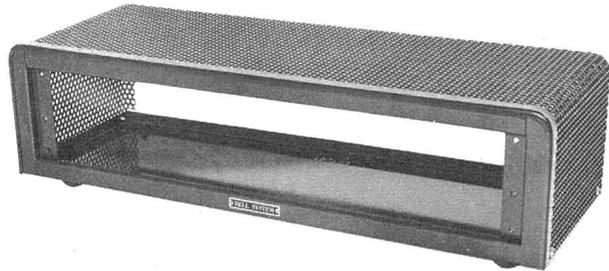


Figure 26 - Graybar GB-9201 amplifier cabinet



Figure 23-A - Altec-Lansing 436A or 439A Compressor Amplifier



Figure 23-B - Altec-Lansing 438A Compressor Amplifier

3.46 Variations between the different types are listed below:

Number	Type of Input	Input Impedance	Gain	General Use
436A	Bridging Trans.	0-15,000 Ohm	56 db	Monitoring From and Service
			15,000 Ohm	Observing Source
			42 db	Bridging
			600 Ohm	Line

<u>Number</u>	<u>Type of Input</u>	<u>Input Impedance</u>	<u>Gain</u>	<u>General Use</u>
438A	Grid	500,000 Ohms	Variable to 56 db	
	Mike Trans.	30 Ohms	90 db (variable)	Dynamic or Low Level Micro- phone
439A	Line Trans.	30,250 or 600 Ohms	54 db From 600-Ohm Line	Telephone Line Termination

3.47 Distribution - All power amplifiers are equipped with a "70 volt" output termination. This means that when the amplifier is being driven to its rated output, the voltage available at the output terminals is 70 volts. If the amplifier is not being driven by the source to its rated value, or if the gain control is set at some point below maximum, the voltage at the output will be something less than 70 volts. The 70-volt output, however, provides us with a relatively easy method of calculating the power consumed by any loudspeaker. Assuming the voltage is always 70 volts, the power can be calculated from the formula  $P=E^2/Z$  where  $E=70$  and  $Z$  is equal to the line impedance of the loudspeaker line transformer. For example, if the transformer line impedance is 5000 ohms, the power consumed by the loudspeaker would be:

$$\begin{aligned}
 P &= E^2/Z \\
 &= \frac{(70)^2}{5000} \\
 &= \frac{5000}{5000} \text{ (Approx.)} \\
 &= 1 \text{ Watt}
 \end{aligned}$$

3.48 The line transformers are all equipped with tapped primary windings so the impedance can be varied over a wide range. This provides a means for adjusting the power delivered to each loudspeaker, and since the sound level is proportional to the power input, it is a convenient way to adjust loudspeaker volume.

3.49 In some cases it may be desirable to have an external volume control to vary the loudness of a single loudspeaker. In general, this should be avoided if at all

possible due to the widely varying opinion between listeners as to what constitutes the proper volume. However, there are instances where, due to varying background noise, an external control must be provided. Refer these cases to the Customer Equipment Engineers Office.

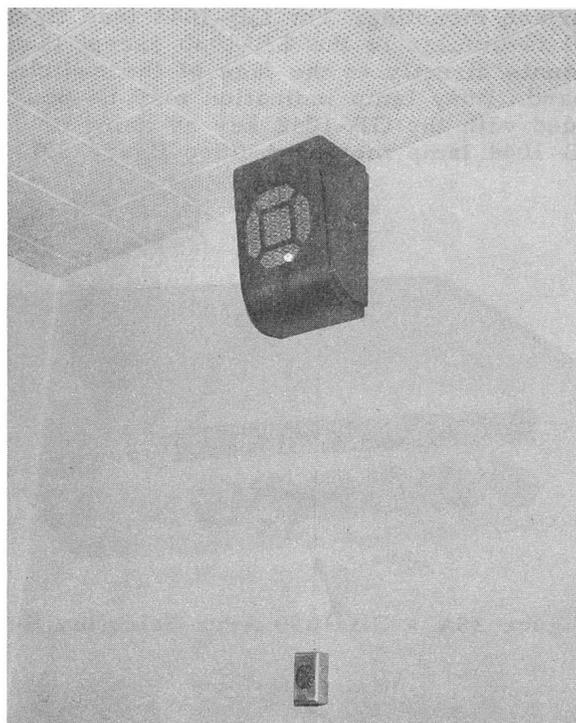


Figure 27 - Externally Mounted Volume Control

### Area Selection Circuits

3.50 The selection of a particular loudspeaker or group of loudspeakers is accomplished through the use of a key or keys. They can be either internally mounted, such as in a key shelf on a switchboard, or separately mounted. These keys are arranged so that all areas may be paged simultaneously in addition to the specific area or areas desired. Area selection keys are usually locking-type keys. In general, when only one amplifier is used in the system, the area selection key operates a relay which switches the amplifier output to the desired speakers. Where more than one amplifier is used, it may be desirable to perform the switching function on the amplifier input rather than the output.

3.51 Two area selection may be accomplished by using a key-shelf mounted 2 GR key or a separately mounted 6017-E key.

3.52 Five area selection may be performed by using the Graybar, GB-1030 or GB-1042-type key. The GB-1030 is shown in Figures 28A and 28B and is designed for surface mounting. The GB-1042 (see figure 29) is similar to the GB-1030 except that it mounts directly in the face of the switchboard. Busy lamp indication may be provided with the GB-1042 key by using a GB-1044 lamp mounting. (See figure 30)

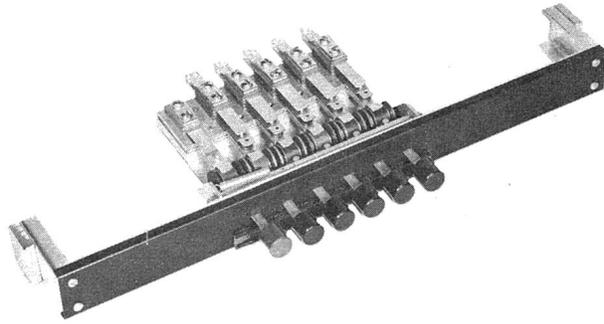


Figure 29 - GB-1042 Area Selection Key - Mounted Directly in Face of Switchboard

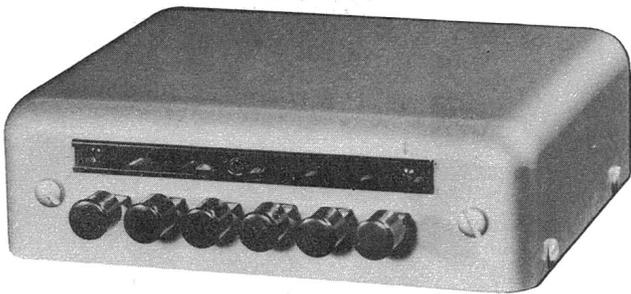


Figure 28A - GB-1030 Area Selection Key

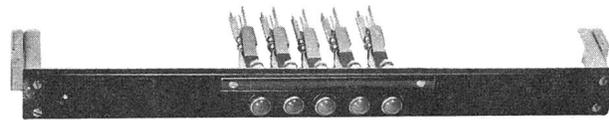


Figure 30 - GB-1044 Lamp Mounting

3.53 Ten area selection may be performed by using the Graybar GB-1209 or GB-1043 key. The GB-1209 is shown in Figures 31A and 31B and is designed for surface mounting. The GB-1043 is similar to the GB-1209 except that it mounts directly in the face of the switchboard. (See Figure 32). Busy lamp indication may be provided with the GB-1043 key by using the GB-1045 lamp mounting. (See Figure 33).

