

AUXILIARY SIGNALS

IDENTIFICATION, INSTALLATION, OPERATION, MAINTENANCE, AND CONNECTIONS

1. GENERAL

1.01 This section provides information on the KS-16301-, KS-8000-, KS-22001-type signals, the KS-20614 relay switch, and 687B subset.

1.02 This section is reissued to:

- Delete information on power relay sets (this information will be included in Section 463-120-100)
- Update changes in Table A
- Include information from Table C with Table B
- Remark Table D as Table C
- Add information on KS-16301, L21 horn
- Add information on 324A adapter.

Since this reissue is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 These signals may be obtained with or without control relays for use in indoor and outdoor locations. Signals which do not contain a control relay require an externally mounted power relay set. One relay may operate several signals.

1.04 When party line identification is required, it should be obtained through the ringer associated with each telephone set. Refer to the particular telephone set used for connections.

1.05 Certain signals are equipped with a 0.5- or 0.45- μ f capacitor in series with a relay which operates on telephone ringing current. The relay

and capacitor constitute a high impedance ringing bridge.

1.06 All signals operate on 115-volt 60-Hz power unless otherwise noted. The operating voltage is stamped on the unit.

1.07 *All KS-16301, L2, L6, L20, and L21 series signaling devices are not intended for use with 115-volt ac power and will be provided by the manufacturer with two warning tags, one on the signal unit frame and one on the signal unit power cord near the plug. The tags will specify:*

Warning: *Do not use on 115 volt 60 Hz.*

See signal for proper voltage.

1.08 The KS-20614 relay switch is intended for use by handicapped persons. The List 1 is equipped with a power cord and switches 115 volt 60 Hz. The List 2 provides a contact closure for switching a customer low voltage supply not requiring Underwriter Approval.

1.09 Relays that operate on telephone ringing current have a 2-position sensitivity adjustment.

2. PURPOSE

2.01 The signals, relay switches, and subsets covered in this section are intended for use by handicapped persons, noisy locations, or for out-of-doors telephone signaling. They provide a number of distinctive loud or visual signals such as:

- Vibrating bells

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

- Single-stroke bells
- Chimes
- Horns
- Lights (ON or OFF).

3. IDENTIFICATION

3.01 The KS-8547-type bell (Fig. 1) is intended for hazardous locations, either indoor or outdoor with a vibrating bell or a single-stroke bell depending on the list number ordered (Table A). Their normal operating voltage is 115-volt ac but the List 3 and 4 single stroke bells may be ordered equipped for 115-volt dc operation. The KS-8547-type bell must have a power set relay to operate.

3.02 The KS-20375, L1 bell (Fig. 2) is for use indoors, has a vibrating bell, operates on 18-volt ac, and must have a power relay set to operate.

3.03 The KS-8229-type (MD) chime (Fig. 3) is a single stroke, 115-volt ac chime intended for indoor operation. It has been superseded by the KS-22001-type chime (Table A).

3.04 The KS-22001-type chime (Fig. 4) replaces the KS-8229-type (MD) chime. It is a single stroke 115-volt ac indoor type chime. The List 5, 6, and 7 have their own relay and operate on relay voltages as shown in Table A. The List 2 must have a power relay set to operate.

3.05 The KS-16301 signals (Fig. 7, 8, 9, 10, 11, or 12) may be ordered as bells, chimes, or horns for indoor or outdoor use and with a variety of signal operating and relay operating voltages as shown in Tables A and C.

3.06 The KS-16301 signals, relays, and backboxes are interchangeable to meet almost any demand.

3.07 The KS-20614-type relay control (Fig. 20, 21, 27, and 28) is a ringing relay developed specifically for the handicapped. It provides a visual indication of a telephone ringing signal but may be used for other signaling forms beside visual.

