VOICE PAGING SYSTEMS
DESCRIPTION, INSTALLATION, CONNECTION, ORDERING AND MAINTENANCE

CONTENTS

1. GENERAL

1.01 This Section provides description, installation, connection, ordering and maintenance information for voice paging systems.

1.02 A paging system consists primarily of three parts - an access circuit (for interfacing the telephone system and the paging amplifier), a paging amplifier, and loudspeakers. The paging amplifier and loudspeakers used in this voice paging system are manufactured by the Dukane Corporation of St. Charles, Illinois. The access circuits consist of standard Western Electric hardware.

2. DESCRIPTION

2.01 The following is a general description of the paging offering which has been developed for use in Southwestern Bell:

A. Amplifiers

2.02 The standard voice paging system consists of the 35, 60 and 100 watt package type amplifiers. The package amplifiers are designed to be shelf mounted, however, they can be rack mounted with the addition of an amplifier rack mounting kit.

2.03 All the amplifiers have both a 25 and 70 volt line output.

2.04 Following is a list of the specific Dukane amplifiers which have been used to develop this paging system:

- Dukane Model 1A1335 - 35 watt Shelf Mounted Package Amplifier
- Dukane Model 1A1360 - 60 watt Shelf Mounted Package Amplifier
- Dukane Model 1A1400 - 100 watt Shelf Mounted Package Amplifier
- Dukane Model 438296 - Rack Mounting Kit for Package Amplifiers

B. Loudspeakers

2.05 Eight loudspeaker arrangements are available for use with any of the above amplifiers:

(a) a wall mounted non-flush type (similar to the K8 loudspeaker used with COM KEY paging.)

(b) a wall mounted non-flush type equipped with a volume control.

(c) a two directional wall mounted corridor type.

(d) a flush ceiling type (where the backbox will be installed by the customer.)

(e) a non-flush ceiling type.

(f) loud speaker assemble only (where the backbox and baffle are provided by customer.)

(g) a single direction horn type typically for outdoor use (similar to the horn used with COM KEY paging.)

(h) a two directional twin horn type with a universal mounting.

2.06 The first six loudspeaker arrangements use an 8" seamless cone type speaker. Each speaker comes equipped with a 25 volt or 70 volt line matching transformer. This transformer has four power settings (1/2, 1, 2 and 4 watts) available to set the desired loudness.

2.07 The horn type speakers also come equipped with a line matching transformer and 5 power settings (0.9, 1.8, 3.8, 7.5 and 15 watts) which can be adjusted with a screwdriver. These horns are weatherproof and can be used outdoors. Horns are about 20% more efficient than a speaker. This means they have the capability of providing more sound in decibels per watt of power. Horns have a higher pitched frequency range than do cone speakers. This may make them inappropriate for purposes of background music, but does make them effective in other ways. Most industrial noise is low frequency and the high frequency horn has the ability to easily penetrate this noise. In high noise areas, better results will be obtained by using more horns at lower power than less horns at more power.

2.08 As an option an area volume control is available to permit customer adjustment of more than one loudspeaker. This volume control is available in two sizes, 10 watts capacity, and 100 watts capacity.

2.09 Following is a list of specific items of Dukane equipment involved:

- Dukane Model 5A527 - 8" Speaker with 25 volt transformer Assembly
- Dukane Model 5A525 - 8" Speaker with 70 volt Transformer Assembly
- Dukane Model 6A557 - Speaker, 25 volt Transformer, and Wall Baffle Assembly
- Dukane Model 6A555 - Speaker, 70 volt Transformer, and Wall Baffle Assembly
- Dukane Model 6A560 - Speaker, 70 volt Transformer, Volume Control and Wall Baffle Assembly
- Dukane Model 5A30 - 15 watt Re-Entrant Horn
- Dukane Model 5A262 - 30 watt Two-Way Re-Entrant Horn
- Dukane Model 6A332 - Corridor Wall Baffle (5A525 and 5A527 speakers)
- Dukane Model 6A339 - Ceiling Baffle (5A525 and 5A527 Speakers)

- Dukane Model 145223 - Flush Mounted Backbox (for use with 6A339 Baffle)
- Dukane Model 145225 - Surface Mounted Backbox (for use with 6A339 Baffle)
- Dukane Model 9A780 - 100 Watt Area Speaker Volume Control
- Dukane Model 9A1550 - 10 Watt Area Speaker Volume Control

C. Access Arrangements

2.10 Access to the paging amplifiers is available as follows:

(a) From a general purpose or non-dial telephone instrument. The user can gain access by simply lifting the handset.

(b) From a multi-line key set via a pick-up key. The user can gain access by depressing the appropriate pick-up key and lifting the handset. The lamp under the key will light for supervisory purposes. This arrangement incorporates the same circuitry presently used for accessing COAM paging systems.

2.11 Since "Barge In" by other telephone users with access to the paging system is possible, if desired, cut-off or exclusion can be provided under existing tariffs in the "Key Telephone Systems" section of the General Exchange Tariff.

2.12 Access via a pick-up key from a COM KEY instrument will not be available because of the multi-line conferencing feature of COM KEY.

(a) From the dial intercom circuit in a key telephone system, a discrete intercom code must be assigned and the user can gain access by dialing the assigned code. This arrangement incorporates the same circuitry presently used for accessing COAM paging systems.

(b) If desired, the paging amplifiers can be used with the COM KEY 718, 1434, 2152 and 416 systems in place of paging system normally provided. Because of the way the COM KEY systems are designed, the COM KEY paging amplifier must be provided to interface with the internal workings of the COM KEY system. The 20A or 27A Apparatus Unit will be the access circuit between the COM KEY paging amplifier and the Dukane paging amplifier. This is the same arrangement presently used when a COM KEY customer desires access to a COAM paging system.

(c) The COM KEY systems have preassigned intercom codes for accessing paging.

(d) From a PBX or Centrex system via a discrete trunk level or switchboard position applique circuit. The same loudspeaker paging trunk presently used to access COAM paging systems will be used to access the Telco provided paging system.

NOTE: All access circuits consist of standard Western Electric hardware.

D. Zone Paging

2.13 Zone paging is available in two forms:

(a) With one amplifier per zone.

(b) With one amplifier for up to 3 zones subject to the following conditions:

(1) With key set access this arrangement requires one pick-up key for talking purposes and a discrete non-locking key per zone. The user gains access to the paging amplifier by lifting the handset and then depressing the appropriate non-locking key while paging.

(2) With key system dial intercom access to this arrangement requires a discrete intercom code per zone.

(3) Not available with COM KEY 416 and 718 systems because of technical limitations. With COM KEY 1434 and 2152 zone paging can be provided in accordance with the existing standard practice for COM KEY 1434 and 2152 zone paging. That is, a discrete intercom code, access circuit and paging amplifier are always required per zone.

(4) Not available with PBX or Centrex systems because of technical limitations. When zone paging is required with PBX or Centrex systems, a discrete level, loudspeaker paging access trunk and amplifier are required per zone.

(5) This type of zone paging will require load switching on the paging amplifier and, therefore, will be limited to a maximum of 30 watts per zone. If more than 30 watts per zone are required, a separate amplifier per zone must be provided.

(6) The combined wattage of all zones cannot exceed the rated output of the paging amplifier.

2.14 All-zone paging will be available as an optional feature with most multi-zone paging arrangements.

2.15 All-zone select circuits and associated apparatus consist of standard Western Electric hardware (primarily key telephone units).

E. Background Music Provisions

2.16 As an option, an access arrangement has been developed to permit customer-provided background music over the paging system. This arrangement is only available with paging systems which have one amplifier per zone.

2.17 The music will be cutoff on the zone being paged.

2.18 This access arrangement is not applicable with COM KEY systems because with COM KEY background music is a standard optional feature.

F. Block Diagrams

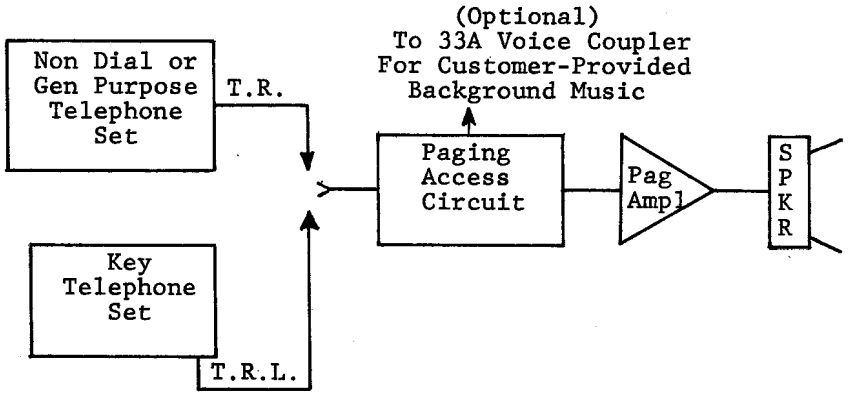
2.19 See Figures 1 through 6 for paging arrangements.

3. OVERVIEW - SYSTEM DESIGN AND LAYOUT

A. Ceiling Speakers

3.01 The purpose of this Section is to provide some rule-of-thumb guidelines for design layout of a paging system. These guidelines are by no means all inclusive and are intended primarily for installer informational purposes only. (See Figures 7 through 12)

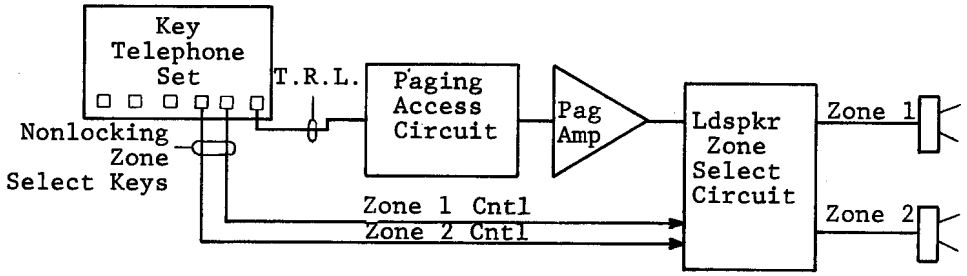
Fig. 1 Basic Paging with Telephone Set Access
(one zone or one amplifier and one access circuit per zone)



Notes:

1. When more than one zone is provided all-zone paging is available as an option.
2. This arrangement is not available for use with COM KEY sets.

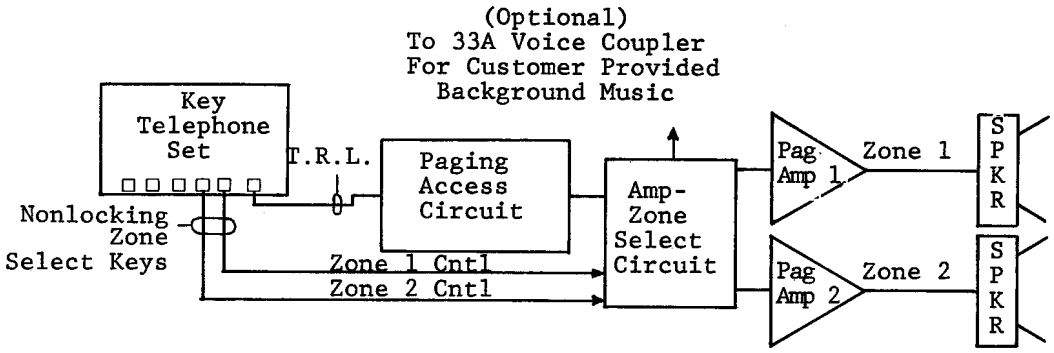
Fig. 2A Zone Paging with Key Telephone Set Access
(multi-zone with one access circuit, one amplifier and loudspeaker select circuit)



Notes:

1. A maximum of 3 zones is available. A dedicated non-locking key or external button is required per zone.
2. Each zone cannot have more than 30 watts of power.
3. The combined wattage of all zones cannot exceed the rated output of the amplifier.
4. All-zone paging is available as an option.
5. Background music is not available.
6. This arrangement is not available for use with COM KEY sets.

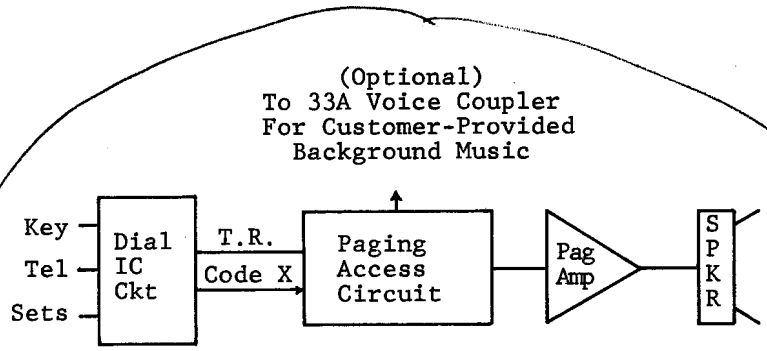
Fig. 2B Zone Paging with Key Telephone Set Access
(multi-zone with one access circuit, an amplifier per zone and an amplifier select circuit)



Notes:

1. A maximum of 3 zones are available. A dedicated non-locking key or external button is required per zone.
2. All-zone paging is available as an option.
3. This arrangement is not available for use with COM KEY sets.

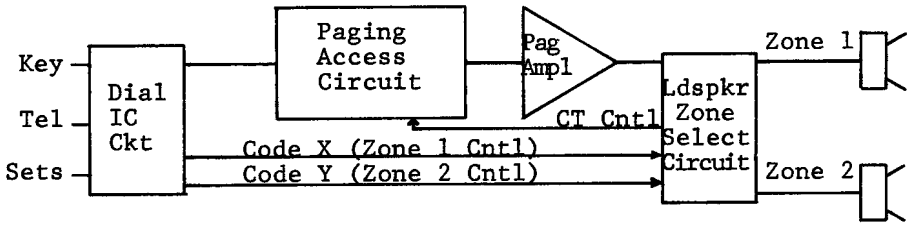
Fig. 3 Key System Dial Intercom Access
(one zone or one amplifier and one access circuit per zone)



Notes:

1. This arrangement can be used with the selector only, single link or two link dial intercom systems.
2. A dedicated intercom code is required.
3. With two link dial intercom systems both links will be tied up during paging.
4. When more than one zone is provided, all-zone paging can be provided as an option.
5. This arrangement is not applicable on COM KEY systems.

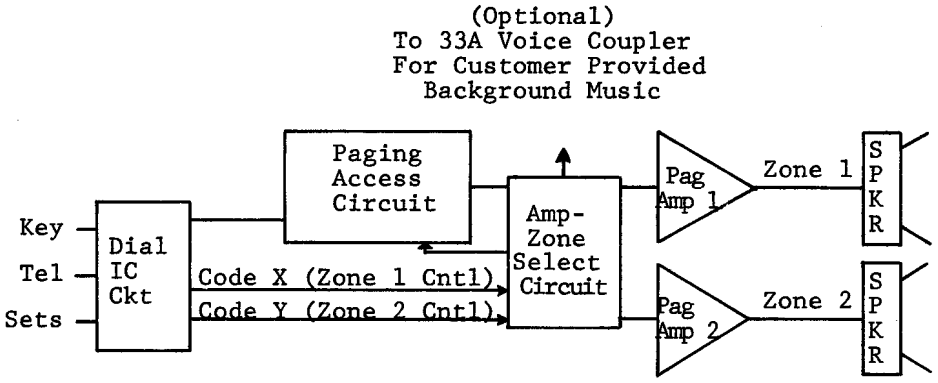
Fig. 4A Zone Paging with Key System Dial Intercom Access (multi-zone with one access circuit, one amplifier and a loudspeaker select circuit)



Notes:

1. A maximum of 3 zones is available. A dedicated intercom code is required per zone.
2. This arrangement can be used with the selector only, single link or two link dial intercom system.
3. With two link dial intercom systems both links will be tied up during paging.
4. Each zone cannot have more than 30 watts of power.
5. The combined wattage of all zones cannot exceed the rated output of the amplifier.
6. All-zone paging is available as an option.
7. Background music is not available.
8. This arrangement is not applicable on COM KEY systems.

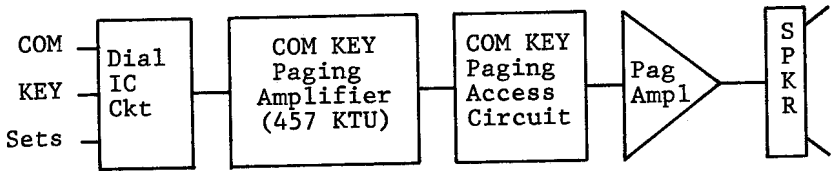
Fig. 4B Zone Paging with Key System Dial Intercom Access (multi-zone with one access circuit, an amplifier per zone and a Zone Select Amplifier)



Notes:

1. A maximum of 3 zones is available. A dedicated intercom code is required per zone.
2. This arrangement can be used with the selector only, single link or two link dial intercom system.
3. With two link dial intercom systems both links will be tied up during paging.
4. All-zone paging is available as an option.
5. This arrangement is not applicable on COM KEY systems.

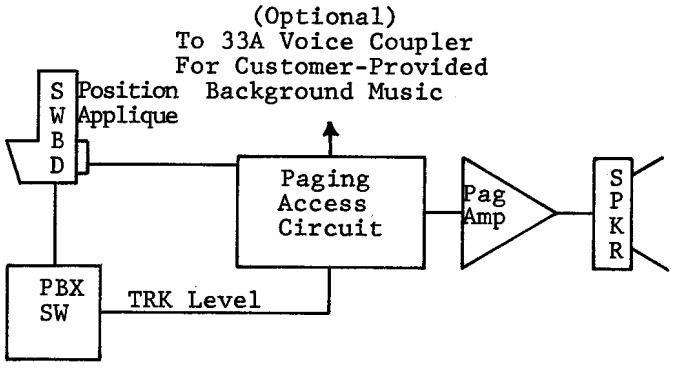
Fig. 5 COM KEY Dial Intercom Access
(one amplifier and one access circuit per zone)



Notes:

1. The COM KEY systems have preassigned dedicated intercom codes for paging access;
   COM KEY 416 - Key Operated (only one zone available)
   COM KEY 718 - Code 2 (only one zone available)
   COM KEY 1434 - Codes 4, 5 and 6 (3 zones available)
   COM KEY 2152 - Codes 37, 38 and 39 (3 zones available)
2. A dedicated amplifier per zone is always required with COM KEY.
3. Background music is available as an optional feature of the COM KEY system.
4. Refer to the BSP for the particular COM KEY system used.