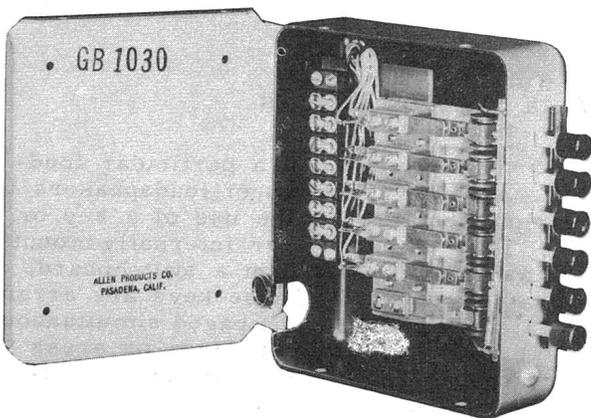


Figure 28B - Graybar GB-1030 Area Selection Key

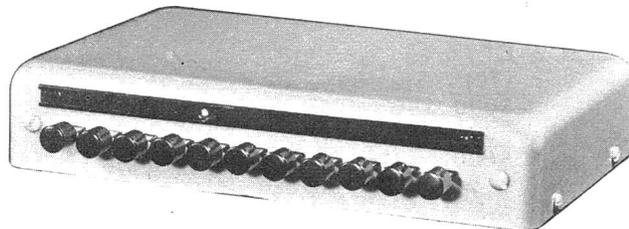


Figure 31A - Graybar GB-1209 Area Selection Key

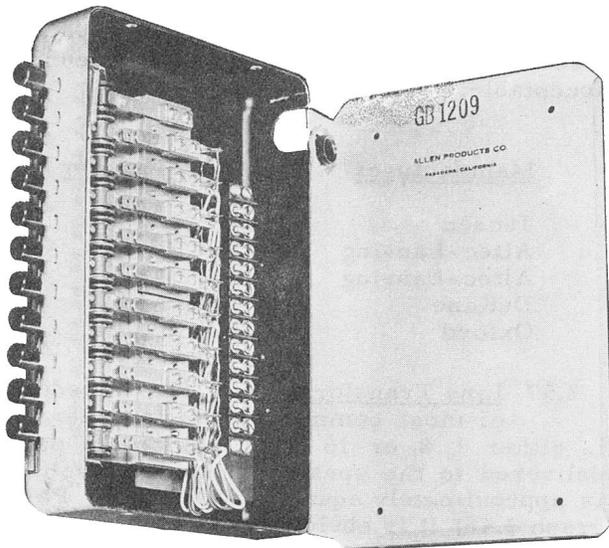


Figure 31B - Graybar GB-1209 Area Selection Key

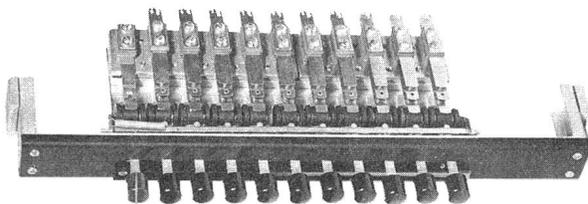


Figure 32 - Graybar GB-1043 Area Selection Key mounts directly in face of switch

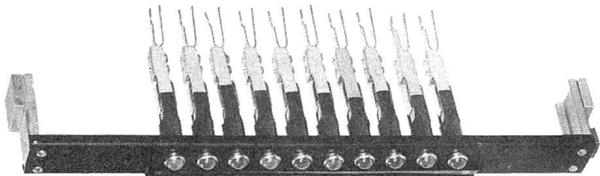


Figure 33 - Graybar GB-1045

Figure 34 shows the GB-1040 console complete with one GB-1041 key and lamp panel, a VU meter, and an "all call" switch. By stacking the GB-1041 keys in this unit, up to 30 areas may be selected. The GB-1041 key and lamp panel is shown in Figure 35. The GB series keys are all accumulative lock-in type which permits the simultaneous selection of more than one area. A separate release key is provided.



Figure 34 (Front View) - Graybar GB-1040 Console

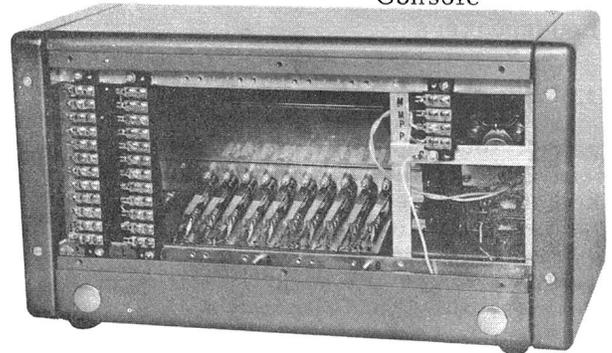


Figure 34 (Rear View) - Graybar GB-1040 Console

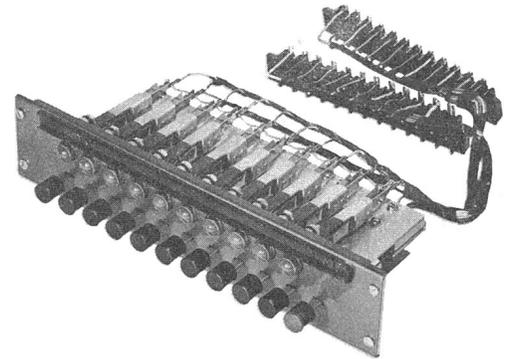


Figure 35 - Graybar GB-1041 Area Selection Key and Lamp Panel

3.54 Adjustable alternate loads should always be used whenever area selection circuits are provided. The alternate load consists of a group of resistors which are connected to simulate the load of the loudspeakers in a particular area. For example, let us assume a single amplifier is used to serve two areas, A and B. The speakers in area A consume 5 watts of power, and the speakers in area B consume 10 watts of power. When both areas are paged at the same time the amplifier would

be required to deliver 15 watts of power. The alternate loads would be so connected that the area A alternate load consumes 5 watts and the area B alternate load consumes 10 watts. Thus, regardless of which area was selected, the amplifier would always deliver 15 watts. If alternate loads were not used, the audio output of the amplifier would vary due to the difference in loads. This means that the speakers in area A, for example, might sound quite loud when only area A is being paged, and quite soft when all areas are being paged.

### Loudspeakers

3.55 Definition - Paragraph 3.07 mentioned briefly the two fundamentally different types of loudspeakers. The horn-type loudspeaker is usually a self contained unit completely assembled at the factory. The cone-type loudspeaker, by strict definition, refers only to the voice coil, frame, and cone which actually produce the sound. However, the salesman, and the customer will usually think of the baffle or enclosure used in mounting the loudspeaker when they refer to a cone-type loudspeaker. To avoid this ambiguity, the loudspeaker voice coil, frame, and cone assembly will be referred to as a loudspeaker unit. The term loudspeaker will include the loudspeaker unit, the cabinet, and in some cases the line transformer when referring to cone-type loudspeakers. When referring to horn-type loudspeakers the word loudspeaker will not include the line transformer. The cone-type of loudspeaker when used with the proper enclosure will generally produce superior music and voice reproduction. The horn-type speakers in general do not reproduce below 300 cycles which does not lend to naturalness of reproduction but does preserve voice intelligibility.

3.56 Loudspeaker Units - Loudspeaker units are manufactured in various diameters from 2 inches to 15 inches. In general, the cost and the low frequency response of the loudspeaker unit go up as the diameter increases. The eight inch diameter size is generally considered to be the most economical size for use in paging systems. In some instances it may be necessary to provide a larger or smaller loudspeaker unit to meet a specific requirement. For example, a 12-inch unit might be required for a high quality music and paging system, or a 4-inch unit might be required

to fit a particular mounting space. The loudspeaker units listed are representative of those commercial types found to be currently acceptable.

<u>Manufacturer</u>	<u>Model Number</u>
Jensen	P8R
Altec-Lansing	755A
Altec-Lansing	401A
DuKane	S-9935A-8
Oxford	CMS (5-inch diameter)

3.57 Line Transformers - The impedance of most commercial loudspeaker units is either 4, 8, or 16 ohms. Since the power delivered to the speaker from a 70 volt line is approximately equal to  $5000/Z$  (see Paragraph 3.48) it is obvious if the unit were connected directly across the line it would draw excessive amounts of power, probably resulting in permanent damage to the unit. The line transformer presents a high impedance to the line controlling the power delivered to the loudspeaker unit within acceptable limits. Typical line transformers found to be currently acceptable are listed below:

<u>Manufacturer</u>	<u>Type</u>	<u>Max. Watts - 70-Volt Line</u>
*W.E. Co.	KS-12048	16
W.E. Co.	KS-14792, L-5	4
*W.E. Co.	KS-14417	32
Transformer Engineers	TE-6478	4
University	SA-30	30
DuKane	710-3060	12
DuKane	710-3050	25
Graybar (Peerless)	GB-3609	4
Graybar (Peerless)	GB-3608	40

\* Replaced by GB-3609 and GB-3608 transformer assemblies.

3.58 Baffles - The loudspeaker units and line transformers may be combined with a number of different types of baffles to form a loudspeaker in the commercial sense of the word. The relative sound intensity of the frequencies reproduced by a loudspeaker may be enhanced or degraded by the type of enclosure in which the loudspeaker is mounted. In addition, the amount of sound produced in any given direction may

also be controlled by the loudspeaker enclosure. The appearance of the enclosure is also important, and the design or style used must be selected to conform to the customer's architectural or individual tastes. The enclosure manufacturers have developed a large number of designs and styles of enclosures, and no attempt is made in this section to describe all of them. Some enclosures and speakers are described which have been found to be commercially acceptable. It is not the intent of this section to limit the use of loudspeakers and baffles to those described here. These are only a guide to those models and combinations found to be currently acceptable. No doubt, as the state of the art progresses, or to meet a specific customer's request, other combinations will have to be used.

3.59 Wall Mounted Baffles - The following baffles are all designed for use with an eight inch diameter loudspeaker unit, and mounted on the wall surface.



Figure 36 - Lowell BL8-A Loudspeaker Baffle



Figure 37 - Lowell WL8-A Loudspeaker Baffle



Figure 38 - Lowell LCS8 Loudspeaker Baffle

## SECTION C70.900.00

3.60 Flush Mounted Baffles - In some installations it may be necessary to recess the loudspeakers in the wall or ceiling. This is particularly true in those cases where a new building is being built or an older building is being remodeled. It is usually not practical to recess loudspeakers in an existing building.

3.61 As a general rule, 1/2" conduit is required to all flush mounted loudspeaker locations. This conduit and speaker enclosure is provided by the customer. The company furnishes only the loudspeaker unit, line transformer, and baffle.

3.62 The Lowell CP8 enclosure is shown in Figure 39. This unit is permanently attached to the conduit system or building by the contractor performing this work. It is available in depths ranging from 2-1/2" to 12", and in general the deepest model should be used that will fit into the available wall or ceiling space. The correct depth should be specified when ordering the enclosure, and the incremental sizes are listed in the supplies Section C70.900.03.