3.08 The 687B subset is needed when installing auxiliary signals on 4-party selective or

8-party semiselective lines for line identification. They may be wired to have the auxiliary signal operated by the line ringing power (Fig. 25) or use low-voltage auxiliary power (Fig. 26).

3.09 The 324A adapter was developed for the 6B KTS but can be used in other applications to control loud ringing bells or other external signaling devices. The adapter consists of two relays and a terminal strip mounted on a base and equipped with a cover. The relays operate on 9-11 volts, 60 cycle ac and the contacts are rated at 125 volts at 5 amperes. Two separate signals can be controlled by the 324A adapter (Fig. 29).

Ordering Guide

3.10 Order as follows:

- Refer to Table A for auxiliary signals and relay switches
- Refer to Table B for associated apparatus which must be ordered separately.

4. INSTALLATION

A. Planning

4.01 Select a wall or column location for the signaling device in accordance with the following:

- Not hazardous to maintenance personnel—avoid stairways, areas of heavy traffic, and moving machinery
- Best sound distribution
- Safe from damage—remote from vehicular traffic, excessive heat, and flammable or corrosive fumes
- Accessible for maintenance or removal
- Near power receptacle or conduit, where required.

4.02 Customer-Provided Wiring: Prior to installation, a definite agreement must be made with the customer to provide any necessary

power wiring (ac, dc, receptacle, conduit) in accordance with the following:

- Not controlled by a switch
- Separately fused, if possible
- Within access of power cord.

4.03 *Line Ringer:*

Note: Any telephone station having auxiliary signals (except a PBX station) must be equipped with a ringer connected to the line at all times to ensure a ringing signal should commercial power fail.

4.04 *Signals, KS-8547 (Fig. 1):* The KS-8547 signal bells are conduit installed, wall mounted, and contactless with explosion proof cast iron housings, made specifically for hazardous atmospheres:

- List 1 and 3 for indoor use
- List 2 and 4 come equipped with a hood and guard for outdoor use
- List 3 and 4 may be ordered equipped for 115-volt dc operation.

The signals shall always be mounted so the signal and plunger are in a vertical position.

Caution: *When the KS-8547 bell is used in an explosive atmosphere, extreme caution should be taken to assure the installation conforms to the requirements specified in Section 502-415-100.*

4.05 *Signals, KS-20375, L1 (Fig. 2):*

- (a) The KS-20375, L1 bell mounts directly on a 4-inch square outlet box.
- (b) The KS-20375, L2 adapter is used when mounting to a 2-inch octagonal outlet box or a single or double gang plaster ring. The KS-20375, L3 (olive-gray) outlet box is also available for use with the bell. These items must be ordered separately.

4.06 *Signals KS-8229 (MD) (Fig. 3):*

- Has slotted mounting holes for easy removal from backboard
- Has 3-conductor cord for terminating on a 42-type connecting block or equivalent
- The signals are for indoor locations.

4.07 *Signals, KS-22001, Chime (Fig. 4):*

- Mount on a vertical surface.
- Use four slotted holes for attaching chime to surface for permanent installation.
- Use KS-22001, L8 (Fig. 6) portable mounting plate for applications where mounting the chime directly or permanently is not desirable.
- The KS-22001, L2 L5, L6, and L7 replace KS-8229, L23, L13, L14, and L15, respectively.
- The KS-22001, L1, L3, and L4 replace KS-5594, L5, L9, and L10, respectively.
- The KS-22001, L5 and L6 are equipped with—
 - (a) One plug ended 3-conductor power cord 4-foot long for connection to the power circuit.
 - (b) One 2-conductor cord 9-inches long with spade terminals at one end.
- The KS-22001, L7 is equipped with a 623P4 jack (USOC RJ11C) to accept a modular plug and also has a plug ended 3-conductor power cord 4-foot long.
- The KS-22001, L9 (Fig. 5) backbox—consists of a 4-inch outlet box, screw-type terminal block with screws for mounting block and jumper leads for making connections to the chime signal.