Fig. 6 PBX or Centrex Access
(one amplifier and one access circuit per zone)



Notes:

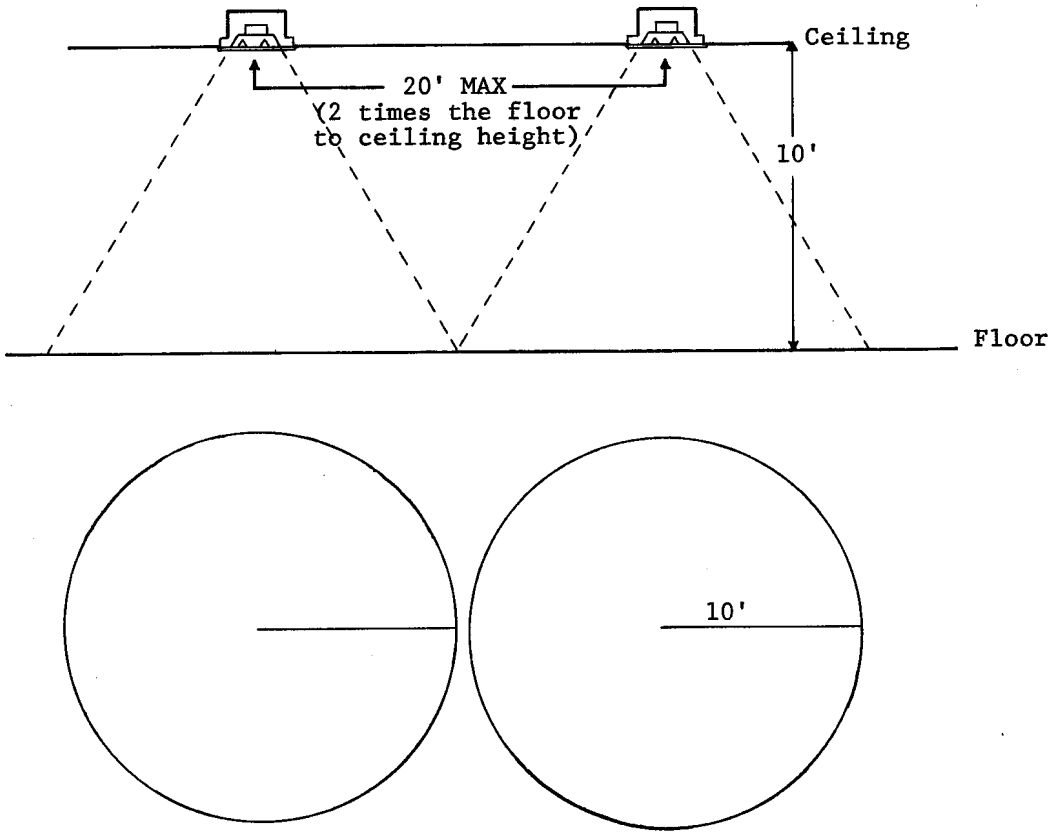
1. This arrangement is available on a level access or switchboard position access basis or both. Direct attendant access cannot be provided on all PBX/CTX consoles.

2. A dedicated amplifier per zone is always required with PBX or Centrex systems.

3. All-zone paging is available as an option.

CEILING SPEAKERS

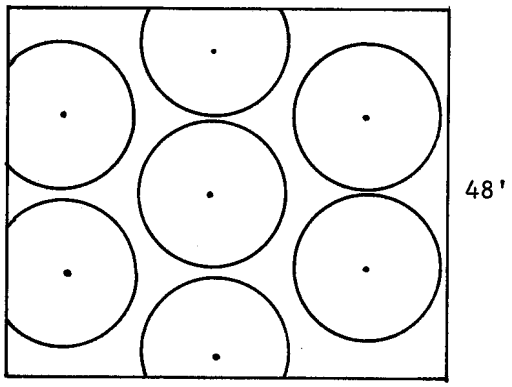
Figure 7
(See Par. 3.02 and Table A)



Guidelines

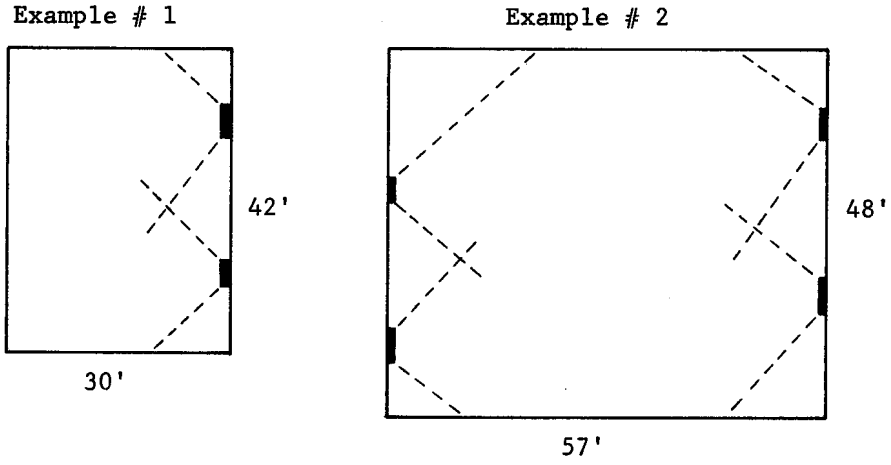
(a) Speakers should be spaced 1-1/2 to 2 times the ceiling height.
(b) Speakers in corridors should be spaced no more than 2 times the ceiling height.
(c) Speakers should be tapped at 1/2 watt for relatively quiet areas and 1 to 2 watts for noisy areas (70 to 85 dB).
(d) At eight foot ceiling height - one speaker for every 250 square feet.
(e) At ten foot ceiling height - one speaker for every 400 square feet.
(f) At fifteen foot ceiling height - one speaker for every 900 square feet.

Speaker Layout
Figure 8



10' Ceiling - 2736 Sq. Ft.

Wall Speaker Placement
Figure 9
(See Par. 3.06)



Guidelines

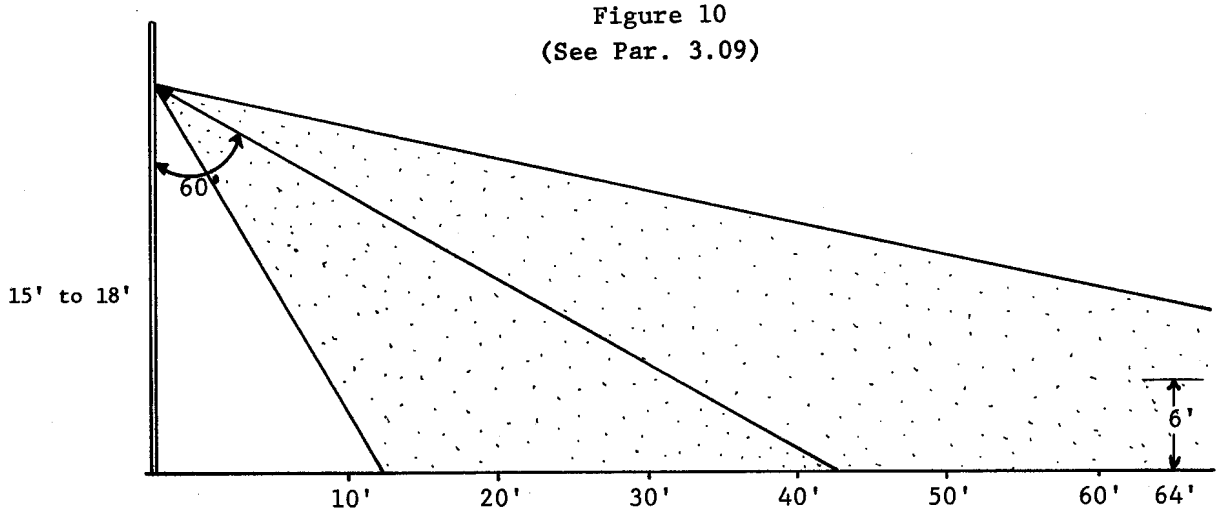
(a) One speaker per 600 square feet with maximum projection of thirty feet. (Speaker coverage reduced to 450 square feet where divider panels are used.)

(b) Alternate speakers on opposite walls only if no other choice.

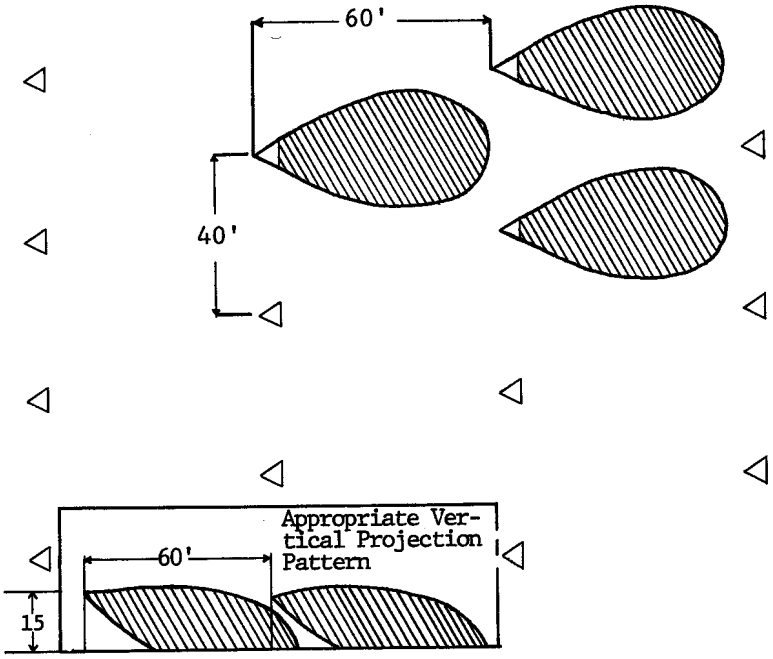
(c) Speakers should be tapped at one watt in normal areas and two watts in noisy areas (70 to 85 dB).

(d) Individual volume controls can be installed to facilitate customer preferences.

Horn Coverage
Figure 10
(See Par. 3.09)



"Diamond Pattern"
Figure 11
(See Par. 3.15)



3.02 As ceiling height increases, the area that each speaker covers increases.

3.03 To assist in determining the total number of speakers required, the basic guidelines previously discussed have been converted into Table A.

Table A Ceiling Height for Speakers

COVERAGE AREA	CEILING HEIGHT					
	8'	9'	10'	12'	15'	20'
250'	1	1	1	1	1	1
500'	2	2	1	1	1	1
750'	3	2	2	2	1	1
1000'	4	3	3	2	2	1
1250'	5	4	3	3	2	1
1500'	6	5	4	3	2	1
2000'	9	7	5	4	2	2
3000'	12	10	8	6	3	2
4000'	18	13	10	8	4	3

3.04 The final step is to determine general placement of these speakers. This is necessary, as it serves as a double check to the basic calculations and as a guide for the installer.

3.05 An example of speaker layout for minimum coverage. Final determination should also take into account the physical layout of furniture and the people (Figure 8).

B. Wall Speakers

3.06 In some installations, the use of ceiling speakers is impractical because of plaster ceilings or open ceilings where there is no place to mount them. When this situation arises, the wall speaker should be used. This is the same speaker and transformer used in the ceiling, but it is now included in an enclosure (baffle), so it can be surface mounted on a wall or pillar.

3.07 Wall speakers should be mounted on the same wall as long as you are not trying to project more than thirty feet (See example 1 in Figure 9). If the area to be covered requires projection of more than thirty feet, speakers can be placed on opposite walls, but they should be alternated as shown in example 2 in Figure 9. Mount speakers at least seven to eight feet above floor.

3.08 One other type of wall baffle is the bi-directional corridor speaker. Its use is in corridors and hall ways. This baffle with one speaker can project sound in two directions and covers approximately 600 square feet in either direction. The rules concerning wattage taps are the same as the previously mentioned wall speaker.

C. Horns

3.09 Horns are used in noisy areas, and/or outdoors because they have the ability to cover enormously large areas. The area of coverage will differ greatly based on the height of the horn and the angle of projection, as well as the ambient noise level. (See Figure 10)

3.10 Figure 10 shows that a horn mounted at a height of 15 to 18 feet and set at a 60 degree angle of projection will allow you to cover approximately 2,500 square feet. This is appropriate in areas where the noise level does not exceed 75 to 80 dB. The area of coverage should be reduced to approximately 1,200 square feet in extremely noisy areas of 90 dB or above.

(a) One horn per 2,500 square feet in noisy areas.

(b) One horn per 1,200 square feet in very noisy areas.

Table B should assist in determining what wattage to set the individual horn:

Table B

Power Requirements For 5A30 (Single Horn)

Noise Level in Decibels	Distance From Horn in Linear Feet			
	8'	16'	32'	64'
100	15W beyond speaker range			
90	.09	1.8W	7.5W	15W
80			0.9W	3.9W
70				0.9W

3.11 The bi-directional horn (5A262) serves the same function as the bi-directional corridor baffle. This horn should be treated as two (2) 5A30 horns mounted back to back. It therefore, has the capacity to cover approximately 2,500 square feet in both directions (5,000 square feet total). To determine wattage requirements of this horn, see Table C.

Table C

Power Requirements For 5A262 (Twin Horn)

Noise Level in Decibels	Distance From Horn in Linear Feet			
	8'	16'	32'	64'
100	30W beyond speaker range			
90	3.7W	7.5W	15W	30W
80			3.7W	7.5W
70				1.8W

3.12 Applications are somewhat limited for this horn. Its prime function will be aisleways in a warehouse or manufacturing plant or used on shipping docks.

3.13 Again, general placement of the horns should be determined. It should also be pointed out that common sense plays as much a part in horn location as does any scientific theories.

3.14 Although there are probably several ways to determine horn placement, the most widely accepted method within the sound industry is that of the "diamond pattern." Figure 11 shows what is meant by this approach.

3.15 It is obvious where the term "diamond pattern" came from. There are several reasons why this method is so effective. Most important is the fact that all horns are pointed in the same direction. They all complement each other. (It should be strongly pointed out that horns should never be directed at each other!) Another one of the advantages of this pattern is that each horn helps fill in a void area left in between two other horns. The spacing of sixty feet and forty feet, as indicated, is also a good rule to follow whenever possible. Of course, you do not always have large open areas to work with as this example shows, however, the fundamentals should be followed.

Guidelines For Fig. 11

(a) Always point horns in the same direction and in a diamond pattern whenever possible.

(b) Spacing of horns should be approximately forty feet apart and sixty feet projection.

D. Determining Amplifier Size

3.16 In determining power requirements, it is necessary to approximate the amount of background noise present in the location to be covered. The following is a general guide in estimating dB of noise level. It should be pointed out that these values will vary within installations, but these are some basic guidelines. Exact noise level measurements should be taken in critical high noise areas.

		dB Of Noise Level
(a)	Normal	
	Rustling leaves	20
	Whisper at five feet	34
	Mens clothing dept. of large store	55
	Conversational speech	60
	Average restaurant	60
	General office areas	65-70
	Bank	65
(b)	Noisy	
	Shipping dept.	70
	Vacuum cleaner in private residence	70
	Factory (average)	75
	Supermarket	75
	Restaurant (noisy)	75
	Assembly lines	80
	Lunch rooms (full)	80
(c)	Very noisy	
	Printing press	85
	Factory (noisy)	90
	Metal shop	85-90
	Machine shop	85-90
	Heavy city traffic	92
	Air compressor	94
	Home lawn mower	95
	Jet air liner (500 feet overhead)	115

3.17 After determining the total number of speakers and horns required for the system and the individual power requirements, the last thing to do is to determine the size of the amplifier necessary to power this system. This is the simplest of all the tasks. You merely add up the power requirements of all the speakers and horns and get the total watts of power required. For example:

(6) - ceiling speakers at 1/2 watt each
(2) - wall speakers at 1 watt each
(4) - horns at 3.8 watts each
Total power required - 20.2 watts

3.18 The power required for the system should not exceed eighty percent of the rated capacity of the amplifier. This is done to allow some flexibility within the system. It allows for future expansion and provides some safety margin for any miscalculation of power required. With this in mind, in the above example, 20.2 watts is required and, therefore, the amplifier that should be used is Model 1A1335 (35 watt amplifier.)

E. Additional Features

3.19 Voice paging systems are primarily designed for paging with incidental background music. However, if background music is desired, it will be the customer's responsibility to provide the music source. The Telephone Company will provide the interconnect unit between the customer-provided music source and the paging access circuit. This interconnect unit will be the 33A Voice Coupler which is the same unit presently used with the COM KEY Systems. The 33A Voice Coupler presents an 8 ohm load to the customer's music source.

3.20 When the paging system includes background music, such systems normally require 1 1/2 to 2 times as many speakers as a paging only system.

3.21 The provision of zone paging will depend on the particular requirements.

F. Feedback

3.22 The term "feedback" applies to an audible howl or singing noise caused by the sound waves feeding back from a speaker or horn into a microphone or telephone transmitter. (See Figure 12). Normally this is caused by the speaker or horn being in close proximity to the telephone or to the acoustic properties of a room.

If feedback does occur after installation, following are some suggested ways to eliminate the problem.

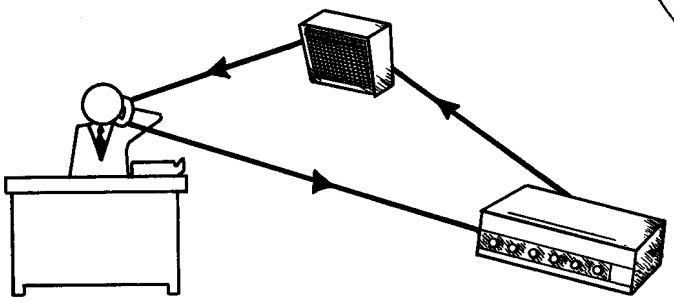
(a) Move the speaker.

(b) Noise cancelling transmitter.

(c) Volume control on the speaker.

(d) Automatic speaker disconnect.

Feedback
Figure 12



3.23 If these efforts are not effective, the installation person should consult Engineering.

G. Additional References

3.24 Bell System Practice 981-251-100 provides more guidelines and practical design information regarding voice paging systems.

4. INSTALLATION, CONNECTION, AND ORDERING INFORMATION

4.01 This paging offering is designed so that the Marketing sales person can layout and sell a paging system using certain rule of thumb guidelines. (See Exhibits 33, 34 and 35).

4.02 When a paging system is sold it will be necessary for the Marketing person to provide the Plant Foreman with a customer's floor plan (see Exhibit 34) showing the proposes location of each speaker, its type and its wattage setting. It will also be necessary for the Marketing person to complete and forward to the Plant Foreman an Amplifier Load Record and Worksheet (Exhibit 35). On initial paging systems proposals it is recommended that the loudspeaker load compilations (watts) not exceed 80% of the rated output of the amplifier. This 20% margin allows for errors and changes of loudspeaker loudness levels, loss of distribution wiring and future speaker additions.

4.03 All equipment will be purchased through Western Electric. When the service order is received, Plant installation should order the Dukane equipment via a hard copy requisition and instruct Western to place the order on the Dukane Corporation, Telecommunications Division, St. Charles, Illinois 60174. All Western Electric equipment should be ordered in accordance with standard procedures

4.04 Specific installation information is contained in Part 4-B of this Section. This Section contains all the technical details about the paging offering and no other CD's or SD's are available.

4.05 Section 4-C contains the Ordering Guide. This Section contains information regarding USOC Code, type of equipment, quantity of equipment and reference to Exhibits required to provide this service.

4.06 Engineering involvement in the provision of the standard paging offering systems is limited to consulting only. However, when the paging system is being installed with a PBX or Centrex, the loudspeaker paging access trunk, position applique, etc., will have to be engineered. In these cases, it will be necessary for Marketing to issue a Marketing Order Form (SW1525) in the normal manner.

4.07 Requests for other special or custom engineered systems should be handled via the Special Service Arrangement Routine.

4.08 Maintenance of the Southwestern Bell paging systems should be limited to normal station repair, wiring checks and replacement of defective components. A defective component should be replaced with one known to be in good working order. A defective Dukane equipment item when removed from service should be returned to Dukane for repair. Defective Western Electric Components should be returned in accordance with standard procedures.

A. Summary of Exhibits

Exhibit 1: Manual Paging Access Circuit

This arrangement permits the paging system to be accessed from a non-key telephone set or dedicated pick-up key of multi-button key set (except COM KEY). Busy lamp connections are provided for, if required.

Exhibit 2: Manual Loudspeaker Zone-Select Relay

The loudspeaker zone-select relay may be accessed through operation of an external non-locking key or dedicated non-locking key of multi-button key set.