Note: This information for customer use only.

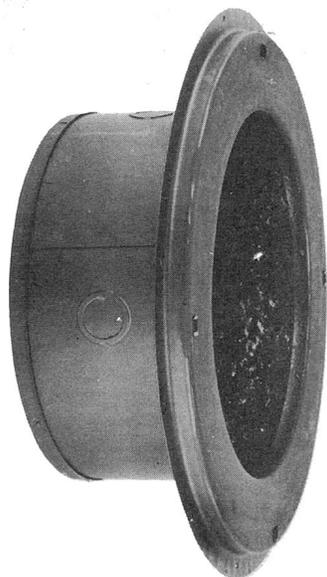


Figure 39 - Lowell CP8 Loudspeaker Enclosure

3.63 The Lowell CP8 enclosure is designed to be used with the following Lowell baffles which will accommodate any of the 8-inch loudspeaker units.

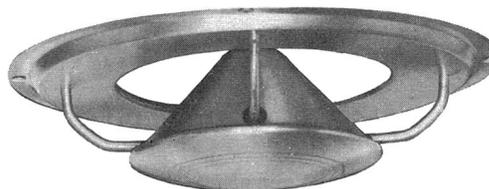


Figure 40 - Lowell AL8A Loudspeaker Baffle

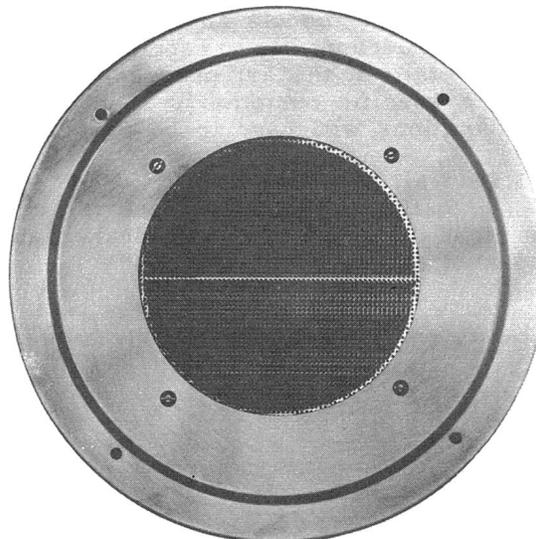


Figure 41 - Lowell RS8A Loudspeaker Baffle

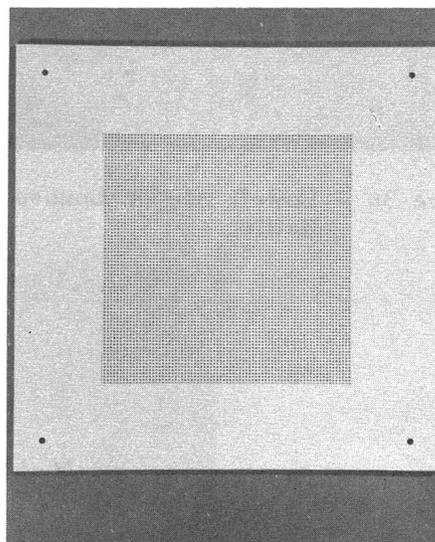


Figure 42 - Lowell JG8 Loudspeaker Baffle

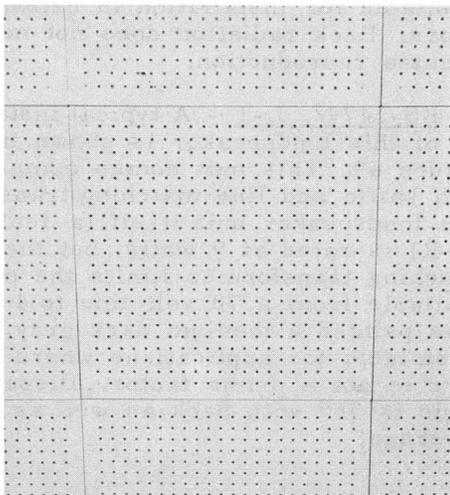


Figure 43 - Lowell M8 Standard Loudspeaker Baffle

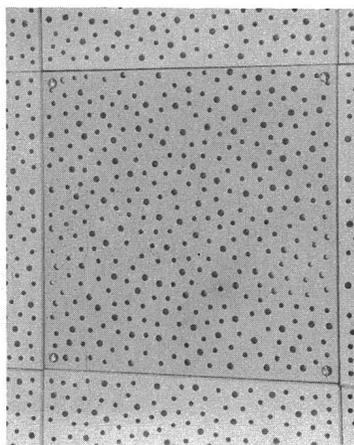


Figure 44 - Lowell M8 Random Loudspeaker Baffle

3.64 Special Enclosures - In some cases the customer may wish to mount the loudspeaker in a custom enclosure which he

provides. When this is required the company usually furnishes only the loudspeaker unit, the line matching transformer, and the baffle.

3.65 Cone-Type Loudspeakers - Two standard cabinet-type loudspeakers are available. The KS-12046 consists of a direct radiating dynamic-type loudspeaker housed in a walnut finish cabinet. A back-board for wall mounting is furnished as part of the speaker. A tapped auto transformer (KS-12048) is included for adjusting the impedance and the power at that speaker. This loudspeaker covers only a 70° frontal pattern and is less efficient than other cone-type speakers. This cabinet is shown in Figure 47.

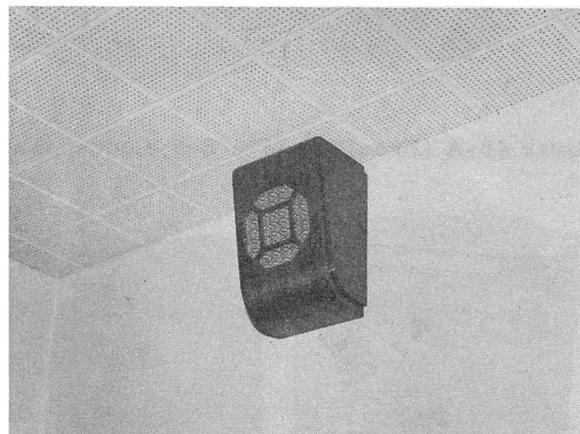


Figure 45 - Western Electric KS-12046 Loudspeaker

3.66 The other standard cabinet-type loudspeaker is the S-5. It is recommended where appearance is the governing factor or where higher quality is desired. It comes complete with a high quality loudspeaker (Altec 401A) and line matching transformer (GB-3609). It is rated at 4 watts. The front is completely covered with a neutral colored grill cloth that blends with the light zolotone finish on the top and bottom. It is designed to fit into a corner as a single unit. Two can be fastened together for use on a flat surface. Two can be used back-to-back and suspended or four can be mounted in a cluster. The S-5 loudspeaker is shown in figure 48.

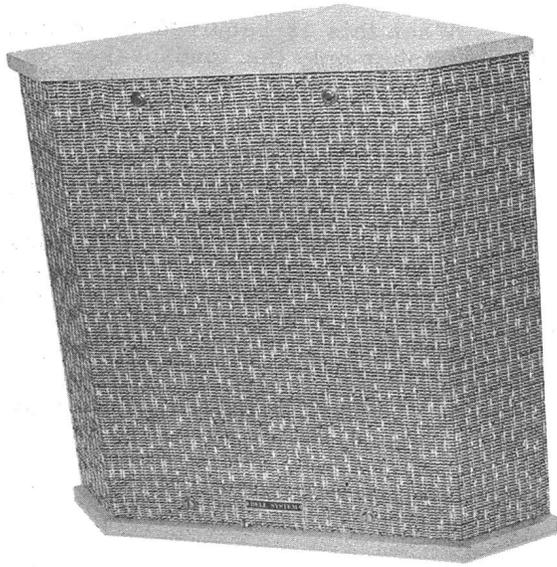


Figure 46-A (Front View) - S-5 Loudspeaker

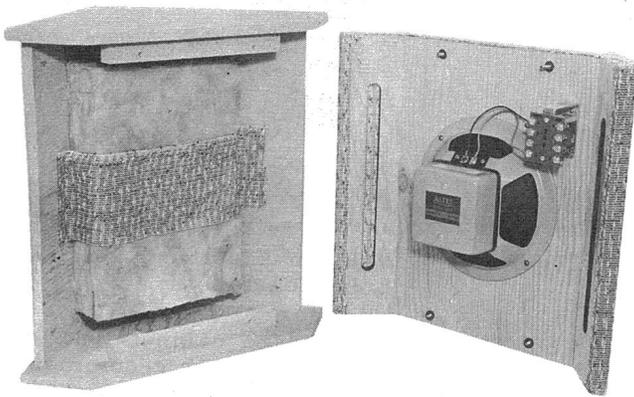


Figure 46-B (Inside view) - S-5 Loudspeaker

3.67 The following loudspeakers are designed to use the sound generated by the back of the speaker cone as well as the front of the speaker cone. They are espec-

ially suitable for installation in hallways or corridors. Back radiation does not make for good music reproduction.

(a) KS-14792, L-1 - A typical installation of this loudspeaker is shown in Figure 49. This unit comes complete with baffle and line matching transformer. The loudspeaker unit itself (a Jensen P8-R) is rated at 9 watts, but the line matching transformer limits the power available from a 70 volt line to 4 watts. It is painted a medium dark gray, and is suitable for applications where appearance is not a prime factor. Dispersion angle is  $75^{\circ}$  with back as well as frontal coverage.