4.08 *Signals, KS-16301:*

- (a) A typical signal (Fig. 7) includes a backbox, a signal premounted to a grilled cover, and a control relay.

(b) The armature on relays associated with auxiliary signals restores to normal (open contacts) by gravity. Always mount signal on a vertical surface. A control relay, if used, must be in the horizontal position.

(c) Any KS-16301 bell, chime, or horn (Table A) may be used with any KS-16301 backbox (Table B) and any KS-16301 relay (Table B) or without a relay if signal is remotely driven with a power relay set.

(d) Fasten signal to backbox as follows:

- Engage the two pins on front cover to form a hinge with the two sockets which emerge from backbox (Fig. 7).
- Fasten the signal to the backbox with four machine screws which are furnished (Fig. 7).

4.09 Type of Installation: The type of installation determines the type of backbox (Table B). Backboards are not necessary.

B. Installing



Make sure power is disconnected before working on circuit. Under no circumstances should the cord provided for commercial power be passed through a hole in a wall or be fastened to a wall.

4.10 Backbox, KS-16301 (Fig. 14, 15, 16, 17, and 18):

- Mount on a vertical surface
- Use two slotted holes and one regular hole for attaching backbox to surface
- Use rustproof fasteners
- Install backbox, List 9 or 11, so the customer may have the commercial power connected (Fig. 15)
- Terminate 3-conductor cord as shown in Fig. 18
- Do not fasten power cord to any surface

- Do not pass power cord through wall holes or partitions
- An entrance hole for the telephone wires is located in the bottom of each backbox (Fig. 14)
- Be sure the gasket on the backbox is in place (Fig. 18).

4.11 Control Relay, KS-16301 (Fig. 13):

- Mount relay in the horizontal position on mounts provided in backbox (Fig. 7).
- Use a full cable pair for each signal circuit when signaling circuits are in the same cable.
- When no talking circuits are involved, low-voltage signal circuits may use half of a cable pair or inside wire.
- The List 15 units, manufactured after the 2nd quarter 1979, are provided with a 623P4 jack and connected to the wall jack via a standard D4BU cord (ordered separately). For long loop areas, move the lead from the LO to the HI terminal.

4.12 Rainhood, KS-16301, L11 and L19 (Fig. 16):

- For protection against the weather and insects
- Attach to the signal unit with furnished screws (Fig. 7).

4.13 Weatherproof Power Outlet KS-16301, L18 (Fig. 19):

- Provided to customer as required
- Used with KS-16301, L19 backbox (ordered separately).

4.14 KS-20614, L1 Relay Switch (Fig. 20 and 27):

- Mount relay to a vertical surface with contacts at the bottom and within 12 inches of local power receptacle.

- Units manufactured after the 2nd quarter 1977 are provided with a 623P4 jack and connected to the wall jack via a standard D4BU cord (ordered separately). For long loop areas, move the lead from the LO to the HI terminal.
- Set single-pole double-throw switch on nearby table or stand.
- Connect visual indicator to receptacle in relay housing.

4.15 **KS-20614, L2 Relay Switch (Fig. 21 and 28):**

- Mount relay to a vertical surface with contacts at the bottom.
- Units manufactured after the 2nd quarter 1977 are provided with a 623P4 jack and connected to the wall jack via a standard D4BU cord (ordered separately). For long loop areas, move the lead from the LO to the HI terminal.
- Terminate 2-conductor cord on a 42A connecting block, or equivalent, as a junction point for the customer low-voltage circuit.
- Set single-pole double-throw switch on nearby table or stand.

5. OPERATION

5.01 Party Line Operation (Fig. 25 and 26): The 687B subscriber set has a cold cathode tube and relay in place of the ringer. When the relay is operated by rectified ringing voltage, the relay contacts may be used to control a signal energized from a local low-voltage source or bridged to CO ringing power.