This circuit is limited to a maximum of 30 Watts of loudspeaker load per zone. When loudspeaker zone load exceeds 30 Watts, a separate amplifier and amplifier zone select relay (Exhibit 3) are required.

Customer provided background music cannot be provided with this circuit. If background music is desired, a separate amplifier and amplifier zone-select relay (Exhibit 3) are required.

This circuit provides connections for busy lamps and all-zone paging if required. A maximum of three (3) loudspeaker zone-select relays may be provided per amplifier and access arrangement (Exhibit 1).

The combined loudspeaker load (Watts) of all-zones cannot exceed the rated output of the associated amplifier.

This circuit is not applicable to COM KEY Systems.

Exhibit 3: Manual Amplifier Zone-Select Relay

The amplifier zone-select relay may be accessed through operation of an external non-locking key or dedicated non-locking key of multi-button key set.

This arrangement is limited to a maximum of three amplifier zones per access arrangement (Exhibit 1).

Optional customer-provided background music may be provided with this circuit.

The zone-select circuit provides connections for busy-lamp and all-zone paging if required.

Exhibit 4: Manual All-Zone-Select Relay

All zone-select circuits may be accessed through operation of an external non-locking key or dedicated non-locking key of multi-button key set. This circuit is intended to be used with Exhibits 2 and 3.

A maximum of three loudspeaker or amplifier zones may be connected to this arrangement.

Exhibit 5: Manual All-Zone-Select Relay

This circuit permits all-zone paging and is intended for use with Exhibit 1. In progress paging, all other zones will be cutoff.

Connections are provided for busy-lamp indication when all-zone page is in progress, if required.

Exhibit 6: Dial Intercom Single Zone Access Circuit

This arrangement permits the paging system to be dial accessed through an assigned intercom code of the Communicator, Selector Only, Single Link and Two Link Dial Intercom Systems.

Optional music input may be provided with this arrangement. This arrangement is not applicable to COM KEY Systems.

Exhibit 7: Dial Intercom Multi-Zone Access Circuit

This arrangement provides the common access circuit to the paging system through which this loudspeaker zone or amplifier zone-select relays (Exhibits 8 and 9) are accessed. A specific intercom code per zone is required.

This arrangement is applicable on the Communicator, Selector Only, Single Link and Two Link Intercom Systems. This arrangement is not applicable to COM KEY Systems.

Exhibit 8: Dial Intercom Loudspeaker Zone-Select Relay

The loudspeaker zone-select relay may be accessed by dialing the assigned dial intercom code of the Communicator, Selector Only, Single Link and Two Link Intercom Systems.

This circuit is limited to a maximum loudspeaker load per zone of 30 watts. When the loudspeaker zone load exceeds 30 watts, a separate amplifier and amplifier zone-select relay are required. Customer-provided background music cannot be provided with this arrangement. When background music is desired, a separate amplifier and amplifier zone relay are required.

A maximum of three (3) loudspeaker zone-select relays may be provided per amplifier and access arrangement (Exhibit 7).

The combined loudspeaker load (Watts) of all-zones cannot exceed the rated output of the associated amplifier.

This circuit is not applicable to COM KEY systems.

Exhibit 9: Dial Intercom Amplifier Zone-Select Relay

This arrangement permits the amplifier zone-select relay to be accessed by dialing the assigned intercom code of a Communicator, Selector Only, Single Link and Two Link Intercom System.

This arrangement is limited to a maximum of three (3) amplifier zone-select relays per dial access arrangement (Exhibit 7).

Optional customer provided background music can be provided with this circuit, if required.

This arrangement is not applicable to COM KEY Systems.

Exhibit 10: Dial Intercom All-Zone-Select Relay

This arrangement permits all loudspeakers on all amplifier zones to be dial accessed through an assigned intercom code of the Communicator, Selector Only, Single Line and Two Line Intercom Systems.

A maximum of three loudspeakers or amplifier zones may be connected to this circuit.

Exhibit 11: COM KEY Interface Unit to External Paging System

This arrangement provides an apparatus unit for interfacing the COM KEY paging output to an external paging system.

In addition to this unit the COM KEY Paging Amplifier must be installed.

Background music and/or music on-hold, may be provided with appropriate KTU's and connection. Zone paging can be provided as described in the COM KEY BSPs. (COM KEY BSPs are 518-450-100, 102, 106, 110 and 111).

Exhibits 12 and 13: Background Music Interconnect Unit

This arrangement provides the music interface, input and cut-off control circuit for connecting a customer-provided music source to the paging system.

One unit is required for each amplifier or amplifier zone connected.

Background music will be cut-off to the amplifier or amplifier zone, when that zone is selected or seized by the paging access circuit.

The music interface unit presents an 8 ohm impedance towards customer music source. (See BSP 463-341-102 for more technical details).

Exhibit 14: PBX Paging Access Trunks

The PBX paging trunks presently being used to access COAM paging systems can also be used to access a Telco provided paging systems.

Direct (manual) PBX. Console access to the paging system should be handled via the Special Service Arrangement Routine.

Form SW1525 is required on all engineered PBX systems.

A Paging Access Trunk, Access Code and Paging Amplifier are required for each zone.

Exhibit 15: PBX All-Zone-Select Relay

This circuit requires a PBX paging trunk and access code which when seized, will override an in progress page and seize all paging zones for a simultaneous All Zone Page.

Connections are provided to make-busy idle paging trunks during All Zone paging.

Exhibit 16: Package Amplifier (35, 60 and 100 watts)

These amplifiers are primarily for shelf mounting but optionally may be rack mounted when such mounting facilities are available.

The unit measures 5 in. high, 10 3/4 inches deep and 16 inches wide.

The customer will be required to provide a grounded duplex electrical outlet at the agreed upon location of the amplifier.

Exhibits 17 thru 24: Speakers & Horns

The Dukane 6A560 Speaker Assembly includes an 8 in. seamless cone speaker with a 70 volt line matching transformer and is equipped with volume control.

The Dukane 5A527 speaker assembly includes an 8 in. seamless cone speaker with a 25 volt line matching transformer.

The Dukane 5A525 speaker assembly includes an 8 in. seamless cone speaker with a 70 volt line matching transformer.

Wall Baffles (Dukane Models 6A557 and 6A555) are finished in brown wood grained vinyl covering, measuring 10 1/2 in. high, 13 1/2 in. wide, and 7 in. deep. The 6A557 baffle comes equipped with a speaker and a 25 volt transformer. The 6A555 baffle comes equipped with a speaker and a 70 volt transformer.

The Corridor Baffle is finished in brushed satin aluminum. It measures 9 1/4 in. high, 6 3/4 in. wide and projects 10 3/4 in. from the wall. The 5A525 or 5A527 speaker assembly must be ordered separately.

For flush ceiling mounted speaker installation, the speaker backbox and baffle can be furnished by the Telco, but must be installed by customer at his expense.

Wiring and speaker installation will be performed by Telco installation forces after completion of backbox and baffle installation by customer.

The flush speaker backbox measures 3 3/4 in. square and 3 5/8 in. deep.

A surface mounted speaker backbox and baffle are also available.

The surface backbox is of white enameled metal measuring 12 1/2 in. square and 4 in. deep.

The speaker baffle is of white stryene plastic 10 inches square.

The speaker assembly should not be mounted on ceilings lower than 9 feet in height.

The 5A525 and 5A527 speaker assemblies must be ordered separately for both the flush and non-flush ceiling mounted speaker arrangements.

Exhibit 25: Automatic or Manual Loud-Speaker Cut-Off Relay

The automatic loudspeaker cutoff arrangement when connected to a designated telephone set, provides automatic cutoff of the loudspeaker, when the telephone is offhook.

The manual loudspeaker cutoff arrangements, when connected to a exclusion key (XCL) or cutoff key (CFFXX) permits the designated speaker to be cutoff through operation of associated key. Exclusion key cutoff is recommended as loudspeaker will automatically be restored to network, when telephone set is hung up.

Exhibit 26: Area Speaker Volume Control

This unit will control 10 watts of loudspeaker power. This unit requires a single mounting outlet box and may be surface or flush mounted depending on building structure or customer preferences.

Exhibit 27: Area Speaker Volume Control

This unit will control 100 watts of loudspeaker power. This is a large unit requiring a double (two gang) mounting outlet box and may be surface or flush mounted depending on building structure or customer preferences.

Exhibit 28: Speaker Transformer Power Settings

Exhibit 29: Speaker Phasing and Wiring

Exhibit 30: Amplifier Output Load Resistor

Exhibit 31: Speaker Distribution Wire Lengths and Power Delivering Values

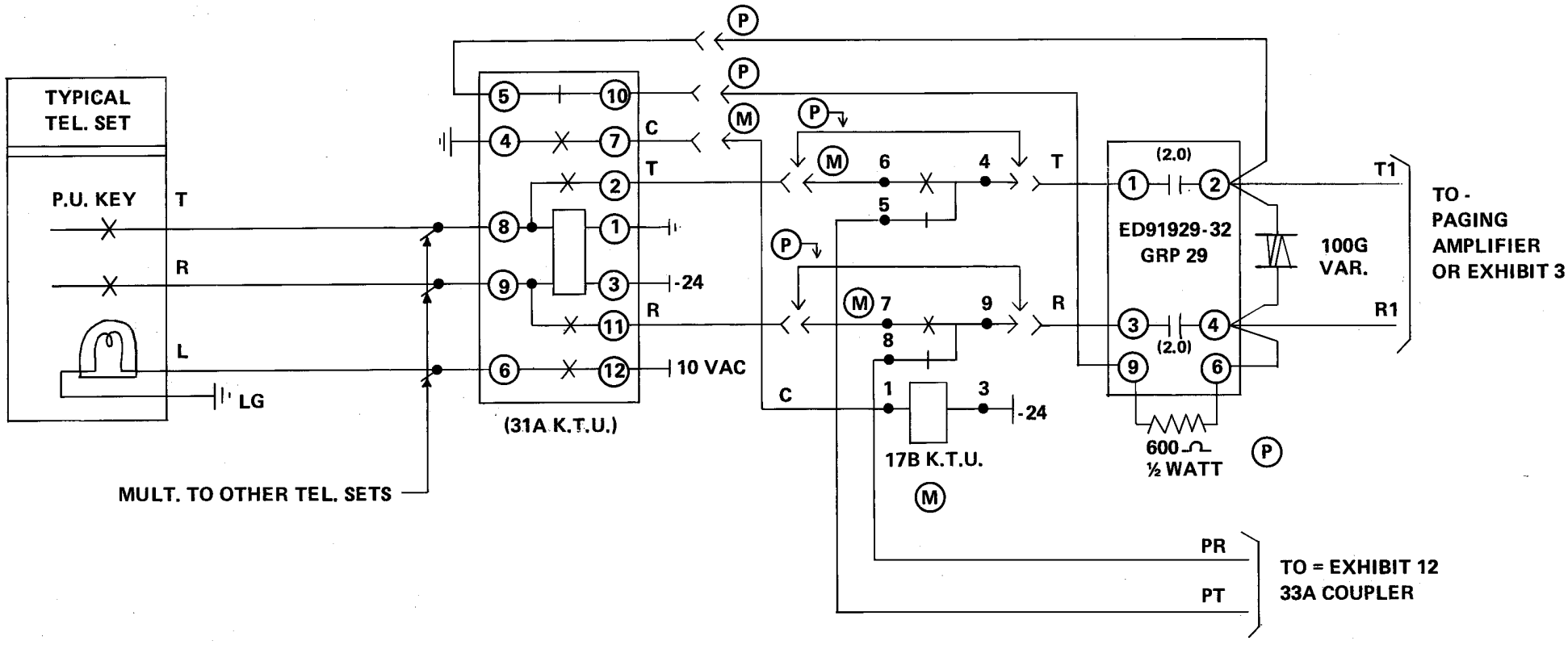
Exhibit 32: Multiple Speaker Distribution Wire Connecting Arrangements

Exhibit 33: Paging System Check List and Work Sheet

Exhibit 34: Floor Plan Sketch

Exhibit 35: Amplifier Load Record and Work Sheet

EXHIBIT 1
MANUAL PAGING ACCESS CIRCUIT
(SEE NOTE – 101)



OPTIONS –

(M) – MUSIC ACCESS PROVIDED

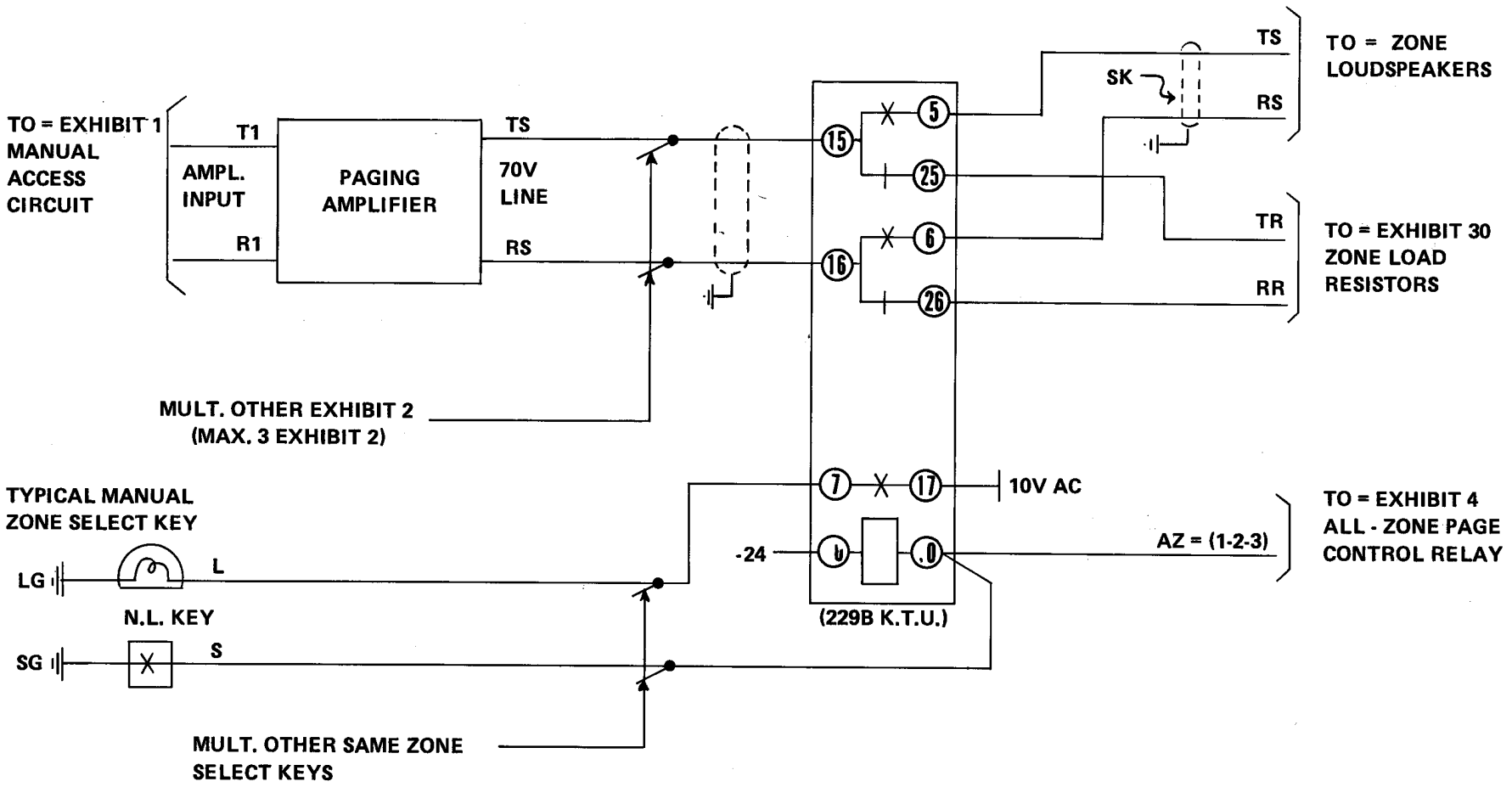
(P) – MUSIC ACCESS NOT PROVIDED

EXHIBIT 2

MANUAL LOUDSPEAKER (ZONE)SELECT RELAY – WITHOUT C.P. MUSIC

(ONE PER ZONE = MAX - 3)

(SEE NOTE - 102 - 103)



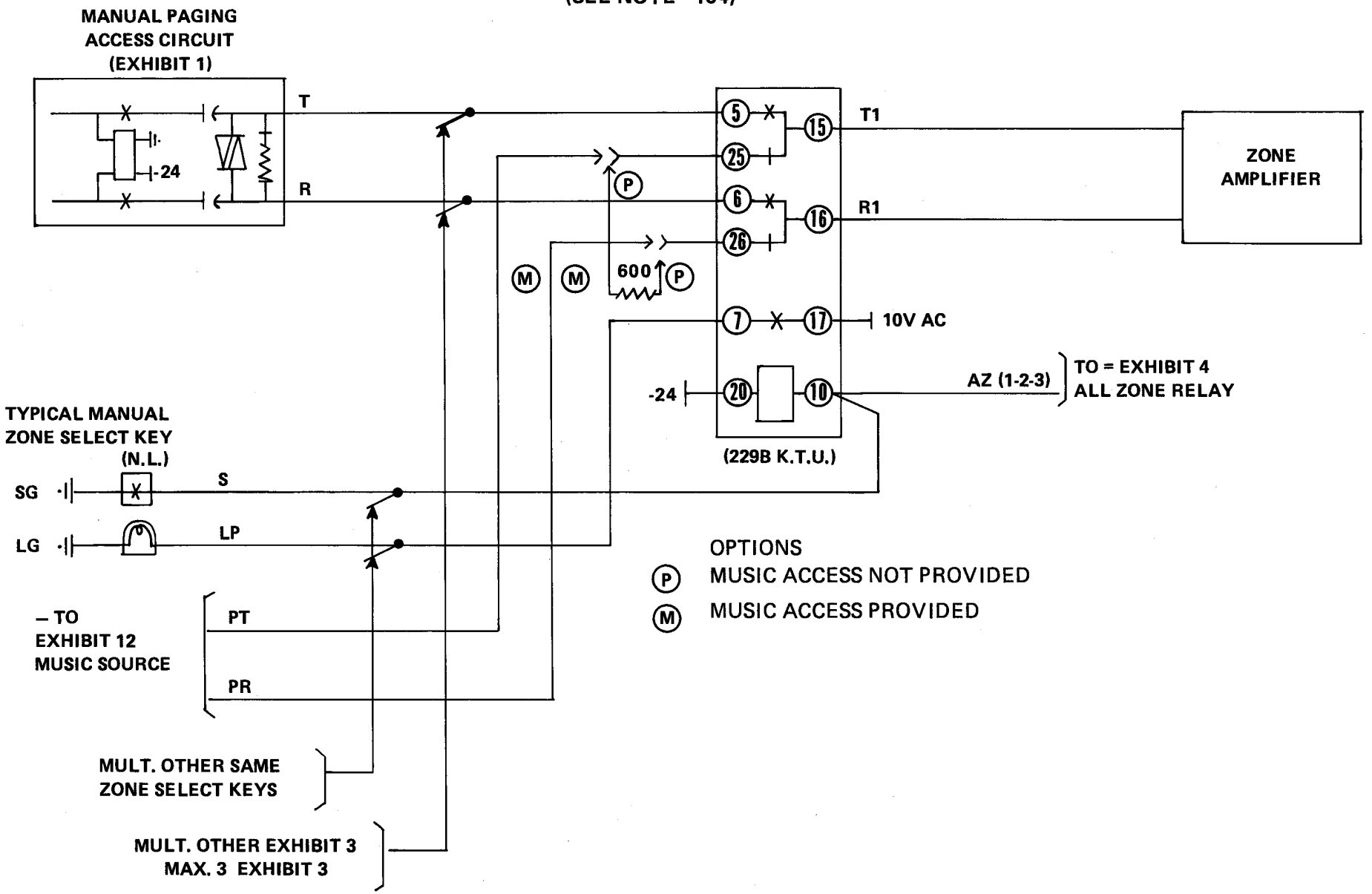
NOTE – BACKGROUND MUSIC CANNOT BE PROVIDED WITH CIRCUIT.