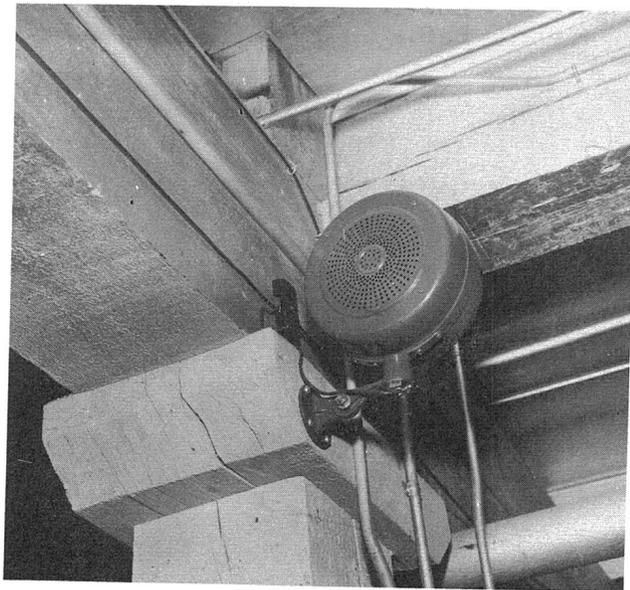


Figure 47 - Western Electric KS-14792, L-1 Loudspeaker

(b) The S-1 Loudspeaker is a 5-inch, 4-ohm, 4-watt Oxford loudspeaker unit mounted in a rectangular bakelite cabinet with a special line transformer, and a volume control potentiometer. It may be wall mounted, ceiling mounted, or mounted on a desk. Dispersion angle is 60° with back as well as frontal coverage. This loudspeaker is shown in Figure 50.

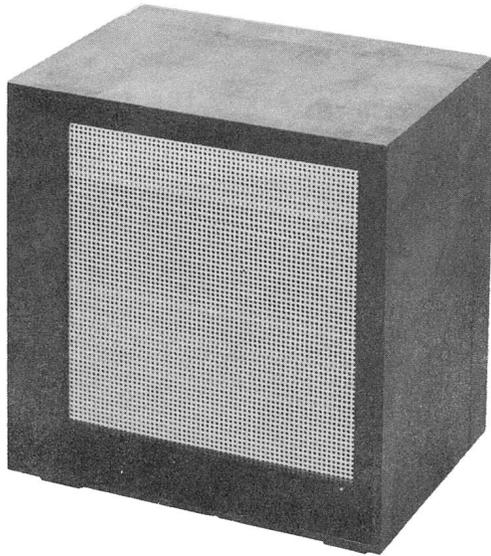


Figure 48 (Front View) - S-1 Loudspeaker

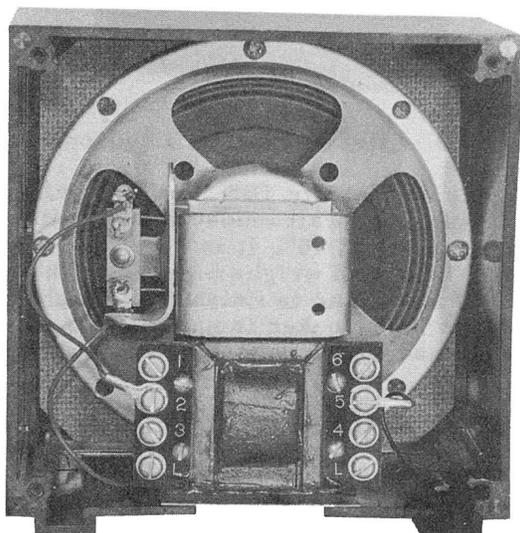


Figure 48 (Rear View) - S-1 Loudspeaker

(c) The S-2 Loudspeaker is an 8-inch, 4-ohm, 8-watt Jensen unit mounted in a round metal housing with a dark brown wrinkle finish. The unit comes completely equipped with loudspeaker and line transformer. It is similar to the KS-14792, L-1 Loudspeaker except that the line transformer is capable of delivering 8 watts to the loudspeaker instead of the 4 watts available in the KS-14792. It is especially suitable for indoor industrial applications. Dispersion angle is 75° with back as well as frontal coverage. This loudspeaker is shown in Figure 49.

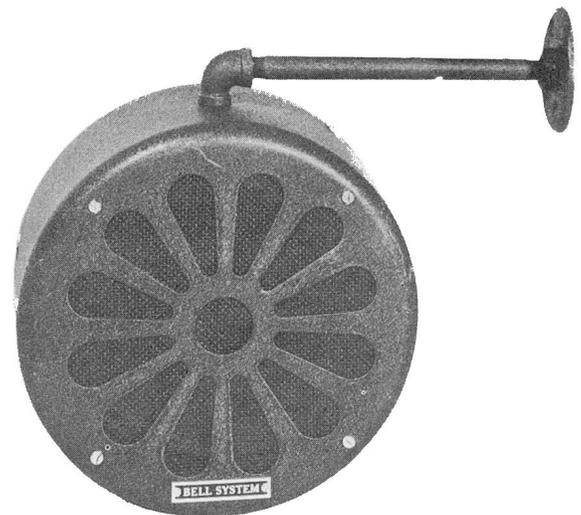


Figure 49 (Front View) - S-2 Loudspeaker

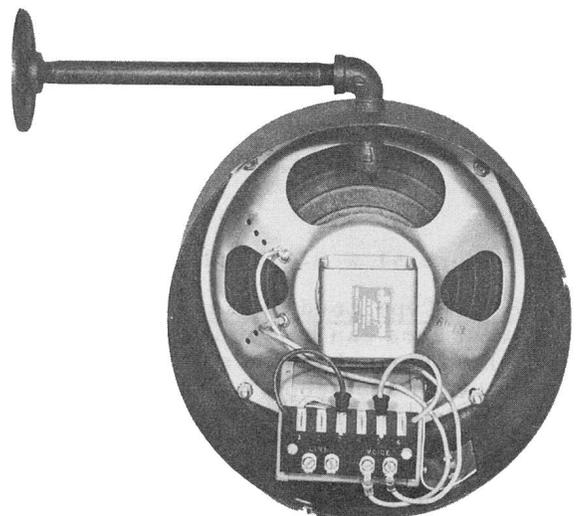


Figure 49 (Rear View) - S-2 Loudspeaker

(d) The S-3 Loudspeaker is an 8-inch, 8-ohm, 14-watt Altec 401-A loudspeaker unit mounted in a modified Lowell MLCB enclosure. It comes complete with the GB-3609 line matching transformer. This limits the power available from a 70-volt line to 4 watts. This loudspeaker is shown in Figure 50.

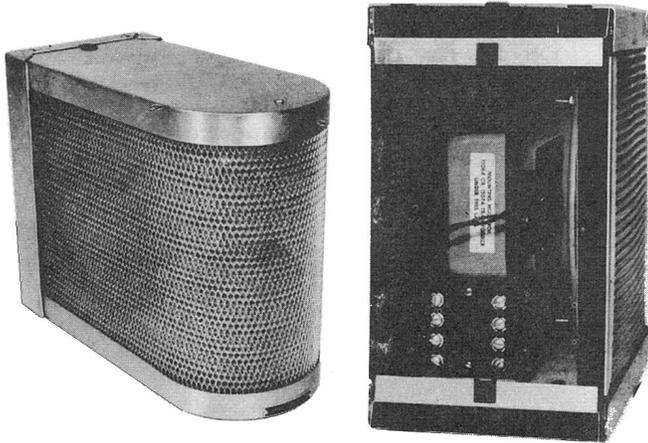


Figure 50 - S-3 Loudspeaker

(e) The S-4 Loudspeaker is an 8-inch, 8-ohm, 14-watt, Altec 401A loudspeaker unit mounted in a Lowell LCB8 enclosure. It comes complete with the GB-3609 line matching transformer. Available power from a 70-volt line is 4 watts. This loudspeaker is shown in Figure 51.

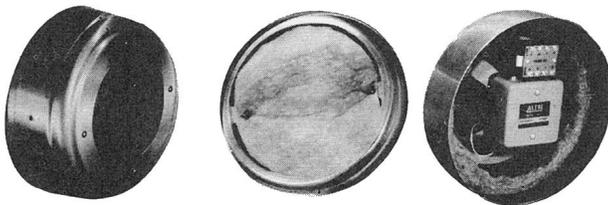


Figure 51 - S-4 Loudspeaker

3.68 Horn-Type Loudspeakers - A low noise level area can be defined crudely as an area in which normal conversation can be carried on between two people by raising their voices. Technically it can be defined as an area where the sound intensity is below 85 db. Two horn-type loudspeakers found suitable for installation in low noise level or moderate noise level areas are the University IB8 and the DuKane 5A105. These speakers are shown in Figures 52 and 53.