5.02 **KS-20614, L1 Relay Switch (Fig. 27):**

This relay is operated by station ringing voltage to control a 2-conductor 115-volt 60-Hz receptacle. The switch reverses function of the relay contacts so the 115-volt 60-Hz receptacle can be either normally on or off with reversal occurring during the ringing interval. Provides for control of any alerting device (visual, tactile, or audible) that operates on 115 volt 60 Hz and draws 5 amperes or less noninductive load.

5.03 **KS-20614, L2 Relay Switch (Fig. 28):**

Operation of the List 2 is similar except the contacts are used to control a customer-provided low-voltage circuit (maximum 30 volts and 3.2 amperes) wired to the 12-inch 2-conductor cord provided.

6. MAINTENANCE

Danger: Before performing any work on equipment connected to commercial power, deenergize the power supply circuit. The customer shall arrange for power disconnection and reconnection on power circuits other than plug and outlet.

A. Signals, KS-16301

6.01 The KS-16301, L3 (vibrating bell) has a volume adjustment. On the Wheelock Signal Company type, the adjustment is a hexagonal nut on the rear of the signal (Fig. 8). The Sperti-Faraday Company type adjustment is on the back of the bell resonator. The direction of adjustment is stamped near the adjusting nut or screw. Table A shows operating currents.

6.02 The KS-16301, L4 (single-stroke bell) uses a cotter key volume adjustment. The signal is shipped with the key inserted through the lowest of the three holes in the sleeve that contains the plunger for maximum volume. To decrease volume, move cotter key to intermediate or top hole in the sleeve (Fig. 9).

6.03 Replace defective signals with complete list number.

B. Relays, KS-16301, KS-20614

6.04 The Lists 15, 16, and 17 relays should meet the following requirements: (Table C)

- The armature should not chatter when the relay is operated with the specified voltage.
- The armature should not bind or stick; gauge by feel.
- The armature airgap is adjusted on Wheelock Signal Company relays by moving a lever on the bottom of the relay.

- In Sperti-Faraday Company relay, the armature airgap is adjusted by rotating the armature airgap adjusting screw 1/2 turn to the desired setting.
- Minimum contact pressure is 6 grams, measured with relay operated either electrically or manually; use 70H gauge.
- The contacts should make almost simultaneously; gauge by eye.
- The armature and pole piece should be free of dirt or metal filings. Clean with 1/2-inch relay cleaning strips or equivalent.

6.05 The KS-16301, L15 and KS-20614 relays used as a ringing bridge should not chatter during dial pulsing to the extent that contacts make. Check position of HI or LO sensitivity adjustment, ie, HI for long loop or LO for dial area. If relay meets all requirements but chatters on dial pulsing, replace in accordance with local instructions.

C. KS-8229 (MD) Signal Chime

6.06 The volume of the KS-8229 (MD) signal chime (Fig. 3) may be adjusted by a screw. No other adjustment should be made. Should the plunger stick in its guide, remove plunger and clean with mineral spirits. If this does not correct operation, replace signal device.

6.07 Some auxiliary signals can cause malfunctions in frequency counters at computer installations due to arcing of the ac contacts of the signal, inducing noise in the ac line, and radiating in the line cord of the computer. The problem can be alleviated by installing a 0.02- μ f capacitor across the ac contacts of the auxiliary signal.

7. CONNECTIONS

7.01 Several signals may be connected as shown in Fig. 22. This has the advantage of only one ringing bridge on the telephone line for several auxiliary signals. The total number of auxiliary signals connected to a power relay set should not exceed the current carrying capacity of the relay contacts. Special commercial power wiring is not needed between relay set and signals.

7.02 Connections for KS-16301 signals and relays are shown in Fig. 23.

7.03 Connections for KS-22001 chimes are shown in Fig. 24.

7.04 Auxiliary signals may be installed on 4-party full selective or 8-party semiselective lines by connecting a 531C or 687B subscriber set as shown in Fig. 25 and 26.