EXHIBIT 3

MANUAL ZONE (AMPLIFIER) SELECT RELAY

(ONE PER ZONE = MAX. - 3)

(SEE NOTE - 104)

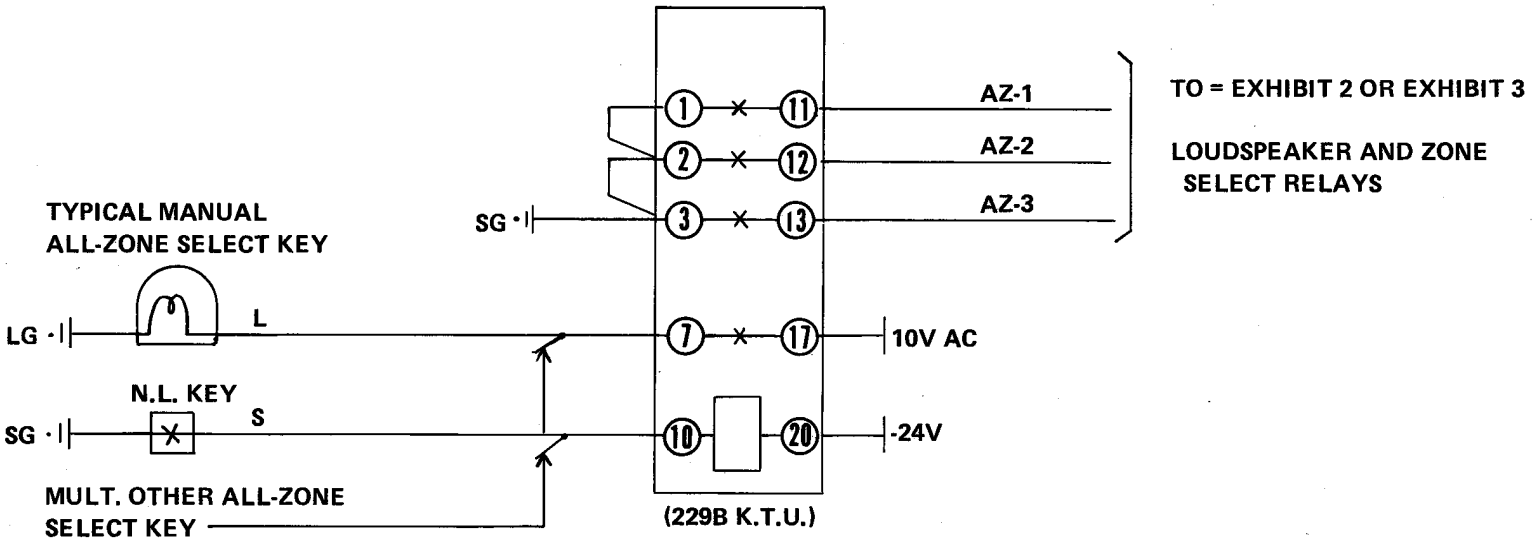


NOTE – PROVIDE Ⓟ OPTION ON EXHIBIT 1 WHEN EXHIBIT 3 IS PROVIDED.

EXHIBIT 4

MANUAL ALL-LOUDSPEAKERS AND ALL-ZONE SELECT RELAY

(ONE PER MAX. 3-ZONES)



MANUAL-PRIORITY AND ALL-ZONE SELECT RELAY

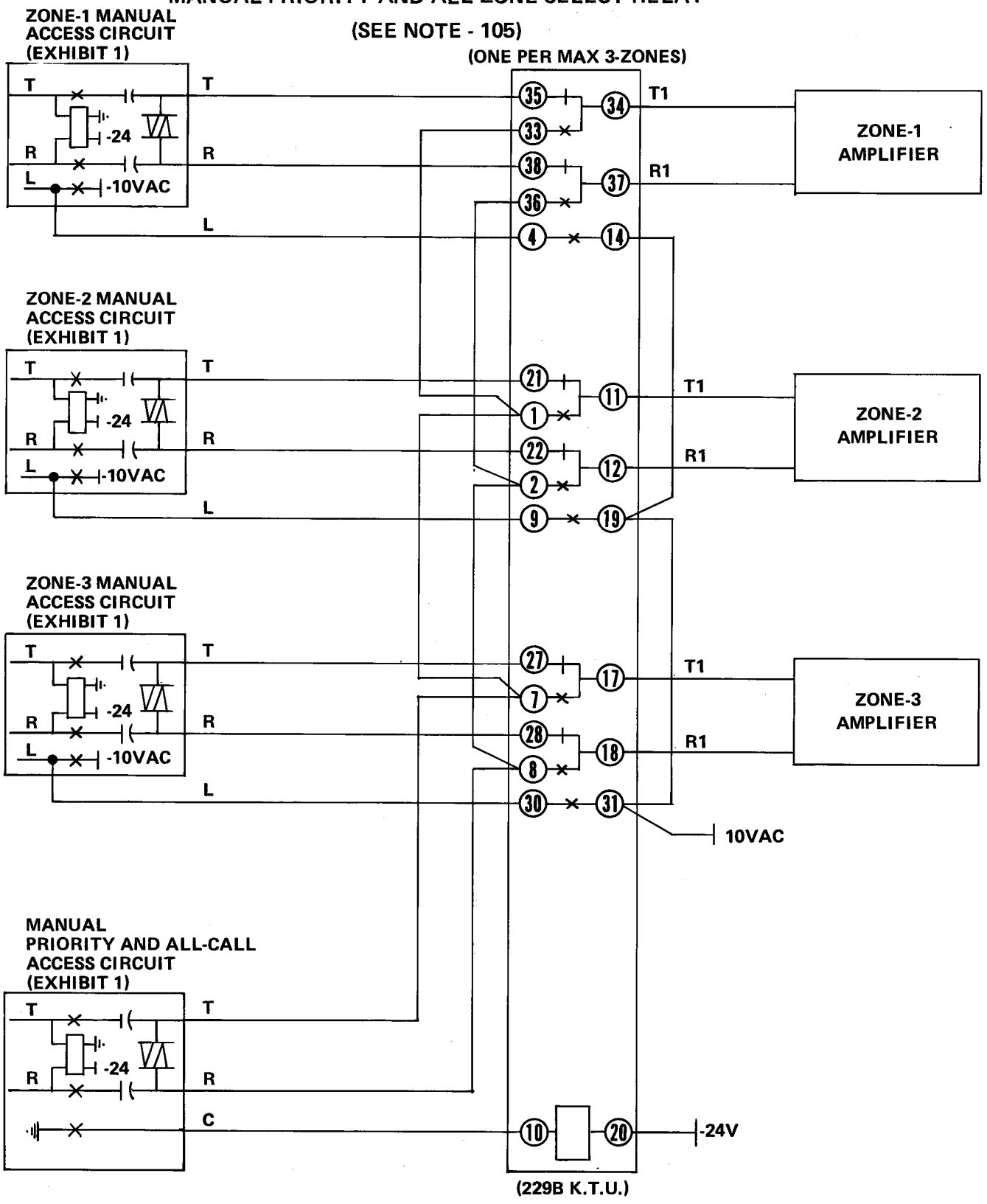


EXHIBIT 6

DIAL INTERCOM (EXCEPT COMKEY) SINGLE ZONE ACCESS CIRCUIT

(SEE NOTE - 101)

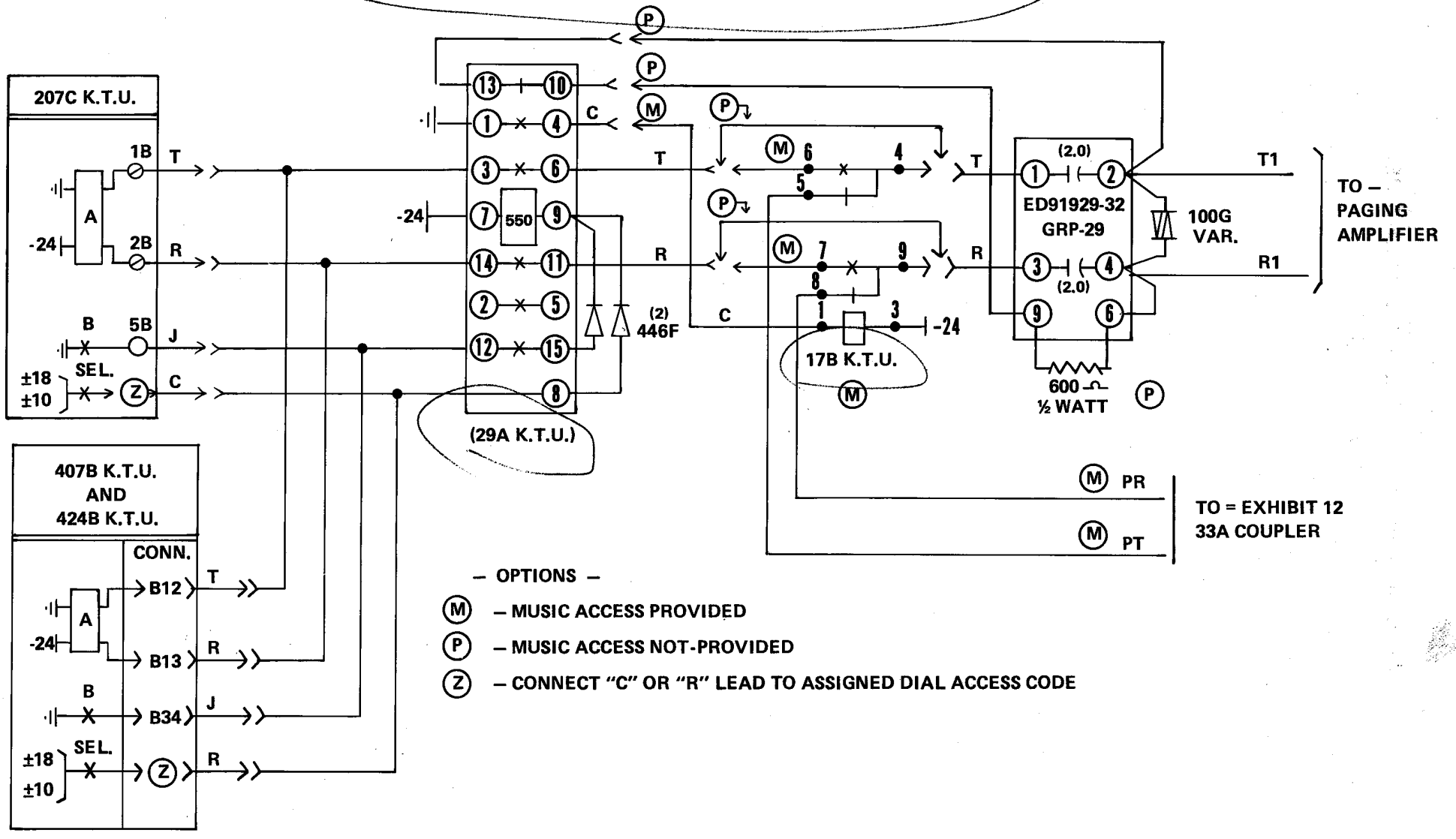


EXHIBIT 7

DIAL INTERCOM (EXCEPT COMKEY) - MULTI-ZONE ACCESS CIRCUIT

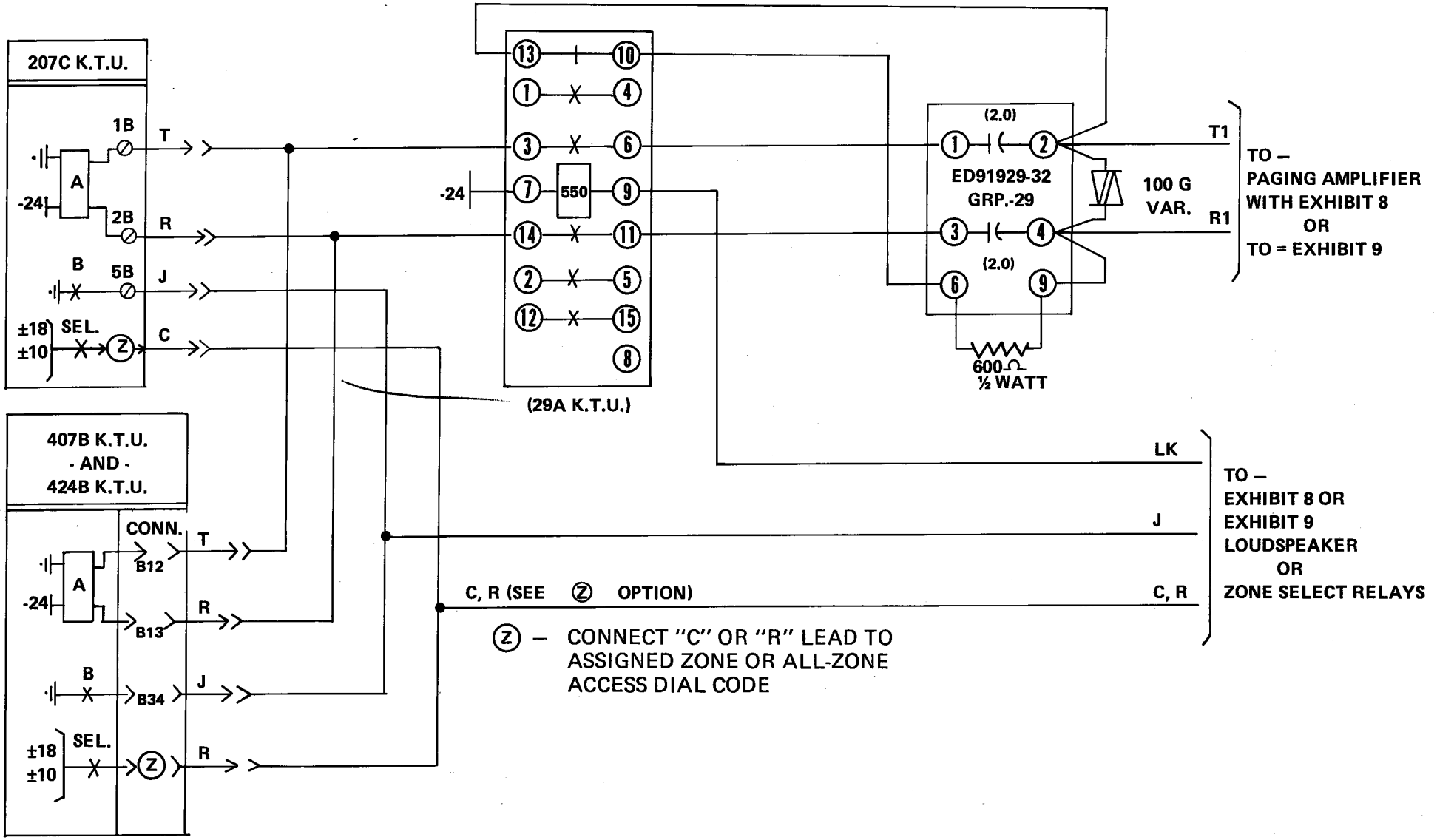
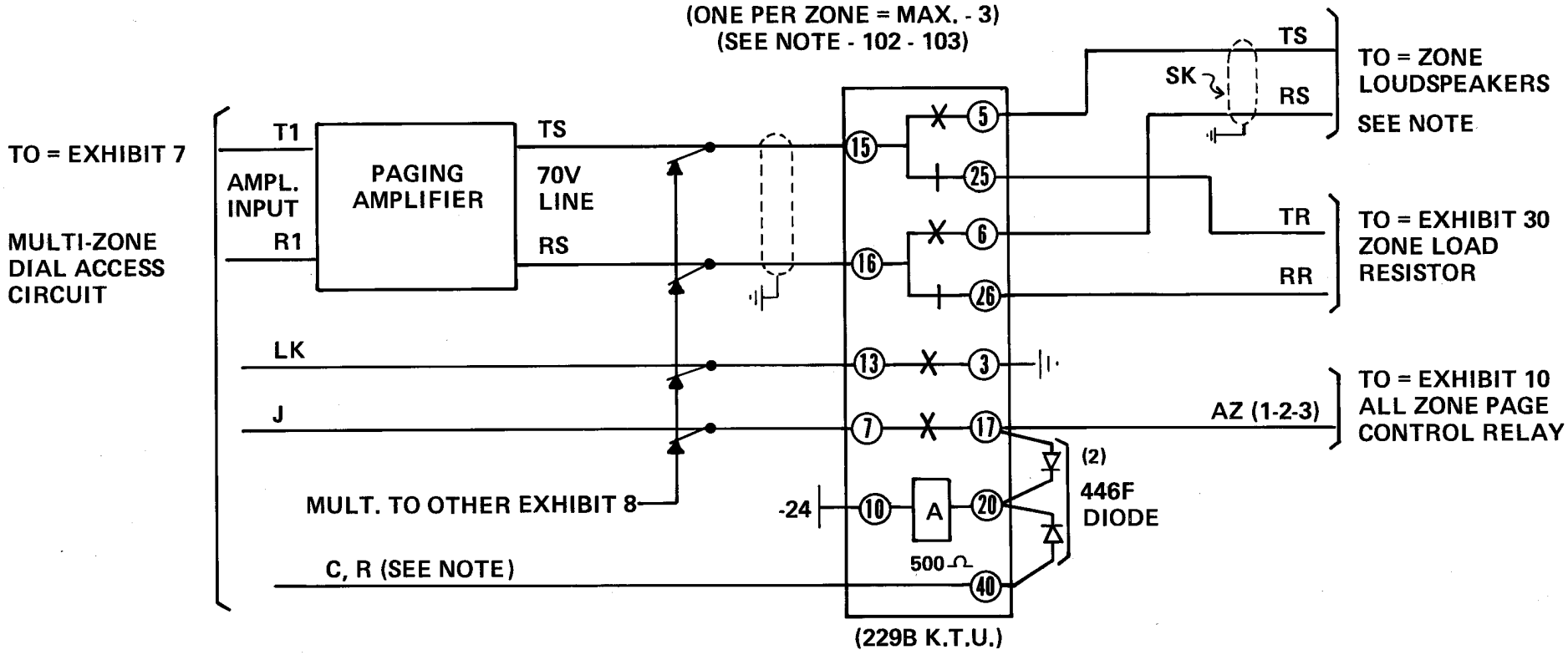


EXHIBIT 8

DIAL INTERCOM LOUDSPEAKER ZONE SELECT RELAY

WITHOUT C.P. MUSIC
(ONE PER ZONE = MAX. - 3)
(SEE NOTE - 102 - 103)



NOTE = CONNECT "C" OR "R" LEAD TO ASSIGNED ZONE ACCESS CODE.