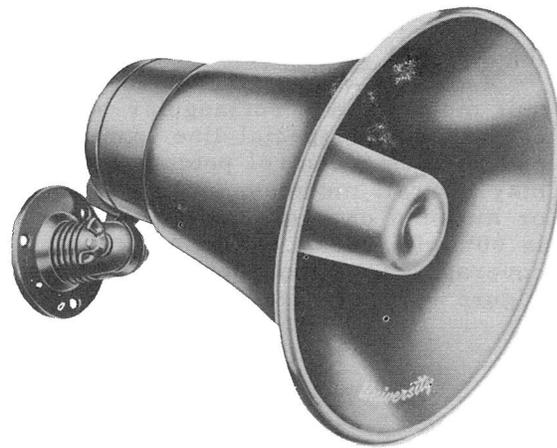


Figure 52 - University IB8 Loudspeaker

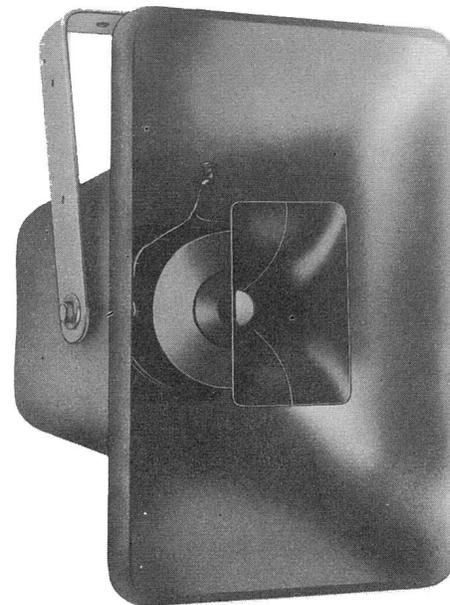


Figure 53 - DuKane 5A105 Loudspeaker

3.69 The University IB8 is a high-efficient, 8-ohm, 12-watt loudspeaker having a dispersion angle of  $90^{\circ}$ . It is 8-1/2" in diameter, 9" high, and weighs 5 pounds. The horn is made of metal and is finished in a light gray color. This loudspeaker is suitable for indoor or outdoor use where concentrated power is needed.

3.70 The DuKane 5A105 is a high-efficient, 16-ohm, 12-watt loudspeaker having a dispersion angle of  $135^{\circ}$ . When used with the DuKane 710-3060 transformer it is suitable for indoor or outdoor use. The horn is made of fiberglass and is finished in a light gray color. It is 7-3/4" wide, 11-3/4" high, 10-7/32" deep, and weighs 6-1/2 pounds.

3.71 A high noise level area can be roughly defined as an area in which it is difficult for two people to carry on a normal conversation even when shouting. Technically it can be defined as an area in which the sound intensity level is greater than 85 db. Two types of loudspeakers found suitable for use in high noise areas are described below.

3.72 The DuKane 5A90 is similar in construction and color to the DuKane 5A105. It is a 16-ohm, 30-watt loudspeaker with a dispersion angle of  $120^{\circ}$ . When used with the DuKane 710-3050 transformer it is suitable for indoor or outdoor use. The over-all dimensions are 10-1/2" wide, 20-1/2" high, and 20" deep. It weighs 12 pounds. This loudspeaker is shown in Figure 54.

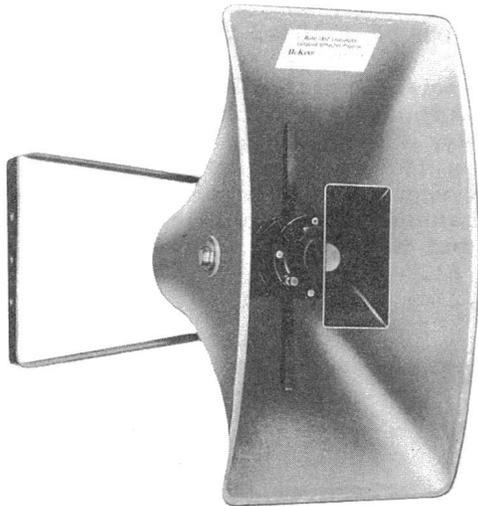


Figure 54 - DuKane 5A90 Loudspeaker

3.73 The KS-14705 horn is an 8-ohm, 30-watt loudspeaker with a dispersion angle of  $120^{\circ}$ . This loudspeaker is composed of three parts as shown in Figure 55. The lower fan-shaped part of the speaker is called the KS-14705 horn. The thin neck on top of this section is called the KS-14707 receiver attachment. The driving unit which mounts on the top of the thin neck is called the KS-14704 receiver. The line matching transformer is mounted on the adjacent GB-3613 bracket. The line matching transformer may also be mounted in the 790053GB, pole box. It is suitable for indoor or outdoor use, and completely assembled, this unit weighs 15 pounds.

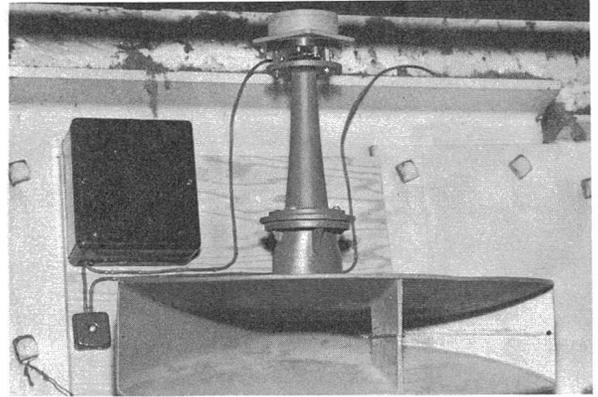


Figure 55 - Western Electric KS14705, KS14707 and KS14704 assembled

3.74 The University RPH loudspeaker is a radial reflex projector giving uniform  $360^{\circ}$  horizontal dispersion. When used with the University SA-30 transformer it will deliver 30 watts of power. Total weight is 26 pounds. It is useful in large industrial applications where high ceilings exist and general construction is steel, concrete, or sheet iron. This loudspeaker is shown in Figure 56.

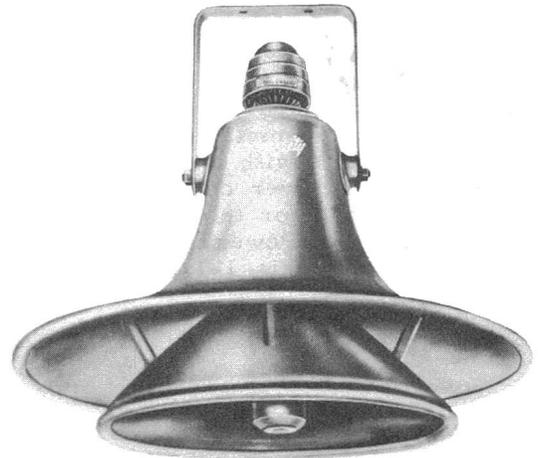


Figure 56 - University RPH

3.75 Explosion-Proof Loudspeakers - The University 7102 explosion-proof loudspeaker shown in Figure 57 is designed for use in most explosive atmospheres. This is a 16-ohm, 25-watt horn-type loudspeaker with a dispersion angle of  $95^{\circ}$ . This speaker comes equipped with a line transformer.



Figure 57 - University 7102 Explosion-Proof Loudspeaker

Note: Special precautions are involved, and possible applications should in all cases be referred to the Chief Engineer's Office.

#### 4. OTHER COMPONENTS

4.01 The 103-2 loudspeaker set is a self-contained amplifier and speaker mounted in a simulated walnut finish bakelite cabinet. It measures 8-5/8" wide, 6-5/8" high, and 5-3/8" deep, and has a gold-tone perforated metal grill in front and back. It comes with an 8-foot 110-125-volt, 60-cycle ac power cord; also, a 6' 6" two conductor cord for telephone termination of a 600-ohm line. Power drain is 25 watts and maximum output is 1-1/2 watts. (Figure 58)

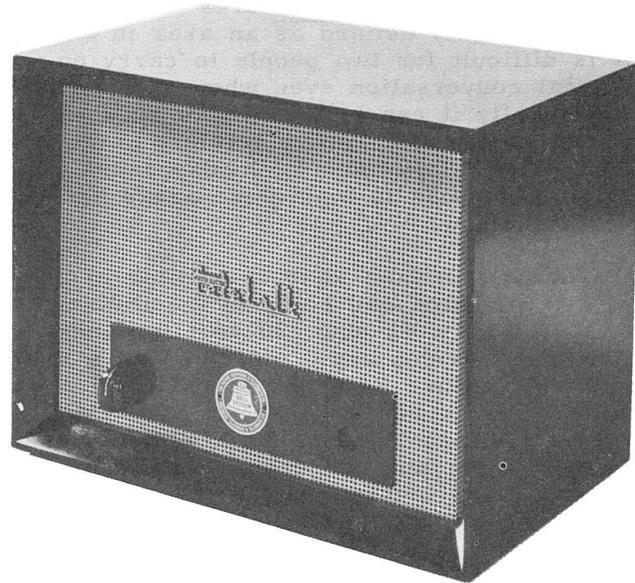


Figure 58 - 103-2 Loudspeaker Set

4.02 Noise Operated Automatic Level Adjusting (NOALA) - This is an assembly, Altec-Lansing 12532 built on a 1-3/4" x 19" rack mounting plate. The NOALA requires a control signal from an Altec-Lansing 444B amplifier. The input and output impedances are 600 ohms. Figure 61.