7.05 The KS-20614 relay switch connections are shown in Fig. 27 and 28.

TABLE A
ORDERING GUIDE

UNIT	LOCATION	STROKE	OPERATING VOLTAGE	MAXIMUM CURRENT (AMPERES)	OUTPUT (dB)	MAXIMUM OUTPUT VOLTS	RELAY OPERATION†	SEE FIG. NO.
BELL KS-8547, L1	Hazardous-Indoor	Vibrating	115-volt ac	0.21				1
KS-8547, L2	Hazardous-Outdoor	Vibrating	115-volt ac	0.21				1
KS-8547, L3*	Hazardous-Indoor	Single	115-volt ac	0.12				1
KS-8547, L4*	Hazardous Indoor-Outdoor	Single	115-volt ac	0.12				1
KS-16301, L3	Indoor-Outdoor	Vibrating	115-volt ac	0.125	100.0		Table C	8
KS-16301, L4	Indoor-Outdoor	Single	115-volt ac §	0.350	98.0		Table C	9
KS-16301, L20	Indoor-Outdoor	Vibrating	48-volt ac	0.325	85.0		Table C	10
KS-20375, L1‡	Indoor	Vibrating	18-volt ac	0.325	101.6			2
CHIME KS-8229, L13 (MD)	Indoor	Single	115-volt ac	0.07			48-volt dc	3
KS-8229, L14 (MD)	Indoor	Single	115-volt ac	0.07			48-volt ac	3
KS-8229, L15 (MD)	Indoor	Single	115-volt ac	0.07			90 volt, 20 Hz	3
KS-8229, L23 (MD)	Indoor	Single	115-volt ac	0.07				3
KS-16301, L1	Indoor-Outdoor	Single	115-volt ac	0.400			Table C	11
KS-22001, L2	Indoor	Single	115-volt ac	0.07	75.0			4
KS-22001, L5	Indoor	Single	115-volt ac	0.07	75.0		48-volt dc	4
KS-22001, L6	Indoor	Single	115-volt ac	0.07	75.0		48-volt ac	4
KS-22001, L7	Indoor	Single	115-volt ac	0.07	75.0		90 volt, 20 Hz	4
HORN KS-16301, L2	Indoor-Outdoor		115-volt dc §	0.031	100.0		Table C	12
KS-16301, L5	Indoor-Outdoor		115-volt ac	0.450	105.0		Table C	12
KS-16301, L6	Indoor-Outdoor		48-volt ac §	1.30	100.0		Table C	12
KS-16301, L21	Indoor-Outdoor		48-volt dc §	1.30	86-96		Table C	
SWITCH, RELAY KS-20614, L1	Indoor			5A		40-130 volt, 20 Hz	90 volt, 20 Hz	20, 27
KS-20614, L2	Indoor			3.2A		40-130 volt, 20 Hz	90 volt, 20 Hz	21, 28

* May be ordered equipped for 115-volt dc operation.

† • 48-volt ac relays will operate on 9-volt minimum.

• 48-volt dc relays will operate on 17-volt minimum.

• Ringing current relays will operate on 53-volt minimum with wide airgap and 34-volt minimum with close airgap.

‡ A KS-2189 transformer or 215A power unit or power supply of local key system may be used to supply 18-volt ac as long as capacity of power supply is not exceeded.

§ Do not plug into 115 volts, 60 Hz.