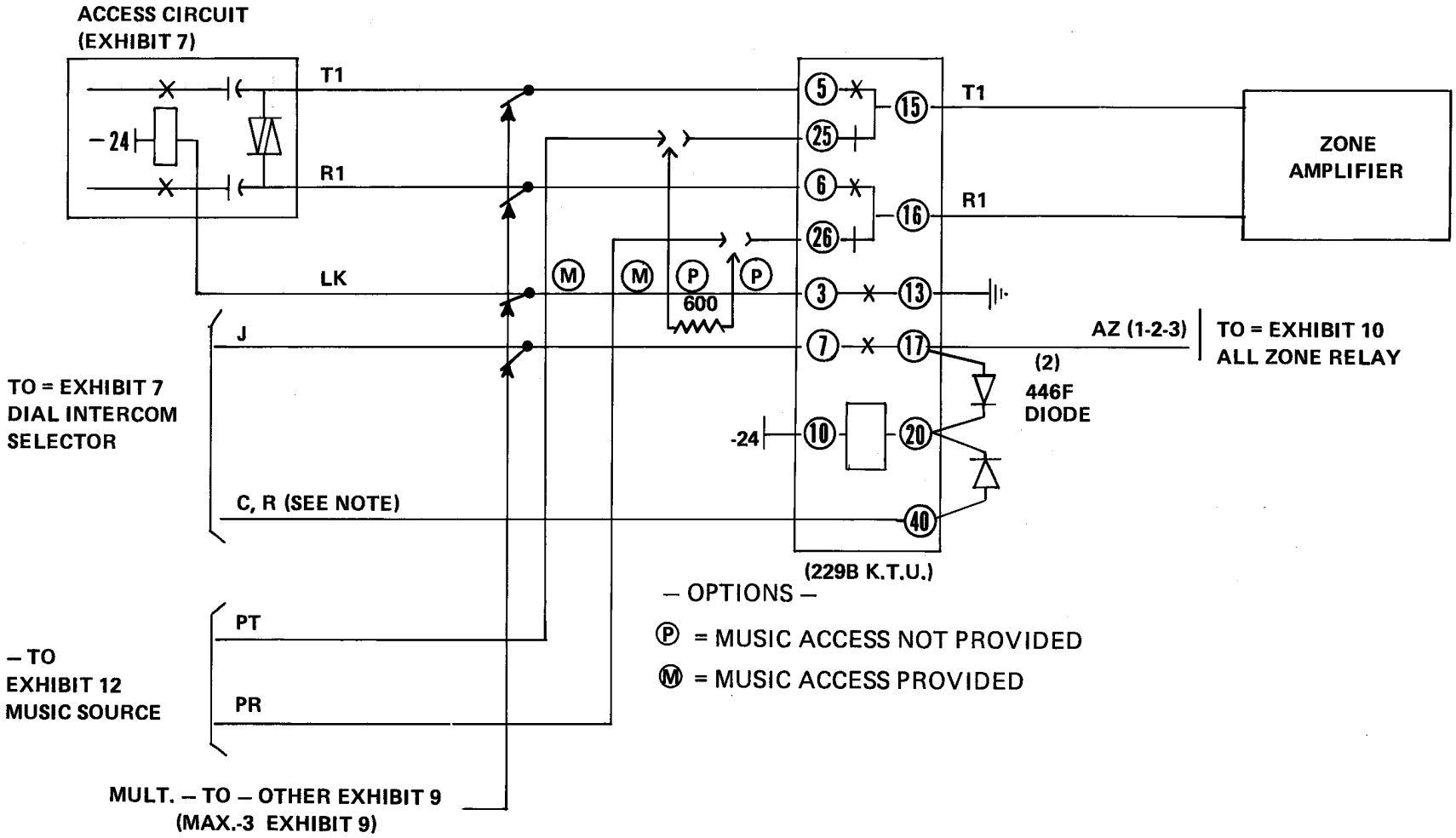
BACKGROUND MUSIC CANNOT BE PROVIDED WITH CIRCUIT.

EXHIBIT 9

DIAL INTERCOM-AMPLIFIER ZONE SELECT RELAY

(ONE PER ZONE = MAX.-3)

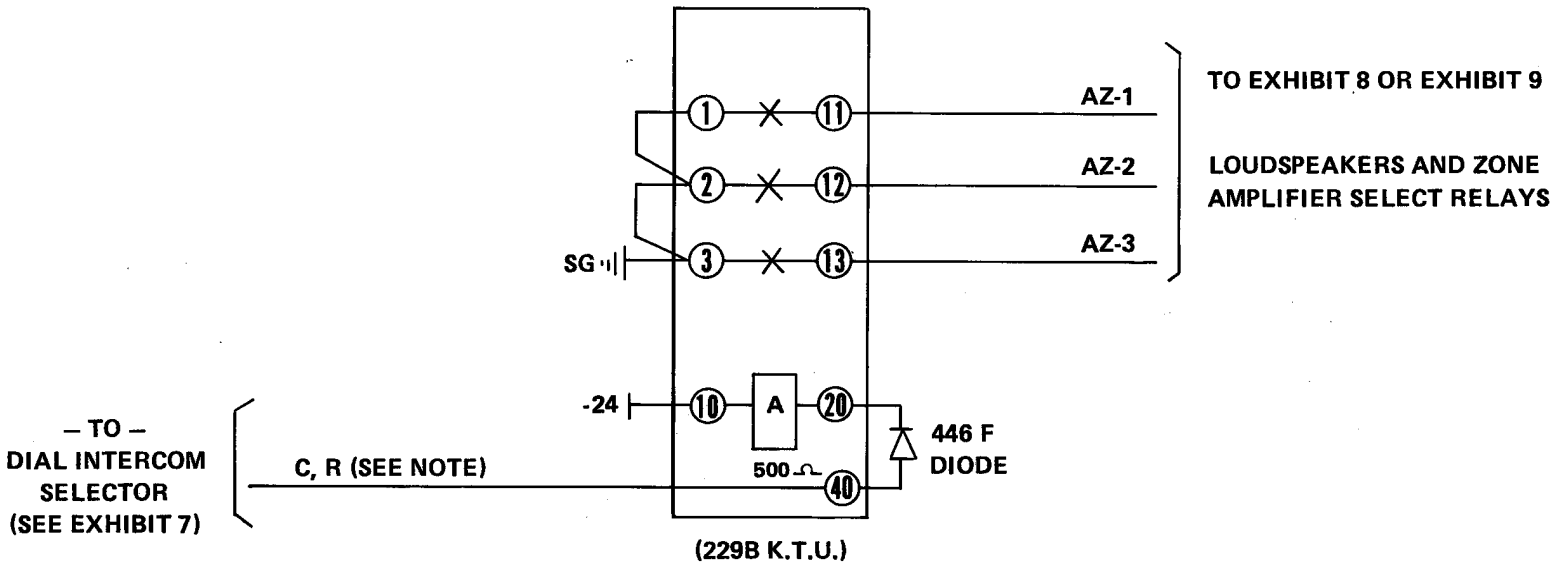
(SEE NOTE - 104)



NOTE = CONNECT "C" OR "R" LEAD TO ASSIGNED DIAL CODE

EXHIBIT 10

DIAL INTERCOM = ALL-LOUDSPEAKERS OR ALL-ZONES SELECT RELAY
(ONE PER DIAL INTERCOM ACCESS CIRCUIT)

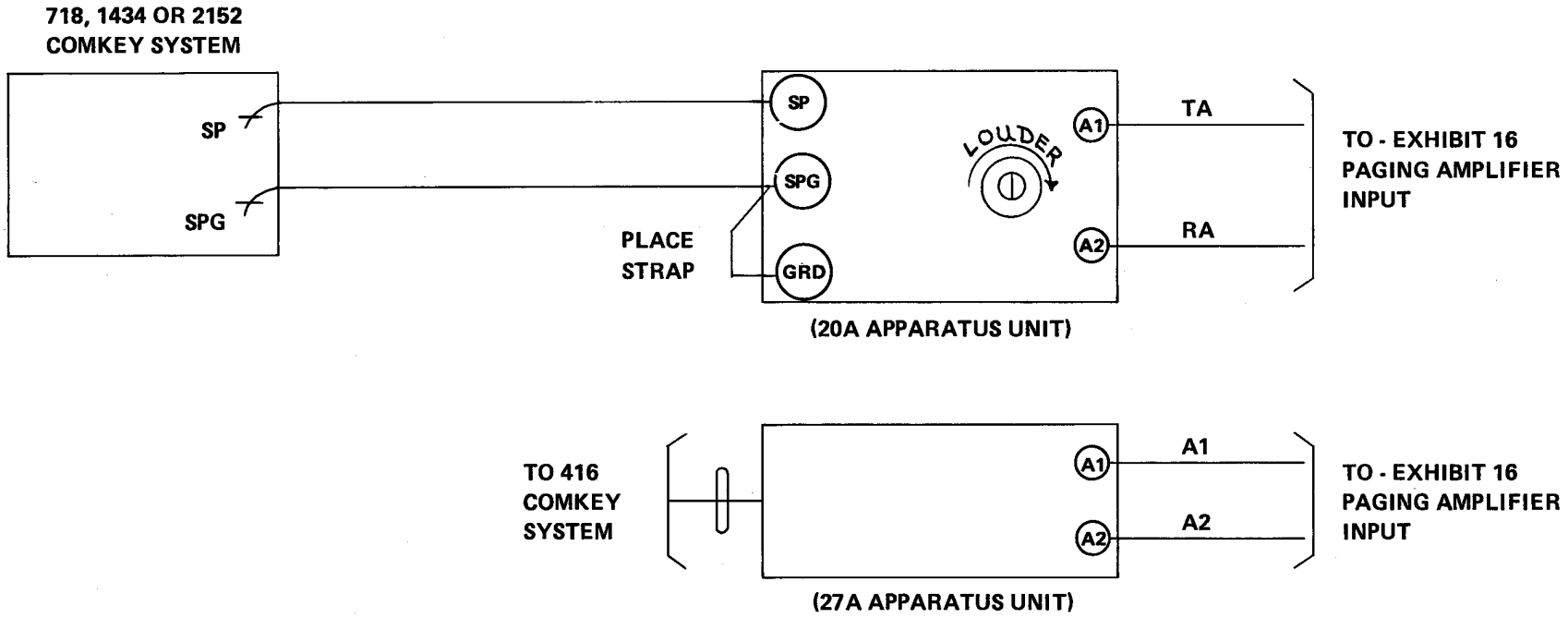


NOTE – CONNECT C OR R LEAD TO ASSIGNED ALL-ZONE DIAL ACCESS CODE

EXHIBIT 11

COMKEY SYSTEM INTERFACE UNIT TO EXTERNAL PAGING SYSTEM

(SEE NOTE - 106)



NOTES –

1 = COMKEY SYSTEM PAGING AMPLIFIER MUST ALSO BE PROVIDED WITH THIS ARRANGEMENT.

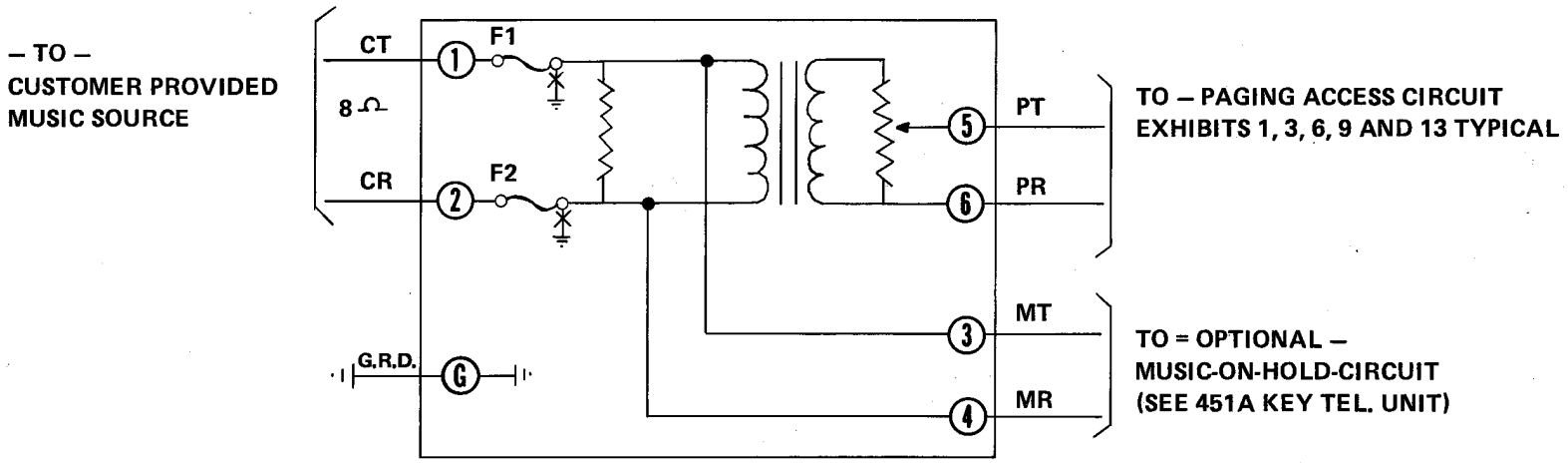
2 = ADJUST POTENTIOMETER OF 20A APPARATUS UNIT TO FULL CLOCKWISE POSITION. (REFER TO COMKEY BSP FOR EACH TYPE SYSTEM.)

EXHIBIT 12

INTERCONNECT UNIT BETWEEN CUSTOMER PROVIDED MUSIC SOURCE AND PAGING ACCESS CIRCUIT

(SEE NOTE - 107)

ONE PER ACCESS CIRCUIT



33A VOICE COUPLER
(REF: BSP 463-341-102)

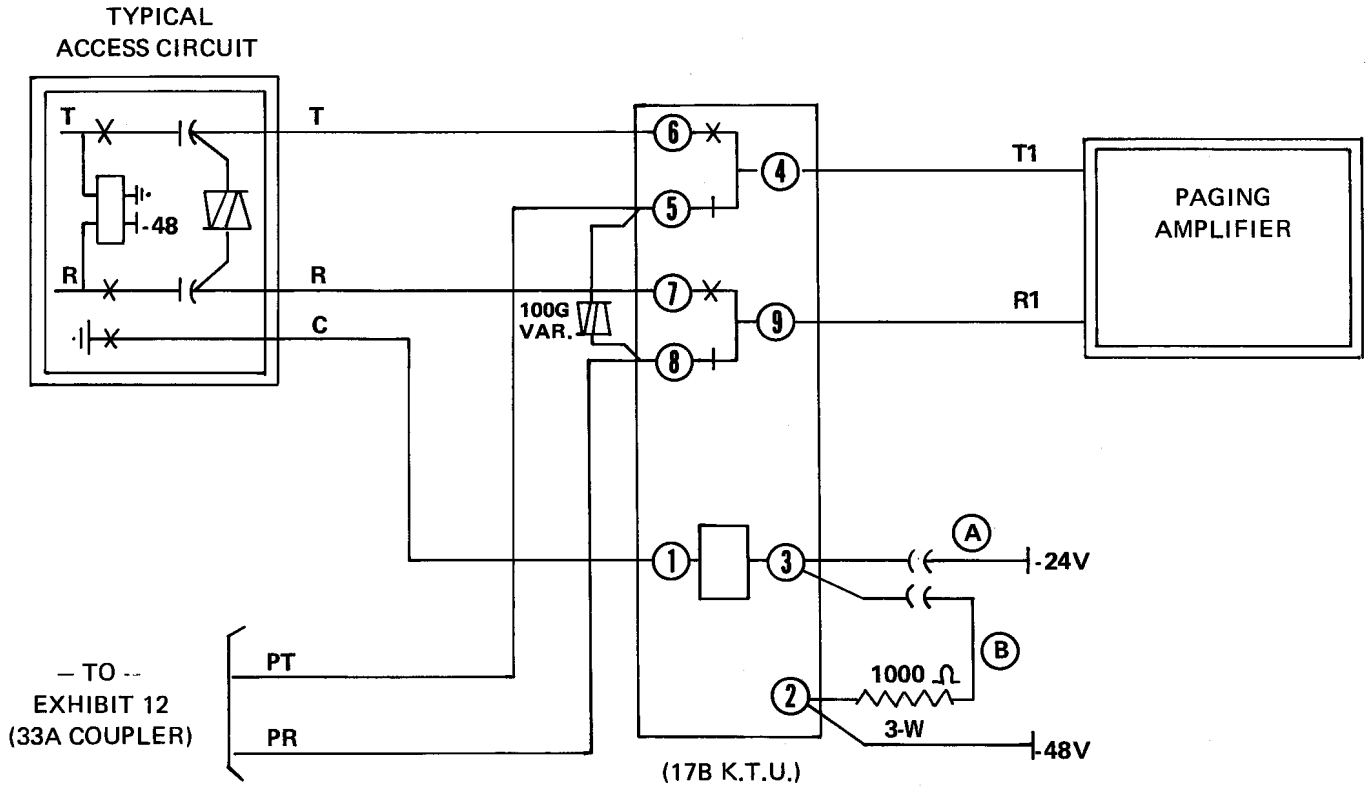
NOTES –

① - CUSTOMER MUSIC SHALL BE PROVIDED AT NORMAL TELEPHONE VOICE LEVEL.

② - ADJUST 33A COUPLER FOR DESIRED LEVEL OF BACKGROUND MUSIC OVER PAGING SYSTEM.

③ - THE 33A COUPLER PRESENTS AN 8 OHM LOAD TO THE CUSTOMER PROVIDED MUSIC SOURCE.

EXHIBIT 13
MUSIC INPUT AND CUT-OFF CIRCUIT
ONE PER ACCESS CIRCUIT
(SEE NOTE 108)



NOTE – PROVIDE THIS CIRCUIT WHEN MUSIC INPUT CANNOT BE PROVIDED THROUGH PAGING ACCESS ARRANGEMENT.