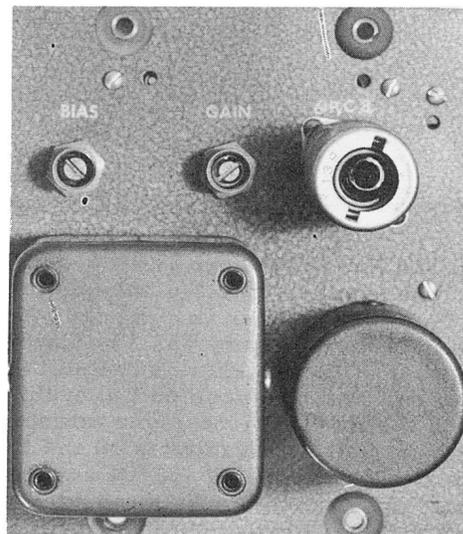


Figure 59A (Front) Noise Operated Automatic Level Adjusting (NOALA)

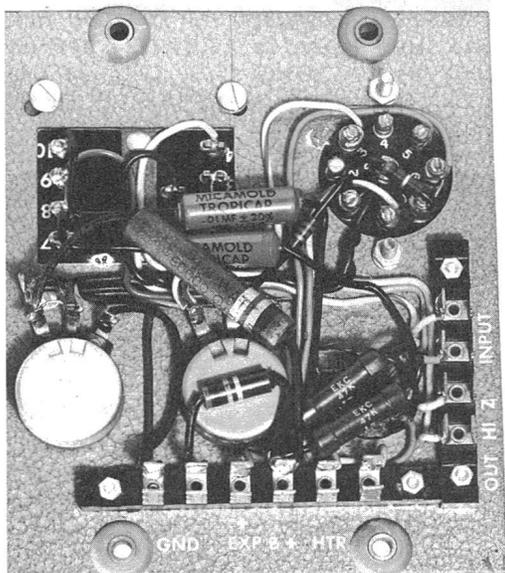


Figure 59B (Rear) Noise Operated Automatic Level Adjusting (NOALA)

4.03 The GB-1014 microphone adapter kit is used in the GB-1060, GB-1064, and GB-1065 assemblies. It measures 1" in diameter by 2" in length. It contains two 1SM1 subminiature micro-switches with an actuator button. These micro-switches are both single pole double throw contacts. Either end of the kit adapts to 5/8-24 or 5/8-27 thread, female or male (Figure 60).

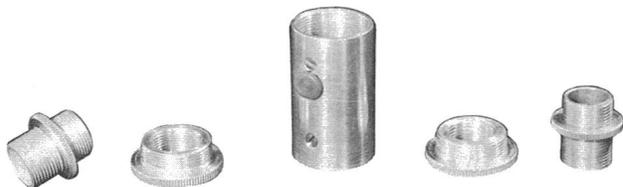


Figure 60 - GB-1014 Microphone Adapter Kit

4.04 The Altec 4665 plug-in transformer is used in the Altec 1569A and 1570A amplifiers to permit balanced or unbalanced line inputs of 30/50, 125/150, 250/300, or 500/600 ohms. It measures 2-5/16" high, 2" wide, and 1-1/2" deep and is arranged to plug-in to a standard octal socket. (Figure 61)

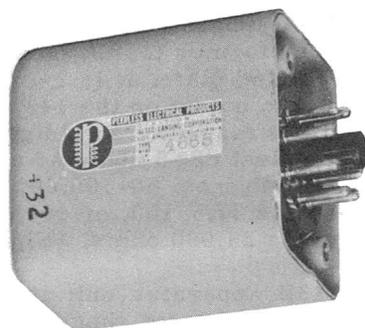


Figure 61 - Altec 4665 Plug-in Transformer

4.05 The DuKane 3A25 input transformer is used in the DuKane amplifiers to convert from high impedance to low impedance (50 ohm) microphone input. It measures 1-3/8" in diameter, 1-3/4" in height, and is arranged to plug-in to a standard octal socket. (Figure 62A)



Figure 62A - DuKane 3A25 Input Transformer

4.06 The DuKane 3A65 input transformer is used in the DuKane amplifiers to convert from high impedance to 600-ohm line input. The measurements are 1-3/8" in diameter and 1-3/4" in height. (Figure 62B)



Figure 62B - DuKane 3A65 Input Transformer

## SECTION C70.900.00

4.07 The 713A apparatus unit is a line-to-grid transformer (618D) mounted on a 5-3/16" x 4-7/16" plate. It is 2-23/32" high and is arranged to mount on the 142 and 143 amplifiers. It has magnetic shielding, a maximum operating level of +8 dbm and a frequency response of +1.5 db from 50-100,000 cps. The input impedance is 37.5, 150, or 600 ohms. The load impedance is 25,000 ohms. (Figure 63)

4.08 The 713B apparatus unit is the same as the 713A except that a switch and a 50,000-ohm potentiometer are added on the high side of the transformer. (Figure 63)

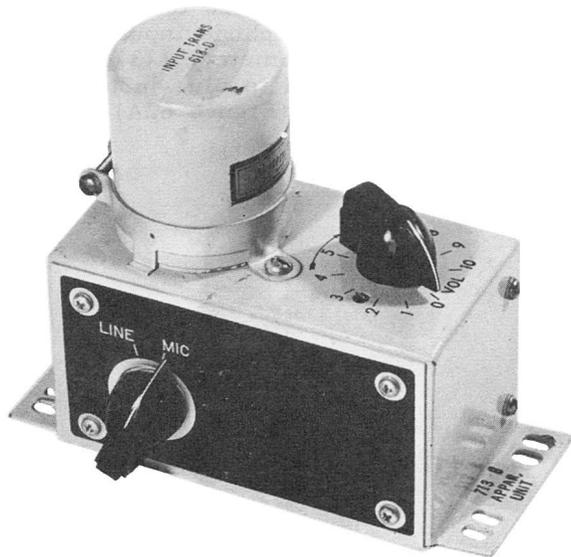


Figure 63 - 713B Apparatus Unit

4.09 The Altec 1550A apparatus unit is a line-to-grid transformer mounted on a plate 5-3/16" long by 3-1/2" wide. It is 4-7/16" high, weighs 1 pound, and mounts on the 1530A amplifier. It has 90 db shielding, a maximum operating level of +8 dbm and a frequency response of +1 db from

10-30,000 cps. The input impedance is 30/50, 125/150, 250/300 or 500/600 ohms. The load impedance is 17,500/21,000 ohms or 70,000/84,000 ohms C.T. (Figure 64)

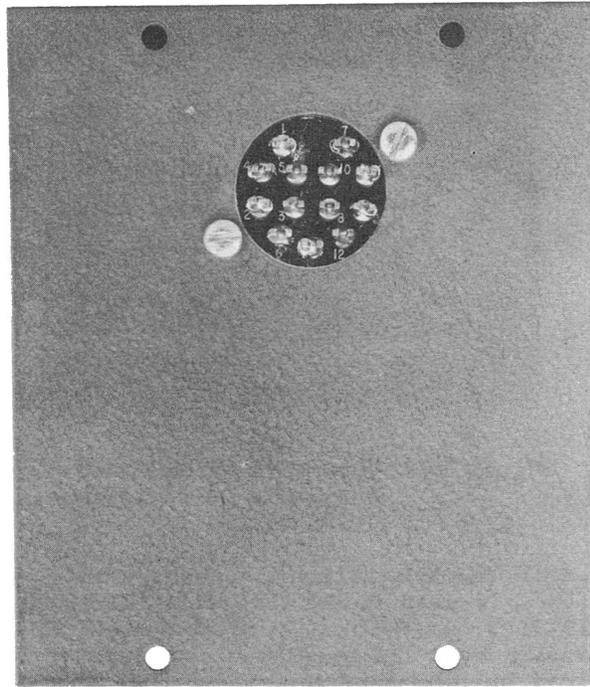


Figure 64 - Altec 1550A Apparatus Unit

4.10 The GB-143A-P'T'T' amplifier cabinet measures 22-1/8" wide, 17-1/8" high, and 10-3/4" deep, plus 5/8" for glides and channel supports. It is intended to shelf mount amplifiers where considerable ventilation is required. The cabinet is highly perforated yet properly reinforced to vertically mount equipment in its 14" high by 19" wide panel space. It has a locking lid, convenient knockouts for wiring, a Western Electric gray finish, and weighs approximately 45 pounds. (Figure 65)

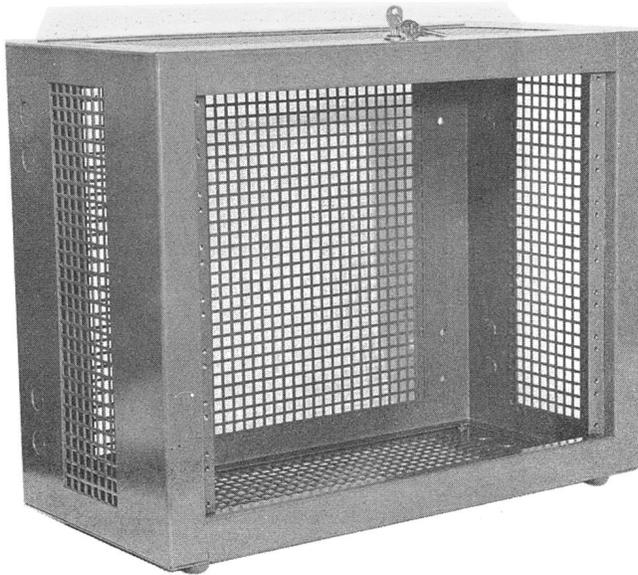


Figure 65 - GB-143A - P.T.T. Amplifier Cabinet

4.11 The 407-B-15 panel is a light gray mat measuring 12-1/4" x 19". It is required to cover the front of the Western Electric Co. amplifiers when they are rack mounted.