TABLE B

ORDERING GUIDE

ASSOCIATED APPARATUS	TYPE OF INSTALLATION	USE WITH				FIGURE NUMBER
		BELL	HORN	CHIME	RELAY	
BACKBOX KS-16301, L8*	Indoor with Power Cord	•	•	•	•	14
KS-16301, L9*	Indoor with Conduit	•	•	•	• ‡	15
KS-16301, L11*	Outdoor with Conduit	•	•	•	• ‡	16
KS-16301, L19*	Outdoor with Power Cord	•	•	•	•	17
KS-22001, L9	Indoor with Conduit			•		5
MOUNTING PLATE KS-22001, L8	Indoor-Portable Mounting			•		6
OUTLET KS-16301, L18†	Outdoor-Weatherproof					19
RELAY KS-16301, L15	Indoor-Outdoor	•	•	•		13
KS-16301, L16	Indoor-Outdoor	•	•	•		13
KS-16301, L17	Indoor-Outdoor	•	•	•		13

* Mounting hardware not furnished

† Use with KS-16301, L19 backbox (ordered separately).

‡ List 9 and 11 may be used with or without a relay as needed.

TABLE C

RELAYS, KS-16301 OPERATING REQUIREMENTS

RELAY	OPERATING VOLTAGE	OPERATING CURRENT AT MAXIMUM VOLTAGE	DC RESISTANCE OF RELAY COIL	IMPEDANCE OF RELAY COIL	RELAY CONTACT-CARRYING CAPACITY
LIST NO.		AMPERES	OHMS	OHMS	AMPERES
15	18- to 48-volts dc	0.011	4500	—	5
	30- to 48-volts 60-Hz ac	0.025	1000	1920	
	39- to 90-volts 20-Hz ac (ringing voltage)	0.012	4500	7550*	
16	9- to 48-volts 60-Hz ac	0.404	26.3	118	
17	12- to 78-volts dc	0.069	1130	—	

* Includes 0.45- μ f series capacitor.



Fig. 1—KS-8547, List 1 Bell

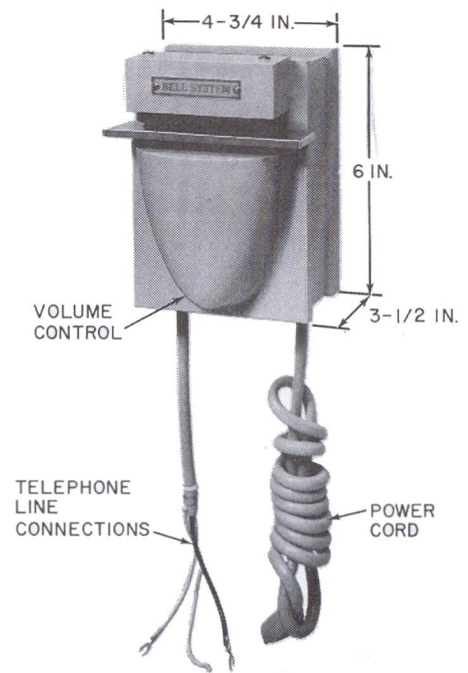


Fig. 3—KS-8229 Chime (MD)

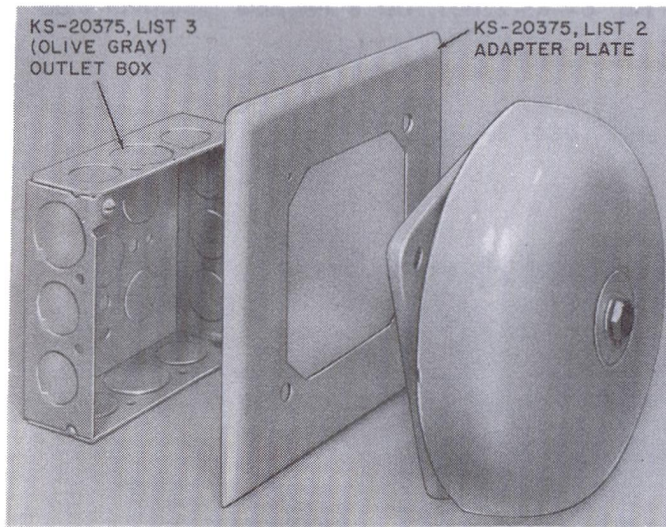


Fig. 2—KS-20375, List 1 Bell, List 2 Adapter Plate, List 3 or 4 (Olive Gray) Outlet Box