Ⓐ = -24V RELAY OPERATION

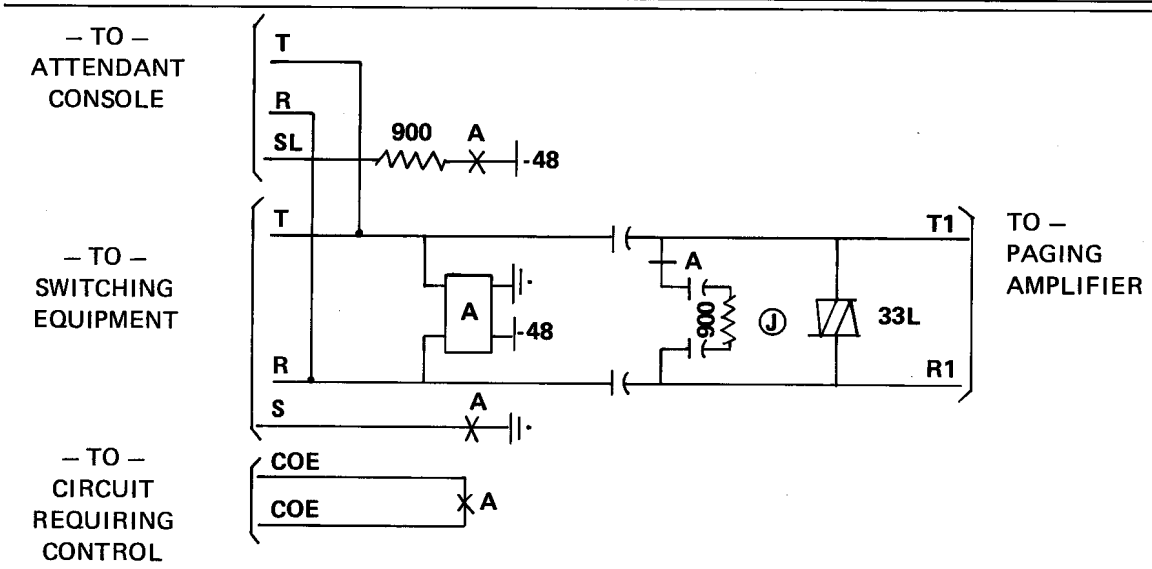
Ⓑ = -48V RELAY OPERATION

EXHIBIT 14

PBX LOUDSPEAKER PAGING TRUNK CIRCUITS

(SEE NOTE - 109 - 110)

(TYPICAL PBX PAGING TRUNK)



PBXs—
558, 756, 800, 801, 805, 812
AND 400 SWITCHING SYSTEM ——— SEE = CD, SD 65747-01

PBXs—
552, 556, 608 SWITCH BOARDS
WITH 701, 711 AND 740 PBXs ——— SEE = CD, SD 66883-01

757 PBX ——— SEE = CD, SD 66762-01

770 PBX ——— SEE = CD, SD 1E362-01

NO. 101 ESS ——— SEE = CD, SD 1H087-01

NO. 1 ESS ——— SEE = CD, SD 1A239-01
CD, SD 1E255-01

CSS-201 ——— SEE = CD, SD 1E446-01

PBX ALL-ZONE AND PRIORITY SELECT RELAY ONE PER MAX. - 3 ZONES

(SEE NOTE - 110)

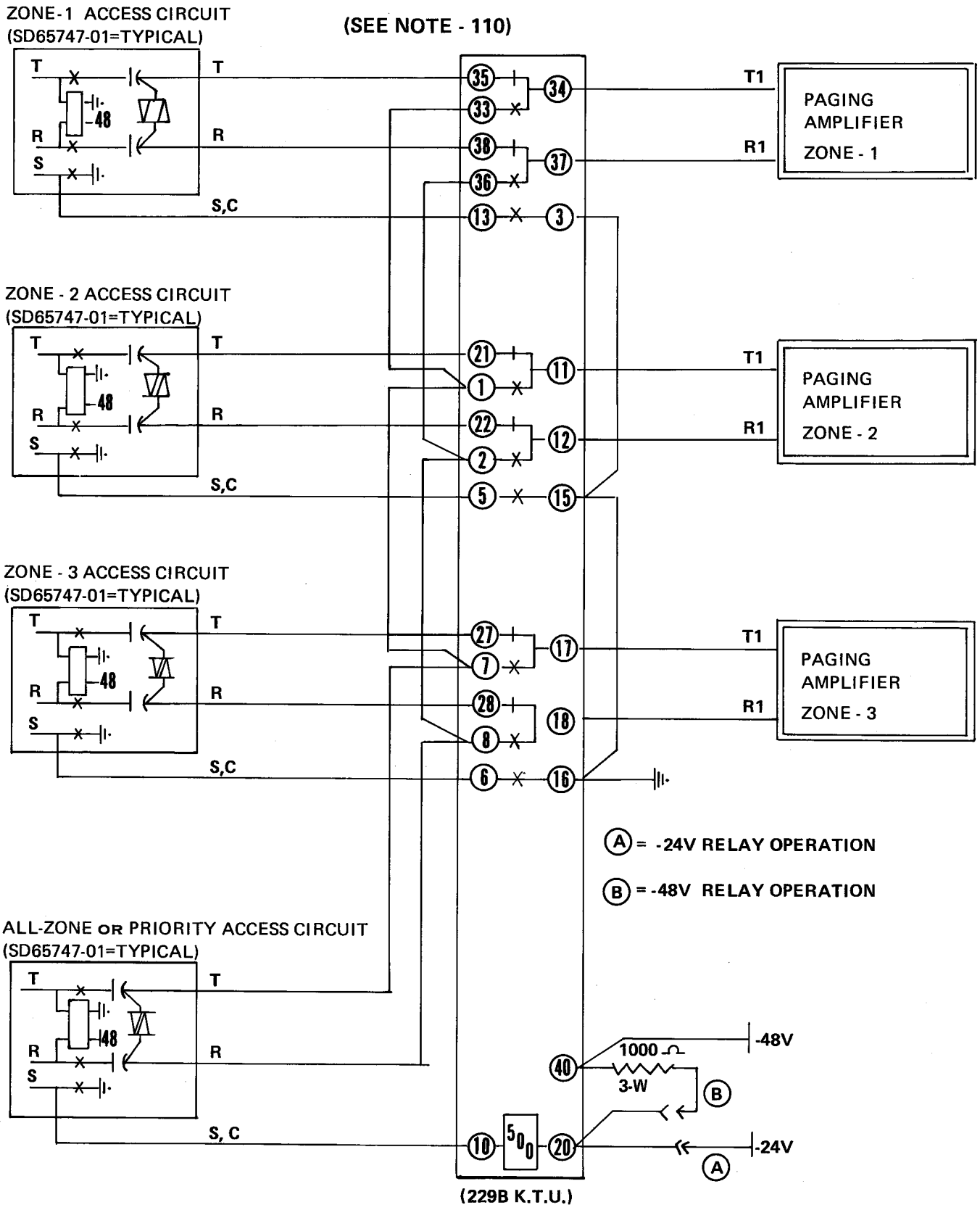
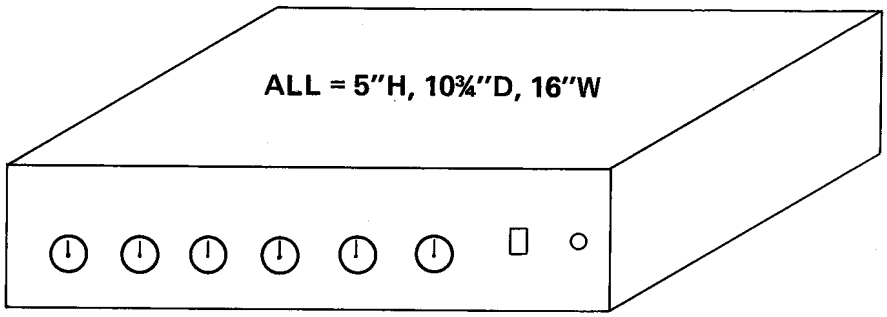


EXHIBIT 16

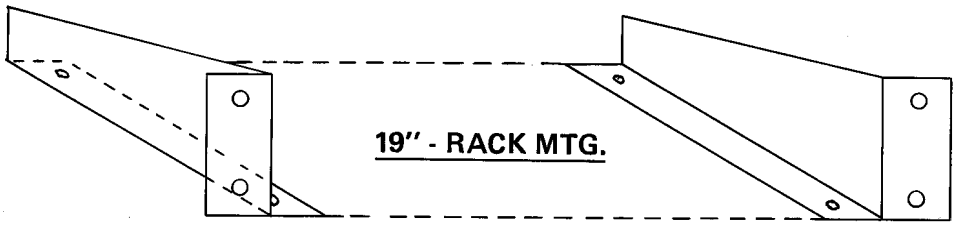
(SEE NOTE - 111, 112)

AMPLIFIER = (DUKANE PACKAGE SERIES)



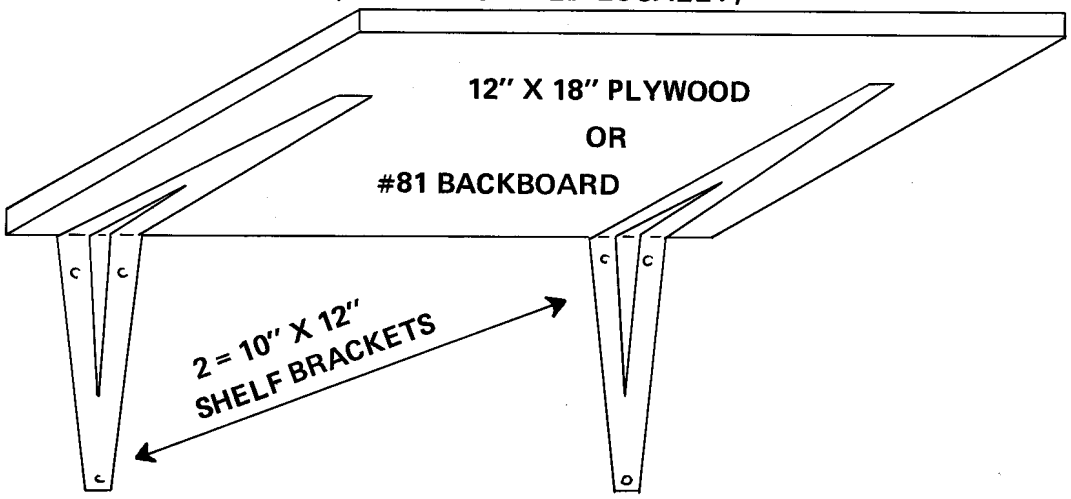
OPTIONAL - AMPLIFIER RACK MOUNTING KIT

(DUKANE # 438-296)



OPTIONAL - AMPLIFIER SHELF

(TO BE PROVIDED LOCALLY)



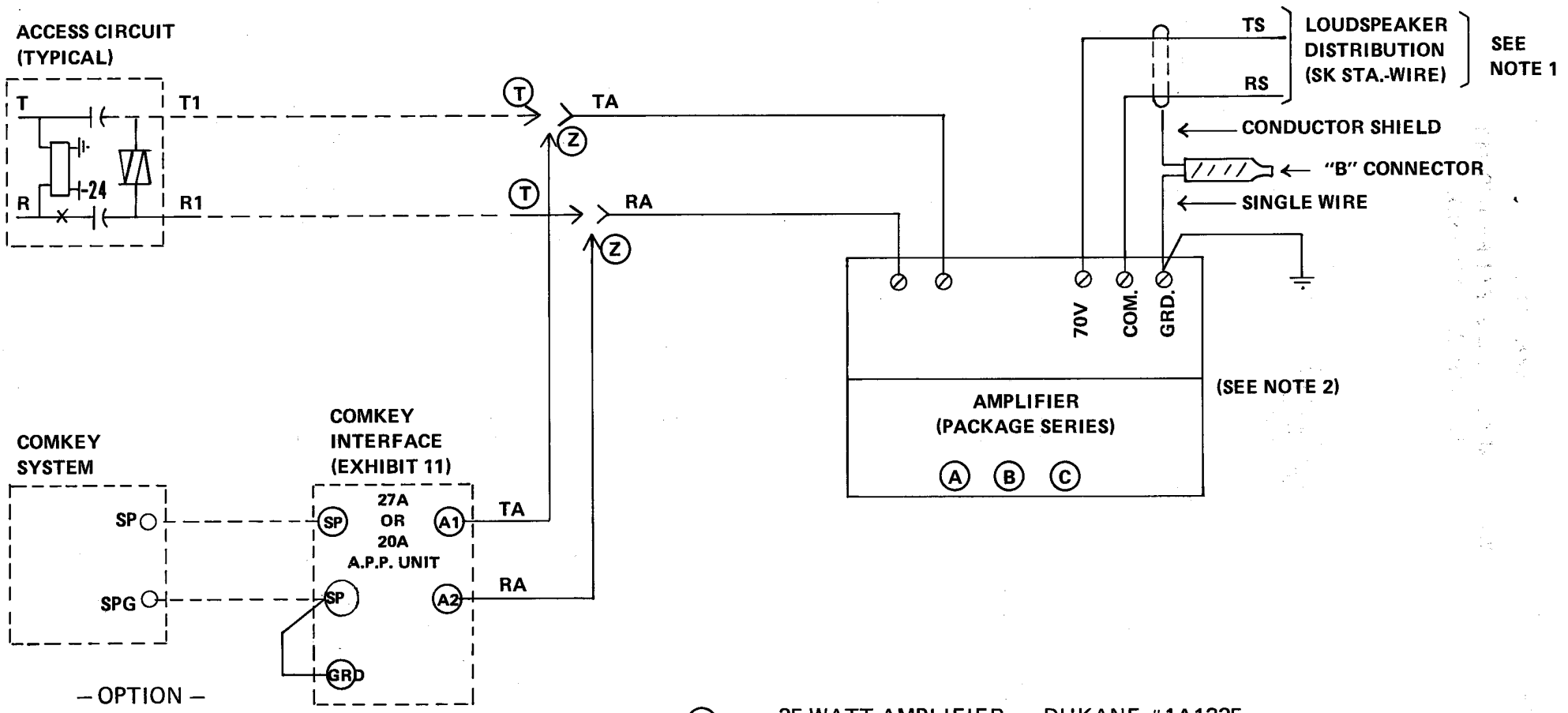
NOTES –

1 = LOUDSPEAKER DISTRIBUTION WIRE SHALL BE "SK" SHIELDED STATION WIRE WITH SHIELDED CONDUCTOR CONTINUOUS THROUGHOUT THE SYSTEM GROUNDED AT THE AMPLIFIER ONLY.

2 = FOR DETAILED AMPLIFIER INSTALLATION, CONNECTION AND OPERATING INSTRUCTIONS REFER TO MANUFACTURER'S MANUAL FURNISHED WITH EACH UNIT.

EXHIBIT 16 (CONT.)

PAGING AMPLIFIER AND TELEPHONE LINE APPLIQUE



– OPTION –

(T) – TELEPHONE LINE OR PBX ACCESS

(Z) – COMKEY SYSTEM ACCESS

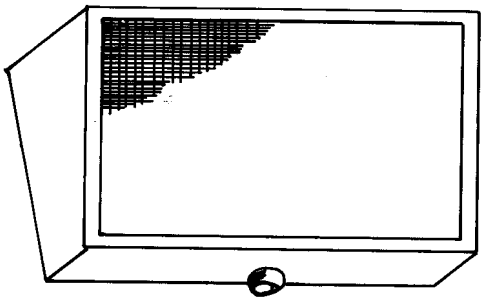
(A) – 35 WATT AMPLIFIER = DUKANE #1A1335

(B) – 60 WATT AMPLIFIER = DUKANE #1A1360

(C) – 100 WATT AMPLIFIER = DUKANE #1A1400

EXHIBIT 17

WALL BAFFLE AND SPEAKER ASSEMBLY WITH VOLUME CONTROL



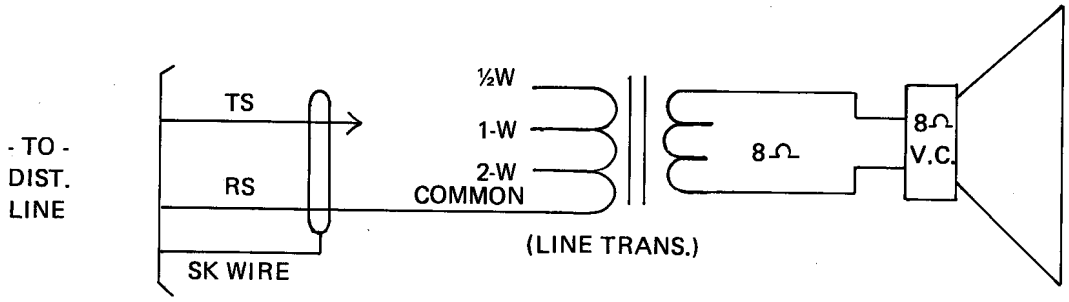
10½ IN. HIGH
18½ IN. WIDE
7 IN. DEEP

DUKANE 6A560 SPEAKER ASSEMBLY = *

* =(BAFFLE, SPEAKER, TRANSFORMER - 70 VOLT - AND VOLUME CONTROL COMPLETE)

EXHIBIT 18

CONE SPEAKER (8 IN) AND TRANSFORMER ASSEMBLY (SEE NOTE - 113 - 114)

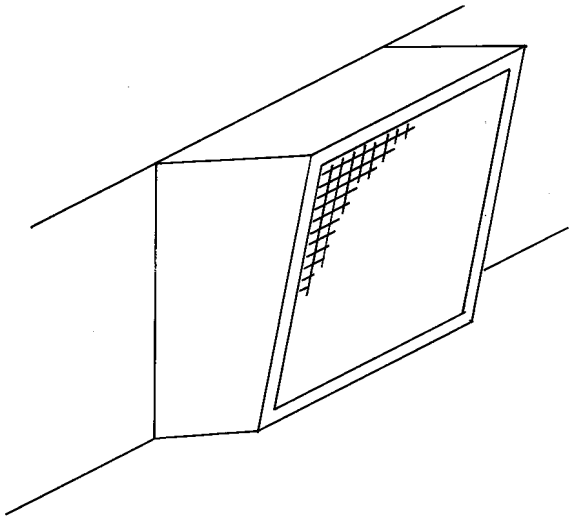


DUKANE 5A527 SPEAKER ASSEMBLY W/25 VOLT TRANS.

DUKANE 5A525 SPEAKER ASSEMBLY W/70 VOLT TRANS.

EXHIBIT 19

WALL BAFFLE AND SPEAKER ASSEMBLY WITHOUT VOLUME CONTROL



10½ IN. HIGH
13½ IN. WIDE
7 IN. DEEP

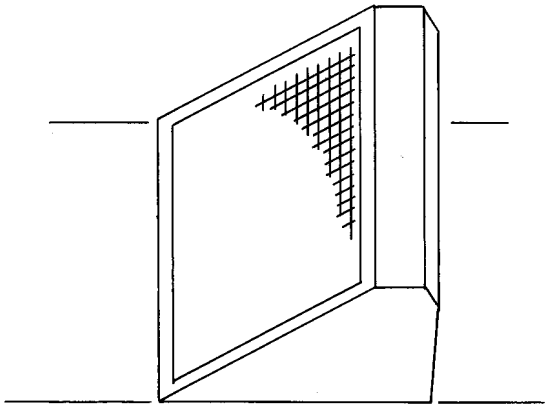
DUKANE 6A557 BAFFLE, SPEAKER ASSEMBLY
(BAFFLE, SPEAKER AND TRANS. COMPLETE - 25 VOLT)

DUKANE 6A555 BAFFLE, SPEAKER ASSEMBLY
(BAFFLE, SPEAKER AND TRANS. COMPLETE - 70 VOLT)

EXHIBIT 20

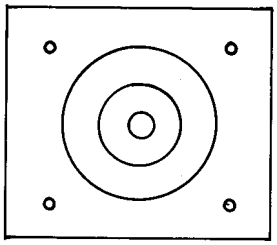
CORRIDOR WALL BAFFLE

DUKANE 6A332 BAFFLE

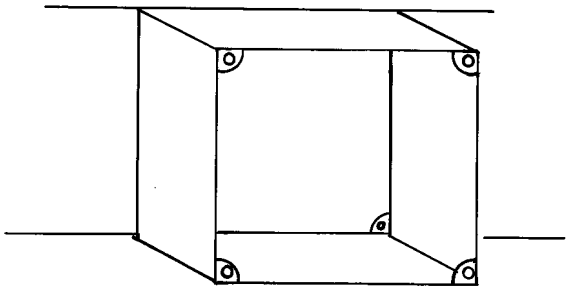


9¼ IN. HIGH
6¾ IN. WIDE
10¾ IN. DEEP

EXHIBIT 21
FLUSH CEILING BAFFLE AND BACK BOX
(SEE NOTE - 116)