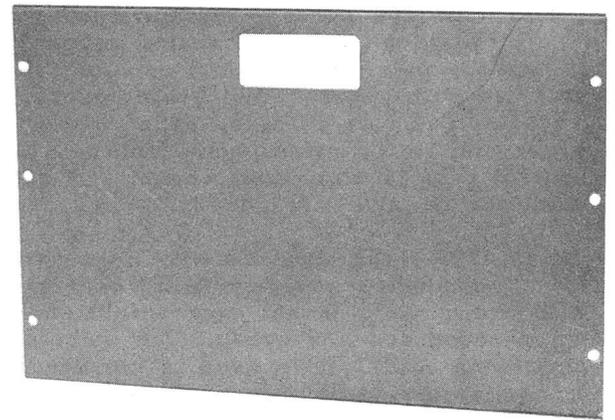


Figure 66 - 407-B-15 Panel

4.12 The GB-9200 and GB-9201 amplifier cabinets are designed to mount the 436A, 438A, or 439A compressor amplifiers. They measure 20-1/2" long by 5" high by 7" deep. They have a 3-1/2" high by 19" wide panel space and weigh approximately 8 pounds. The GB-9200 has a solid one-piece cover and provides a slight visor effect on top which is desirable where appearance governs. The GB-9201 has a perforated metal cover. (Figures 25 and 26)

4.13 The 12442 mounting assembly is available to adapt the 1570A amplifier for rack mounting. It measures 18-13/16" wide, 9-1/2" high, 12-1/8" deep, and consists of a mounting shelf and a front panel and weighs 10 pounds. (Figure 67)

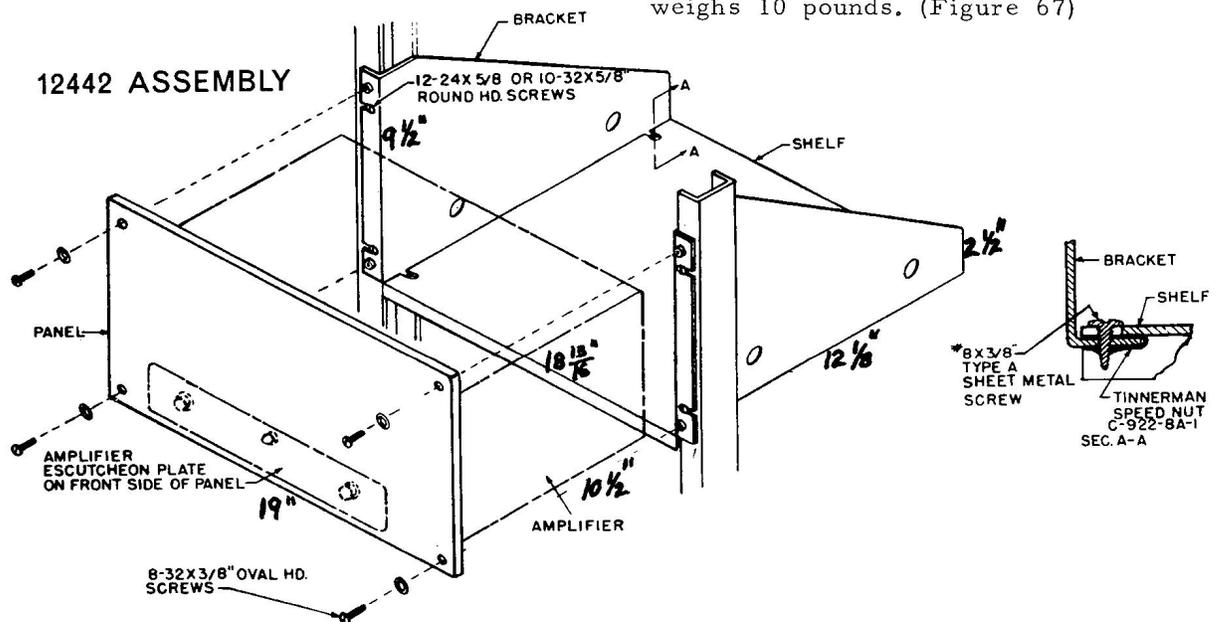


Figure 67 - 12442 Mounting Assembly

SECTION C70.900.00

4.14 GB-1204 cordage is four conductors 20-gauge stranded tinned copper wire. It has one pair shielded and one pair not shielded with a gray vinyl jacket overall. The shielded pair is color coded red and green and is for microphone inputs. The control pair is black and white. The outside diameter is .290". (Figure 68)

4.15 GBA-1102 shielded wire is a two-conductor 18-gauge solid copper wire with brown vinyl jacket over shield and is color coded red and green. The outside diameter is .222". It is used to cut down transmission loss where very long speaker leads must be run. (Figure 68)

4.16 The SK station wire is a two-conductor 20-gauge annealed copper-steel wire with brown or ivory thermoplastic jacket over shield. It is color coded red or green. The outside diameter is .216". (Figure 68)

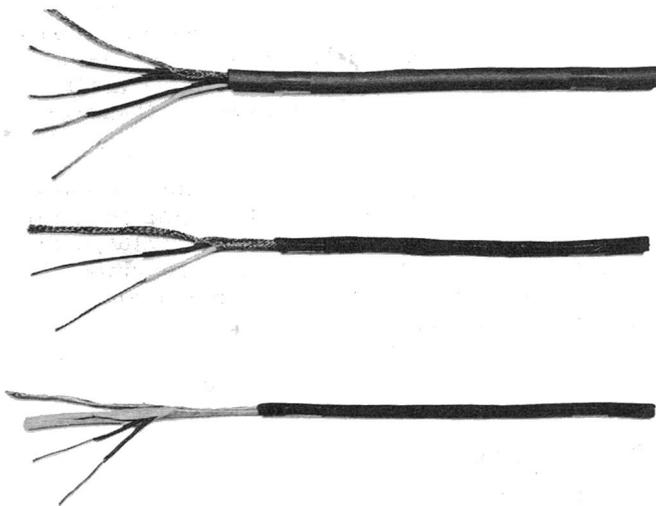


Figure 68 - GB-1204 Cordage, GBA-1102 Shielded Wire and SK Station Wire

4.17 The GB-1026A dividing network provides from two to ten 600-ohm outputs from one 600-ohm input. The loss from the input to any output is 18 db. It consists of a 5-1/8" by 6-3/4" linen base phenolic panel arranged to mount in a 105B apparatus box. It contains a 600-ohm to 16-ohm coil (GB-5511) on the input and two 245-ohm resistors on each output. (Figure 69)

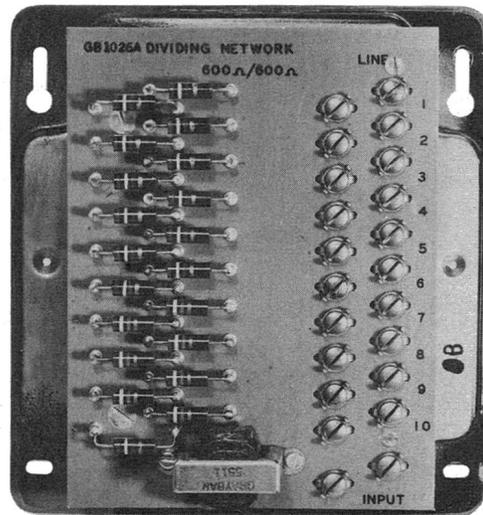


Figure 69 - GB-1026A Dividing Network

4.18 The GB1318-8 cord is an 8-foot 3-conductor power cord for use with Western Electric and Altec-Lansing amplifiers. It has a 3-prong molded plug which includes the "U" clip grounding. The "U" clip shall not be removed for standard 2-prong receptacles but a Hubbel 5273-L, or equivalent, adapter shall be used. (Figure 70)

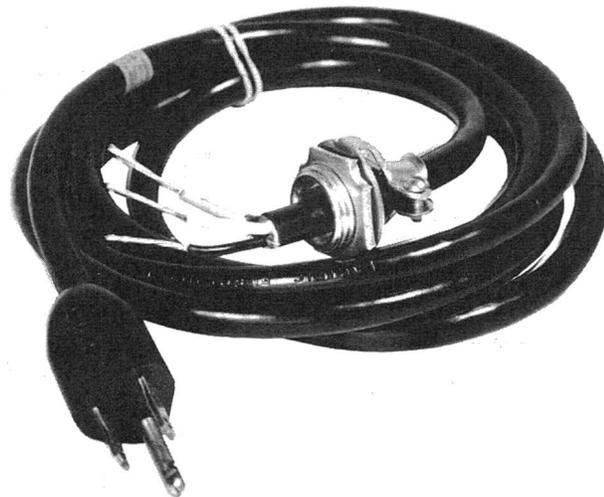


Figure 70 - GB-1318-8 Cord

4.19 The GB-3302 mounting shelf is a 15" by 24" wooden shelf on a 24" by 24" backboard. There is a smaller shelf (7-1/2" by 22") located 3 inches below the larger one for drawings, sketches, etc. The upper shelf has a protective cleat 3 inches high along the front and is drilled for input, output, and power wiring. (Figure 71)