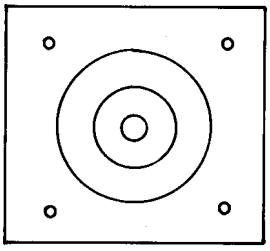


DUKANE 6A339
– CEILING BAFFLE –
WHITE PLASTIC (STYRENE)
10-INCHES SQUARE

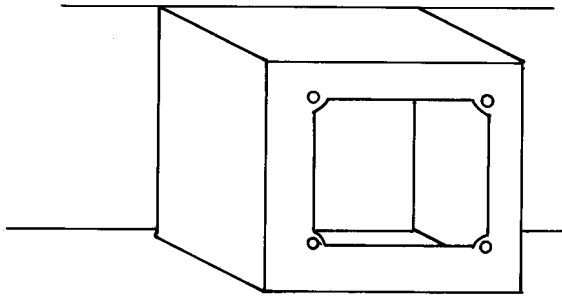


DUKANE 145-223
FLUSH CEILING BACK BOX
8¾ IN. SQ.
3⅝ IN. DEEP

EXHIBIT 22
SURFACE MOUNTED (NON-FLUSH) CEILING SPEAKER

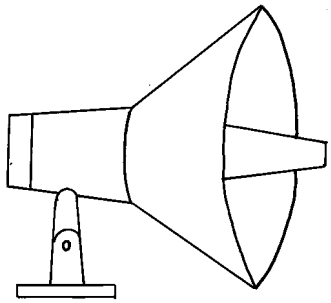


DUKANE 6A339
– CEILING BAFFLE –
WHITE PLASTIC (STYRENE)
10-INCHES SQUARE



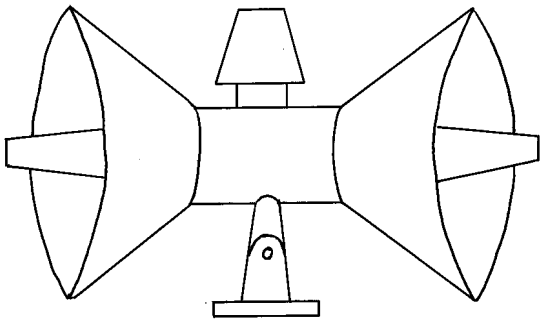
DUKANE 145-225
SURFACE MOUNT BACK BOX
WHITE ENAMEL
12½ IN. SQ.
4 IN. DEEP

EXHIBIT 23
SINGLE INDOOR-OUTDOOR HORN
DUKANE 5A30 HORN



8 - IN. WIDE
8 - IN. HIGH
9 - IN. DEEP

EXHIBIT 24
TWIN INDOOR-OUTDOOR BI-DIRECTIONAL HORN
DUKANE 5A262 HORN

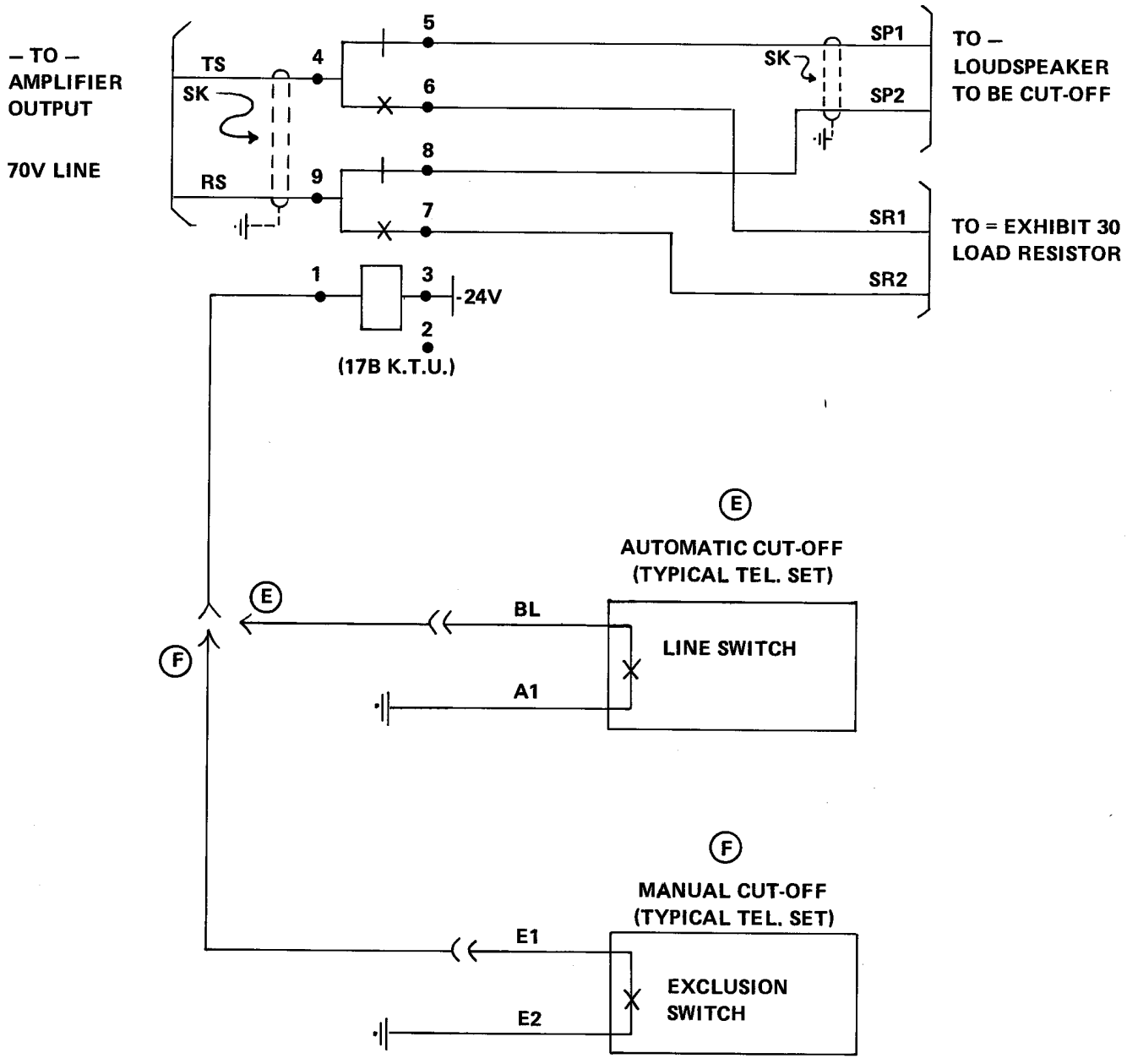


16½" IN. LONG
9¾" BELL DIAM.

EXHIBIT 25

LOUDSPEAKER CUT-OFF ARRANGEMENT

AUTOMATIC Ⓔ OR MANUAL CONTROL Ⓕ

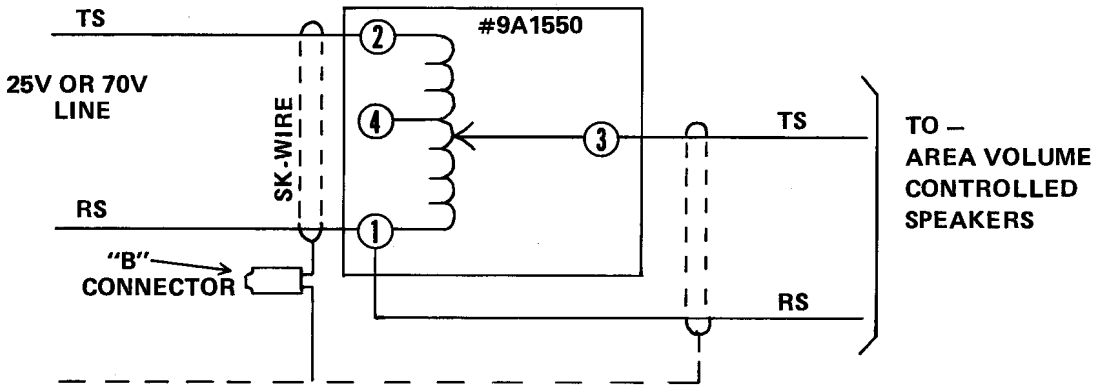


OPTION – Ⓔ = AUTOMATIC SPEAKER CUT-OFF

Ⓕ = MANUAL SPEAKER CUT-OFF

EXHIBIT 26

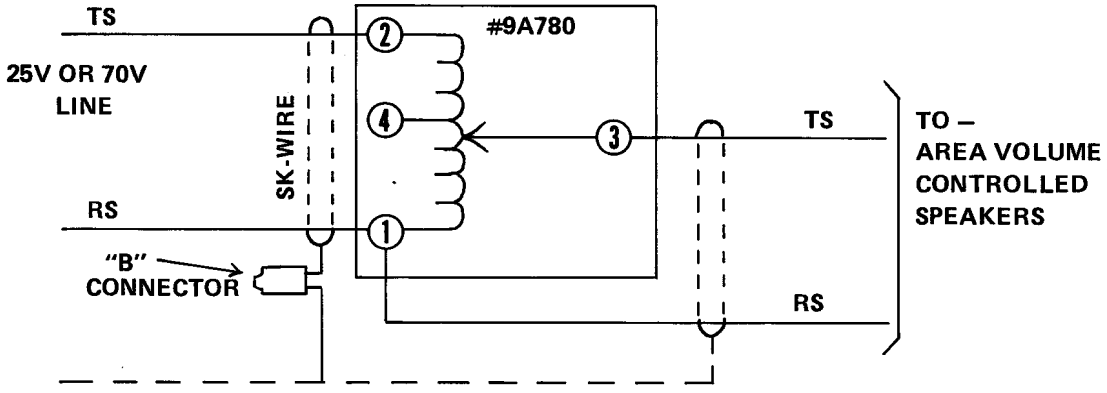
AREA SPEAKER VOLUME CONTROL (10 WATT)



NOTE –
DUKANE #9A1550 VOLUME CONTROL REQUIRES USE OF A SINGLE FLUSH OR SURFACE MOUNTING OUTLET BOX.

EXHIBIT 27

AREA SPEAKER VOLUME CONTROL (100 WATT)



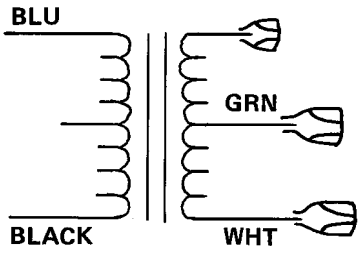
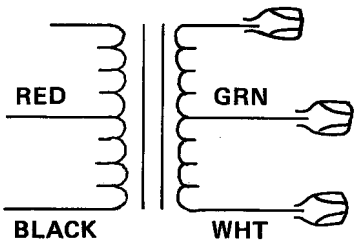
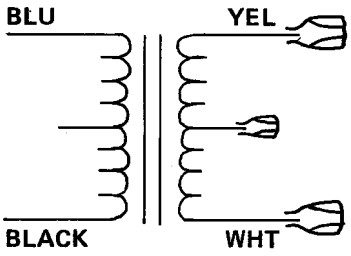
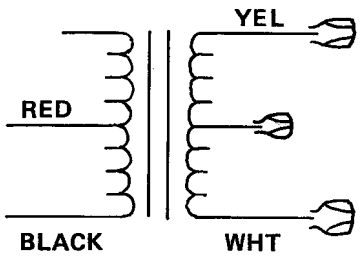
NOTE –
DUKANE #9A780 VOLUME CONTROL REQUIRES DOUBLE (TWO-GANG) FLUSH OR SURFACE MOUNTING OUTLET BOX.

EXHIBIT 28

SPEAKER TRANSFORMER – POWER SETTINGS

(SEE NOTE - 114)

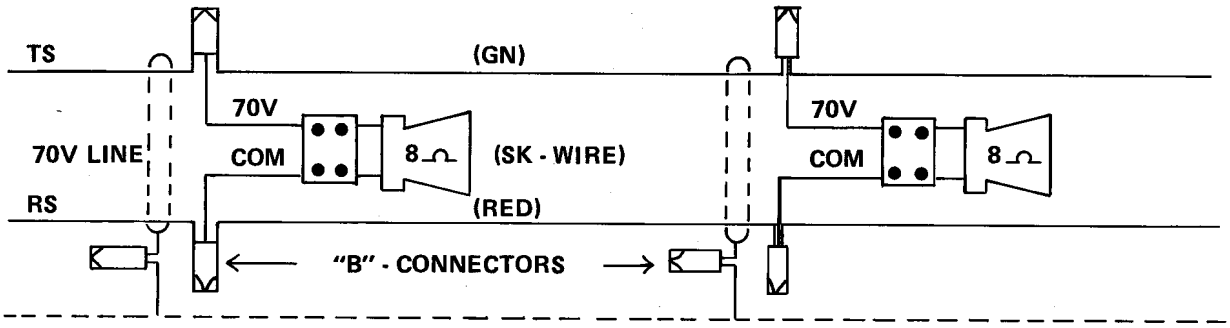
710-3095,-3096

<table>
<tr>
<td>1/2 WATT
 
</td>
<td>1 WATT
 
</td>
</tr>
<tr>
<td>2 WATT
 
</td>
<td>4 WATT
 
</td>
</tr>
</table>

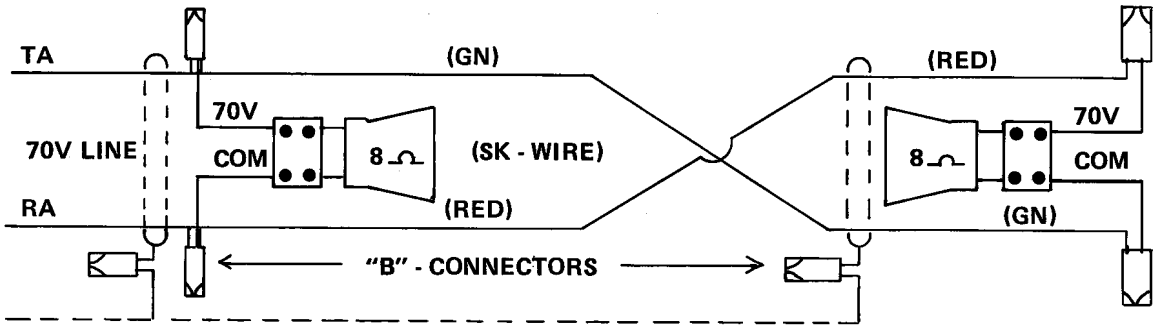
NOTE – The input voltages are 70 volts for 710-3095, and 25 volts for 710-3096. The above rated values are based on a rated secondary load of eight ohms. With a sixteen ohm load connected to the eight ohm winding, primary impedance values are doubled. Power ratings are then divided by "2".

EXHIBIT 29
SPEAKER PHASING AND WIRING
(SEE NOTE - 114, 117)

SPEAKERS IN PHASE = FACING SAME DIRECTION
(SEE NOTES 1 AND 2)



SPEAKERS OUT-OF-PHASE = FACING EACH OTHER
(SEE NOTES 2 AND 3)



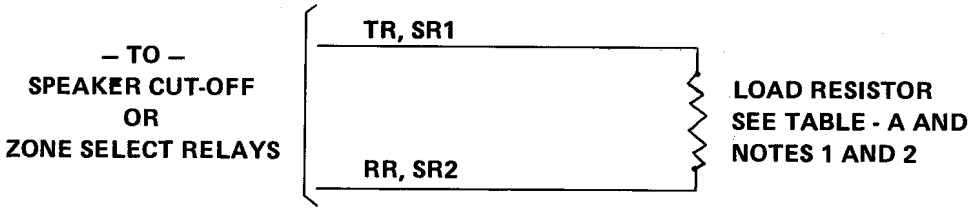
NOTES –

1 – SPEAKERS FACING THE SAME DIRECTION INCLUDING CORRIDOR AND CEILING SPEAKERS SHOULD HAVE 70V LINE TRANSFORMERS CONNECTED IN-PHASE.

2 – SPEAKERS FACING EACH OTHER OR ANGLED TOWARD THE SAME SPOT SHOULD HAVE 70V LINE TRANSFORMERS OF ONE SPEAKER CONNECTED OUT-OF-PHASE TO PREVENT SPEAKER VOICE COILS FROM PUMPING EACH OTHER.

3 – LOUDSPEAKER DISTRIBUTION WIRE SHALL BE "SK" SHIELDED STATION WIRE, CONTINUOUS THROUGHOUT THE SYSTEM AND GROUNDED AT THE AMPLIFIER ONLY.

EXHIBIT 30
AMPLIFIER OUTPUT LOAD RESISTORS
(SEE NOTE - 118)



"TABLE – A"

AMPLIFIER LOAD	LOAD RESISTOR = (OHM)	RESISTOR WATTAGE
0.5 TO 1.0 WATT	NONE REQUIRED	–
1.5 TO 2.5 WATT	3300 OHM	5¼ - WATT = *
3.0 TO 5.0 WATT	1600 OHM	
5.5 TO 7.5 WATT	900 OHM	8 - WATT = *
8.0 TO 10.0 WATT	600 OHM	
10.5 TO 12.5 WATT	450 OHM	12 - WATT = *
13.0 TO 15.0 WATT	350 OHM	
15.5 TO 19.5 WATT	300 OHM	20 - WATT = *
20.0 TO 30.0 WATT	250 OHM	

(* = OHMITE BROWN DEVIL 200 SERIES OR EQUIVALENT.)

NOTES –

1 – PROVIDE CLOSET LOAD RESISTOR VALUE TO POWER SETTING OF SINGLE LOUDSPEAKER OR COMBINED POWER SETTINGS OF ALL SPEAKERS WIRED TO A PARTICULAR ZONE.

2 – LOAD RESISTORS MAY BE MOUNTED ON BLANK 8A OR 265A KEY TEL. UNIT AND STRAPPED TO SPEAKER CUT-OFF RELAY OR ZONE SELECT RELAYS.

EXHIBIT 31

LENGTHS OF "SK" (20 GA.) STATION WIRE DELIVERING VALUES OF POWER AT –0.5 DB LOSS

SPEAKER POWER	10-W	15-W	20-W	30-W	40-W	60-W	100-W
70V - LINE	1400 - FT.	960 - FT.	710 - FT.	480 - FT.	350 - FT.	240 - FT.	110 - FT.
25V - LINE	175 - FT.	120 - FT.	90 - FT.	60 - FT.	45 - FT.	30 - FT.	15 - FT.

NOTE –

FOR 1-DB LOSS, DOUBLE ALL LENGTHS.

EXHIBIT 32

TYPICAL – MULTIPLE SPEAKER DISTRIBUTION WIRE CONNECTING ARRANGEMENT

(SEE NOTE - 117)

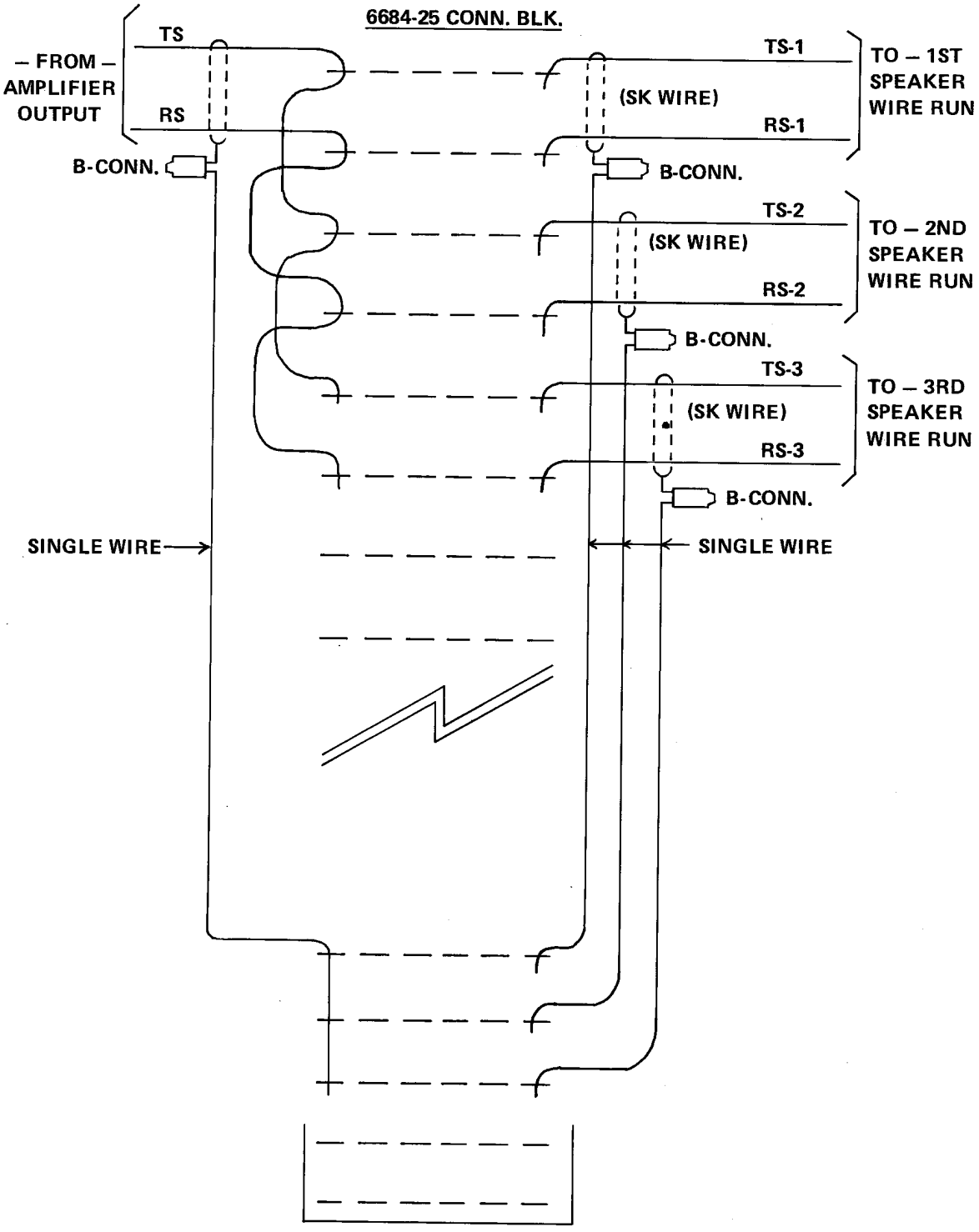


EXHIBIT 33

PAGING SYSTEM CHECK LIST

AND

WORK SHEET

1. Method of input to paging system.

○ Com Key ○ Manual PBX ○

○ KTS ○ Dial PBX ○

2. Identify all areas where paging is required.

3. Outline the floor plans of these areas or the attached graph or obtain complete floor plans from the customer.

4. Indicate all area dimensions and include ceiling height.

5. Indicate each area's noise level in decibels or by noise category.

6. Identify type of speakers/horns required and wattage requirements.

☐ Ceiling Speaker	☐ ½	☐ 1	☐ 2	☐ 4	_____	
☐ Wall Speaker	☐ ½	☐ 1	☐ 2	☐ 4	_____	
☐ Corridor Baffle	☐ ½	☐ 1	☐ 2	☐ 4	_____	
☐ Uni-directional horn	☐ 15	☐ 7.5	☐ 3.8	☐ 1.8	☐ .9	_____
☐ Bi-directional horn	☐ 30	☐ 15	☐ 7.5	☐ 3.9	☐ 1.8	_____
☐ Wall Speaker W/Vol. Control	☐ ½	☐ 1	☐ 2	☐ 4	_____	

7. Locate speakers and horns on your floor plans.

8. Are area volume controls requested? ☐ Yes ☐ No

EXHIBIT 33 (Cont'd.)

9. Determine size of amplifier required

☐ 35 watt package ☐ 60 watt package ☐ 100 watt package

10. Does the customer intend to add a music source to the system? ☐ Yes ☐ No

Is muting required? ☐ Yes ☐ No

11. Does the customer require zone paging? ☐ Yes ☐ No

Are more than three zones required including all-call?

☐ Yes ☐ No

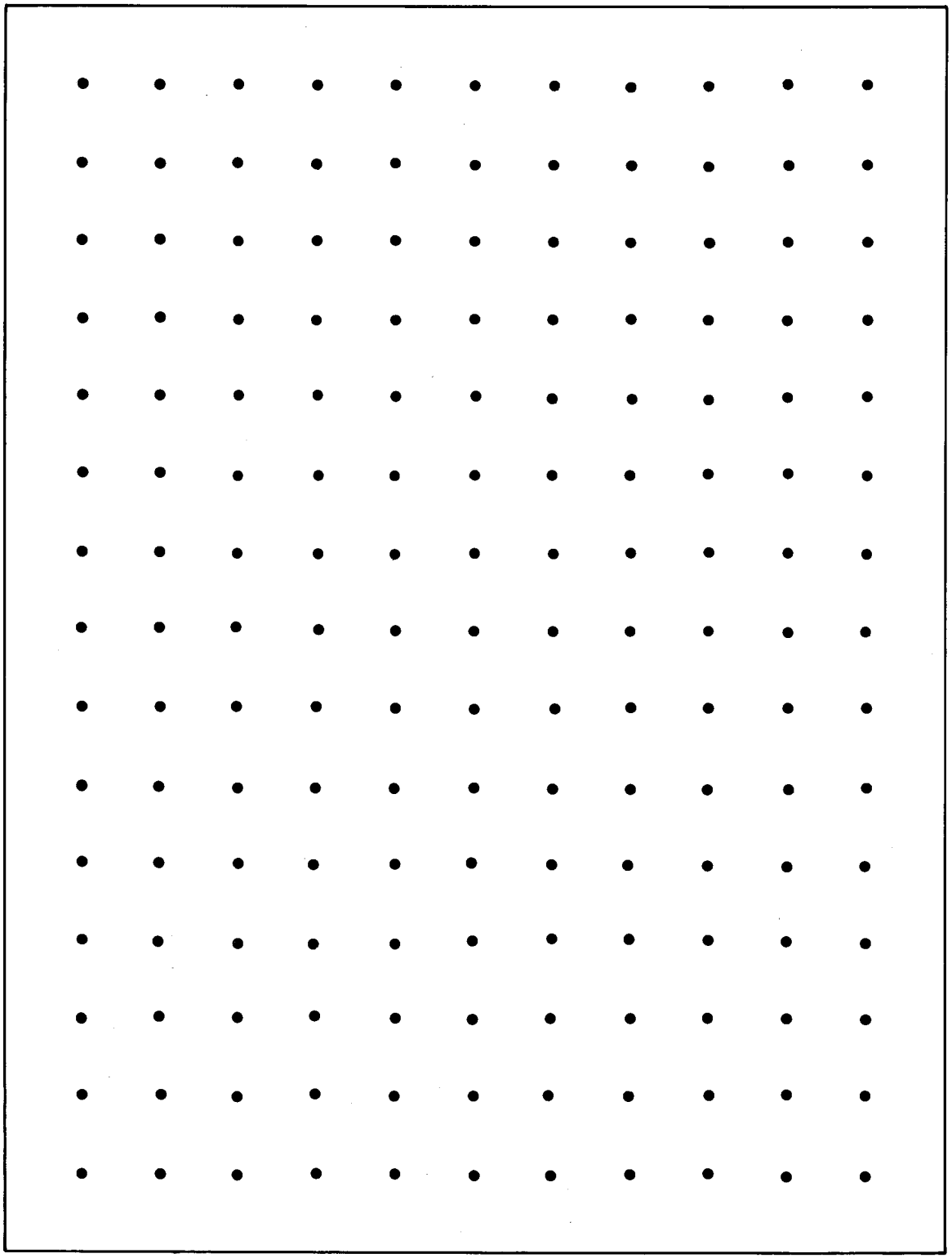
Will zone paging be used in conjunction with background music?

Yes No

Does the customer require off-premise paging?

☐ Yes ☐ No

EXHIBIT 34



• TO • EQUALS _____ FEET

WS = WALL SPKR CS = CEILING SPEAKER H = HORN

SPECIAL INSTRUCTIONS _____

EXHIBIT 35

AMPLIFIER LOAD RECORD AND WORK SHEET

– LOUDSPEAKERS –		POWER SETTING	60 WATT AMPLIFIER		
			ZONES		
QTY.	LOUDSPEAKER TYPE	WATTS EACH	1	2	3
10	INDOOR WALL BAFFLE	0.5	5		
6	INDOOR WALL BAFFLE	1.0	6		
5	INDOOR WALL BAFFLE	1.0		5	
2	OUTDOOR HORN	3.5		7	
6	OUTDOOR HORN	3.5			21
	35				
LOUDSPEAKER LOAD = WATTS PER ZONE			11	12	21
AMPLIFIER LOAD = TOTAL WATTS ("*")			44		

* = NOTE – COMBINED LOUDSPEAKER LOAD (WATTS) OF ALL ZONES SHALL NOT EXCEED 80% OF THE RATED OUTPUT OF THE AMPLIFIER.

NOTES

101 Optional music input may be provided through this access arrangement when connected to a single zone amplifier.

102 Loudspeaker zone switching shall not exceed 30 watts per zone. The combined loudspeaker load (watts) of all zones shall not exceed the rated output of the amplifier. When loudspeaker switching exceeds 30 watts, a separate amplifier and zone select relay shall be provided for each zone.

Loudspeaker switching shall not exceed three (3) select relays per amplifier output.

103 Optional music input cannot be provided with loudspeaker zone switching.

When music input is desired, a separate amplifier and zone select relay shall be provided for each zone.

104 Amplifier zone switching shall not exceed three (3) zone select relays per access arrangement.

Optional music input may be connected to each amplifier zone as required.

105 A separate manual paging access circuit must be provided with this select circuit, with a maximum connection of three (3) amplifier zones.

106 COM KEY System paging amplifiers must also be provided to connect COM KEY paging output to the external paging system.

NOTES

107 Customer provided music shall be provided to Telco at normal telephone voice level.

108 This circuit may be provided when optional music input cannot be provided through paging access arrangement.

109 A separate PBX paging trunk, access code and paging amplifier must be provided for each paging zone.

110 A separate PBX paging trunk and access code must be provided with this select circuit with a maximum connection of three (3) amplifier zones.

111 On initial paging system installations, the calculated loudspeaker load (watts) should not exceed 80% of the rated output of the amplifier.

112 A record of loudspeaker load (power drain) shall be maintained for each amplifier.

113 Speaker assembly only may be provided for customer owned or provided speaker enclosure such as flush ceiling type.

114 Speaker output level may be set or changed through various primary lead connection of line transformers.

115 Optional speaker volume control available only on the 6A560 Speaker Assembly.

116 Flush Ceiling Installations
Speaker backbox and baffle will be furnished by Telco for installation by customer.

NOTES

116 Cont'd.

Wiring and speaker installation will be performed by Telco installation forces after completion of backbox and baffle installation by customer.

117 Loudspeaker distribution wire shall be "SK" shielded station wire or equivalent, with shield conductor continuous throughout the system grounded at the amplifier only.

118 Load resistor wattage values higher than specified may be substituted when required.

Resistance values (ohms) lower than specified should not be connected as this presents a higher load (power drain) on the output of the amplifier.

4-B Diagrams

FEATURE	OPTIONS		EXHIBIT	NOTES
Manual Paging Access Circuit	With Music Input	M	1	101
	Without Music Input	P		
Manual Loudspeaker Zone Select Relay			2	102-103
Manual Amplifier Zone Select Relay	With Music Input	M	3	104
	Without Music Input	P		
Manual All-Zone Select Relay			4	
Manual Priority All-Zone Select Relay			5	105
Dial Intercom Single-Zone Paging Access Circuit	With Music Input	M	6	101
	Without Music Input	P		
Dial Intercom Multi-Zone Paging Access Circuit			7	
Dial Intercom Loudspeaker-Zone Select Relay			8	102-103
Dial Intercom Amplifier-Zone Select Relay	With Music Input	M	9	104
	Without Music Input	P		
Dial Intercom All-Zone Select Relay			10	
COM KEY System (416, 718, 1434 & 2152) Interface Unit To External Paging System			11	106
Music Interconnect - Unit Between Customer Provided Music Source and Paging System			12	107
Music Input and Cut-Off Control Circuit			13	108
PBX Paging Access Trunks			14	109
PBX Priority and All-Zone Select Relay			15	110
Amplifier (Package Series)	35 watt	A	16	111-112
	60 watt	B		
	100 watt	C		
Wall Baffle and Speaker Assembly with Volume Control			17	115

FEATURE	OPTIONS		EXHIBIT	NOTES
Loudspeaker (8" cone) and Transformer Assembly			18	113-114
Wall Baffle and Speaker Assembly			19	
Corridor Wall Baffle and Speaker Assembly			20	
Flush Ceiling Baffle, Backbox and Speaker			21	116
Surface (non-flush) Ceiling Baffle and Speaker			22	
Single Indoor-Outdoor Horn			23	
Twin Indoor-Outdoor Bi-Directional Horn			24	
Loudspeaker Cut-Off-Relay	Automatic	E	25	
	Manual	F		
Area (Multiple) Speaker Volume Control (10 Watt)			26	
Area (Multiple) Speaker Volume Control (100 Watt)			27	
Speaker Transformer Power Settings			28	114
Speaker Phasing and Wiring			29	114,117
Amplifier Load Resistors			30	118
Speaker Distribution Wire Lengths and Power Delivering Values			31	
Multiple Speaker Distribution Wire Connecting Arrangement			32	117

4-C ORDERING GUIDE

USOC CODE	EQUIPMENT CODE	REMARKS
P3Y	Dukane Model 1A1335 Amplifier (35 watt)	order as required
See Exhibit - 16	Dukane Model 438-296 rack mounting kit	order 1 each per amplifier if mounting in rack or cabinet
	81 type backboard and two 10"x12" shelf brackets	order when mounting amplifier on wall
	Misc. wire and hardware	order as required
PQ8	Dukane Model 1A1360 Amplifier (60 watt)	order as required
See Exhibit - 16	Dukane Model 438-296 rack mounting kit	order 1 each per amplifier if mounting on rack or cabinet
	81 type backboard and two 10"x12" shelf brackets	order when mounting amplifier on wall
	Misc. wire and hardware	order as required
PZD	Dukane Model 1A1400 Amplifier (100 watt)	order as required
See Exhibit - 16	Dukane Model 438-296 rack mounting kit	order 1 each per amplifier if mounting on rack or cabinet
	81 type backboard and two 10"x12" shelf brackets	order when mounting amplifier on wall
	Misc. wire and hardware	order as required
PZQ	Dukane Model 5A527 speaker and transformer assembly	order as required (for 25 volt line)
	-or-	
	Dukane Model 5A525 speaker and transformer assembley	order as required (for 70 volt line)
See Exhibits - 18 & 21	Dukane Model 145-223 speaker back box Dukane Model 6A6339 flush ceiling baffle	order 1 each per speaker assembly
	Misc. cable and hardware	order as required

USOC CODE	EQUIPMENT CODE	REMARKS
PZG See Exhibit - 19	Dukane Model 6A557 speaker assembly -or- Dukane Model 6A555 speaker assembly Misc. cable and hardware	order as required (for 25 volt line) order as required (for 70 volt line) order as required
PVG See Exhibit - 17	Dukane Model 6A560 speaker assembly with volume control Misc. cable and hardware	order as required (for 70 volt line) order as required
PZO See Exhibits - 18 & 20	Dukane Model 5A527 speaker and transformer assembly -or- Dukane Model 5A525 speaker and transformer assembly Dukane Model 6A332 corridor baffle Misc. Cable and hardware	order as required (for 25 volt line) order as required (for 70 volt line) order 1 each per speaker assembly order as required
8BK See Exhibit - 18	Dukane Model 5A527 speaker and transformer assembly -or- Dukane Model 5A525 speaker and transformer assembly Misc. cable and hardware	order as required (for 25 volt line) order as required (for 70 volt line) order as required
PZL See Exhibits - 18 & 22	Dukane Model 5A527 speaker and transformer assembly -or- Dukane Model 5A525 speaker and transformer assembly Dukane Model 145-225 speaker back box Dukane Model 6A339 ceiling baffle Misc. cable and hardware	order as required (for 25 volt line) order as required (for 70 volt line) order 1 each per speaker assembly order as required

USOC CODE	EQUIPMENT CODE	REMARKS
PZT See Exhibit - 23	Dukane Model 5A30 single indoor-outdoor horn assembly Misc. cable and hardware	order as required order as required
PZX See Exhibit - 24	Dukane Model 5A262 twin indoor-outdoor horn assembly Misc. cable and hardware	order as required order as required
Q1M See Exhibit - 1	31A Key Tel. Unit ED 91929-32 G-29 unit 100G varistor 600 ohm - ½ watt resistor apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per access arrangement order as required
Q1D See Exhibit - 6	29A Key Tel. Unit ED 91929-32 G-29 Unit 100 G varistor 600 ohm - ½ watt resistor 446 F diode (2 required) apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per access Code (Single Zone) order as required
KZK See Exhibit - 11	20A apparatus unit -or- 27A Apparatus Unit Misc. wire and hardware	order 1 each per COM KEY Amplifier order as required
Q1A See Exhibit - 14	No material required	a SW1525 must be issued to have the access circuit or circuits installed
23F See Exhibits - 2 & 30	229B key tel. unit 8A key tel. unit apparatus cabinet (if req'd.) OHMITE #200 series resistor Misc. wire and hardware	order 1 each per zone arrangement order as required (see table A in Exhibit 30) order as required

USOC CODE	EQUIPMENT CODE	REMARKS
23G See Exhibit - 3	229B key tel. unit 600 ohm - ½ watt resistor apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per zone - maximum 3 order as required
23E See Exhibit - 4	229B key tel. unit apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per maximum of 3 zones order as required
Q3L See Exhibit - 5	229B key tel. unit apparatus cabinet (if req'd.) Misc.wire and hardware	order 1 each per maximum of 3 zones order as required
QMDZ1 See Exhibit - 7	29A key tel. unit ED 91929-32 G-29 unit 100 G Varistor 600 ohm - ½ watt resistor apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per access arrangement order as required
24F See Exhibits - 8 & 30	229B key tel. unit 8A key tel. unit 446 F Diode (2 required) apparatus cabinet (if req'd.) OHMITE #200 series resistor Misc. wire and hardware	order 1 each per zone - maximum 3 order as required (see table A in Exhibit - 30) order as required
24J See Exhibit - 9	229B key tel. unit 600 ohm - ½ watt resistor 446F diode (2 required) apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per zone - maximum 3 order as required
QMDZ3 See Exhibit - 10	229B key tel. unit 446F diode apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per access - maximum 3 order as required
P09 See Exhibit - 15	229B key tel. unit 1000 ohm - 3 watt resistor apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 each per zone - maximum 3 order as required

USOC CODE	EQUIPMENT CODE	REMARKS
MC6 See Exhibits - 1, 6 & 13	17B key tel. unit 100 G Varistor 1000 ohm - 3 watt resistor apparatus cabinet (if req'd.) Misc. wire and hardware	order 1 per system if Exhibit 1 or 6 access ckt. is used -or- order as required (see Exhibit - 13)
9EV See Exhibits - 25 & 30	17B key tel. unit apparatus cabinet (if req'd.) OHMITE #200 series resistor Misc. wire and hardware	order as required order as required (see table A in Exhibit - 30) order as required
QV4 See Exhibit - 26	Dukane Model 9A1550 area volume control (10 watt) Misc. wire and hardware	order as required order as required
QV9 See Exhibit - 27	Dukane Model 9A780 area volume control (100 watt) Misc. wire and hardware	order as required order as required