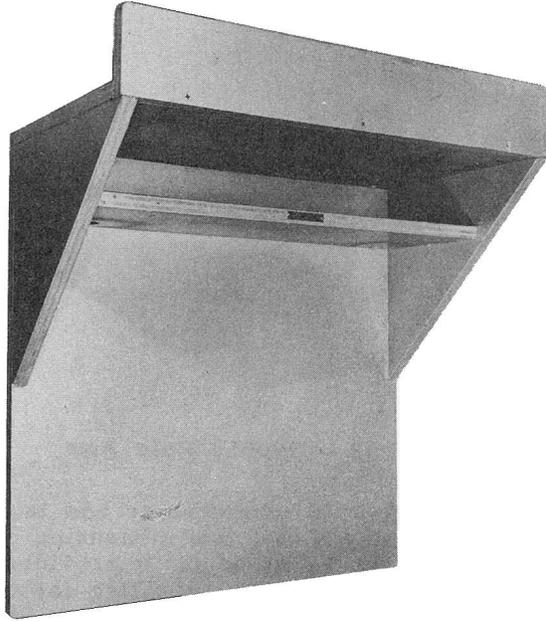


Figure 71 - GB-3302 Mounting Shelf

4.20 Pads T and L Type - The T600-type has three variable elements for 600 ohm constant impedance. Its three elements measure 2-9/32" in length and 1-23/32" in diameter. It has a mounting stud 3/8" long by 3/8-32, and a control shaft 1-1/2" long by 1/4". The L pads have two variable elements and are available in 4-, 8-, or 15-ohm impedances. Dimensions are the same except the two elements measure 1-19/32" in length. (Figure 72)

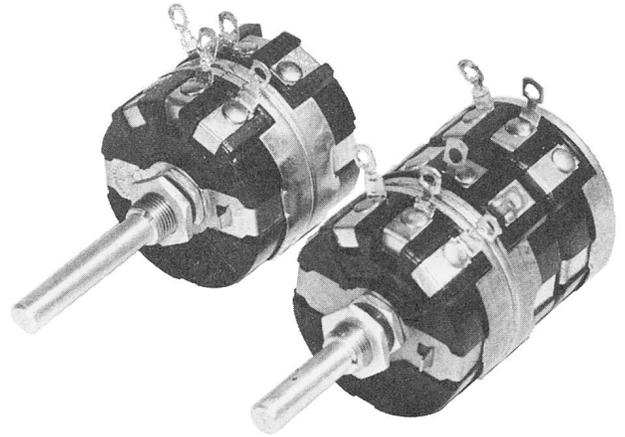


Figure 72 - Pads-T and L Type

4.21 The GB-1037 mounting bracket is an L shaped 1/8" thick metal bracket. It is 3" wide and each leg is 3" long. It has a 3/4" NC machine screw in the center of each leg and comes with lockwashers and nuts. This bracket permits mounting the KS-14705 horn (31-A) for complete vertical or horizontal adjustment. (Figure 73)

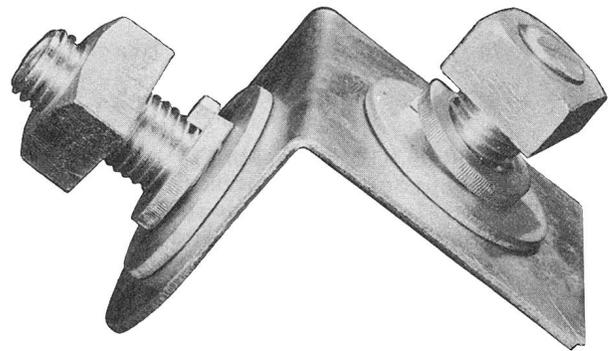


Figure 73 - GB-1037 Mounting Bracket

4.22 The GB-3613 mounting bracket is an L shaped bracket for mounting the GB-3608 transformer assembly or the KS-14417 auto-transformer. It is an L shaped bracket of 14-gauge metal and measures 3-3/4" in width. The back plate is 4-3/4" long and has four 3/16" holes for mounting on a backboard. The bottom plate protrudes 3", is drilled for the two types of transformers, and has a terminal clearance hole 2" in diameter. It comes with 6 nuts, 6 lockwashers, and two bolts. (Figure 74)



Figure 74 - GB-3613 Mounting Bracket

4.23 The 790053GB pole box is a galvanized weatherproof box approximately 4" by 4" by 6" high. It has a removable cover, a grommeted opening at the bottom for wire entrance and a fibre lining for insulation. It comes with a L shaped mounting bracket that is drilled for backboard mounting and accommodates the GB-3608 transformer assembly and the KS-14417 autotransformer. (Figure 75)

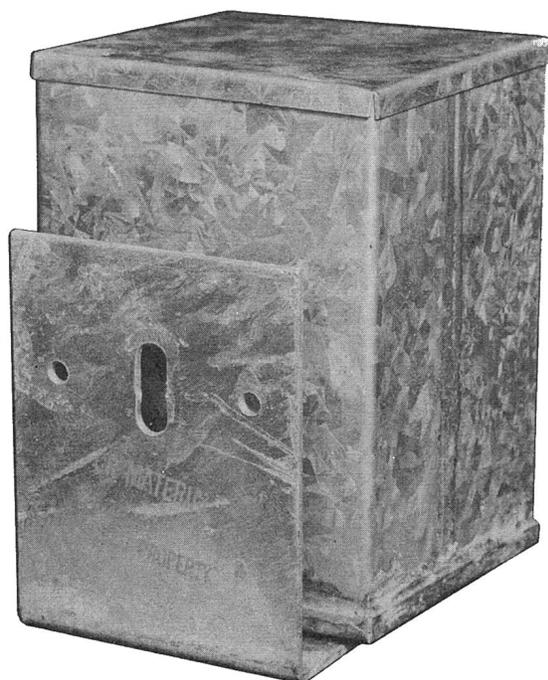


Figure 75 - 790053 Pole Box

4.24 The GB-3610 transformer box is a gray sheet metal box measuring 3-1/4" by 3-1/4" by 4" high. It provides a neater and less expensive mounting for the GB-3609 transformer assembly and the KS-12048 autotransformer where not exposed to the weather. It is drilled in the back for mounting on a backboard and in the bottom for transformers. It has two grommeted holes in the bottom for wire entrance. (Figure 76)

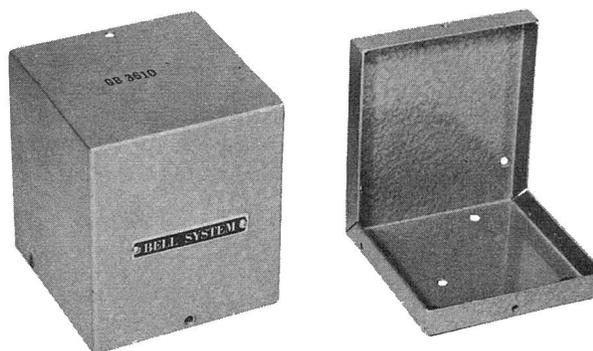


Figure 76 - GB-3610 Transformer Box

4.25 The GB-9392 speaker adapter is a small flange curved to fit the S-2 and S-4 loudspeakers. It has a 1/2" pipe connector welded in the center and comes equipped with two bolts, two nuts, and two lockwashers for fastening on the speaker housing. It is to be used with the GB-9393 mounting bracket. (Figure 77)

4.26 The University SPA adapter is a serrated swivel-mounted bracket threaded for 1/2" pipe. It is to be used with the IB8 speaker to mount on the GB-9393 mounting bracket. (Figure 77)

4.27 The GB-9393 mounting bracket consists of a flange for mounting on wall or ceiling. It has a ball-joint swivel upon which a 1/2" pipe nipple is fastened. The ball joint allows a 120° adjustment in position of speaker. Designed for use with the GB-9392 speaker adapter or the University SPA adapter. (Figure 77)

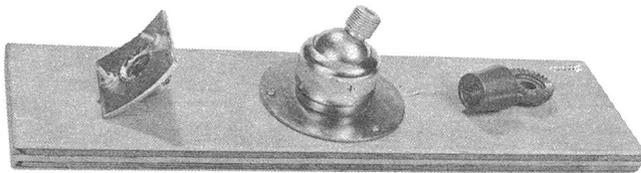


Figure 77 (Left) - GB-9392 Speaker Adapter  
(Middle) - GB-9393 Mounting Bracket  
(Right) - University SPA Adapter

4.28 GB-1516 "Bell System" Labels. The L1 and L3 labels measure 3/8" x 2". The L2 and L4 are round and measure 1" in diameter. The L1 and L2 labels are metal and require number O-PK drive pins or number 2-56 machine screws. The L3 and L4 labels are pressure sensitive adhesive type. These labels are to be used on all unmarked items of equipment to identify them as Bell System property. The list 10 label measures 1" x 3" and has red letters on an aluminum background with the wording: 'WARNING - HAZARDOUS VOLTAGES INSIDE' (Figure 78)



Figure 78 - GB-1516 "Bell System" Labels

4.29 The continual development of new items makes it impractical to list them in these practices. Appendix B of the C section of the Catalogue of Supplies contains the latest items.