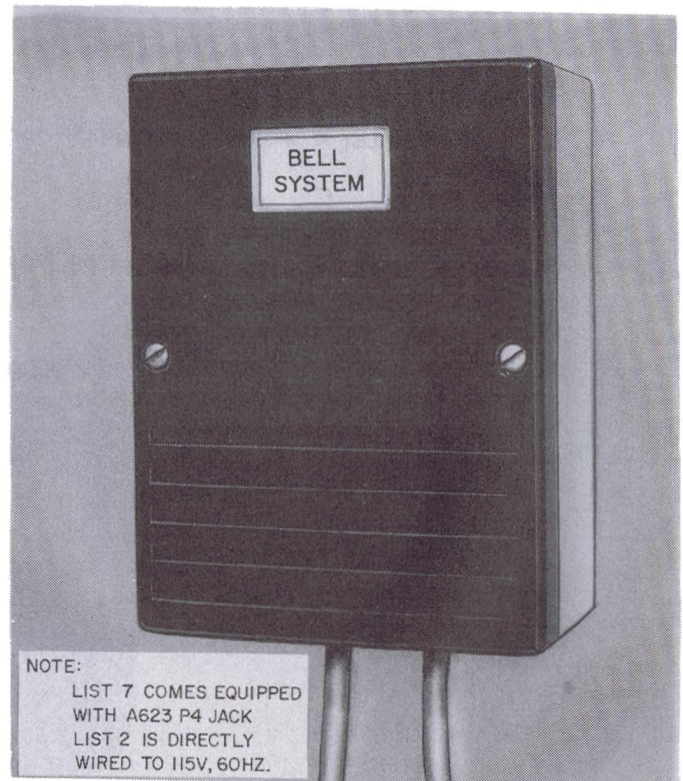


Fig. 4—KS-22001-Type Chime

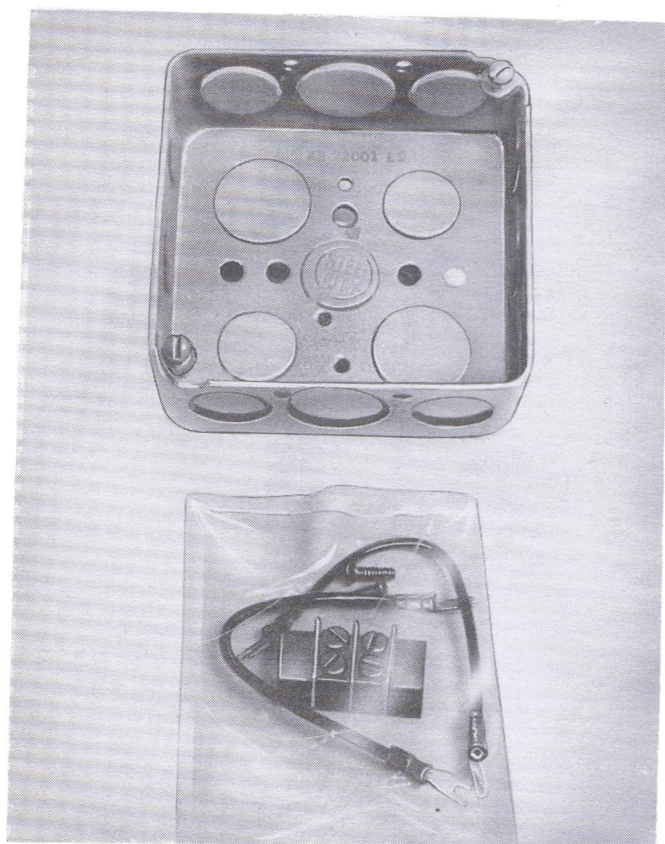


Fig. 5—KS-22001, List 9 4-Inch Backbox

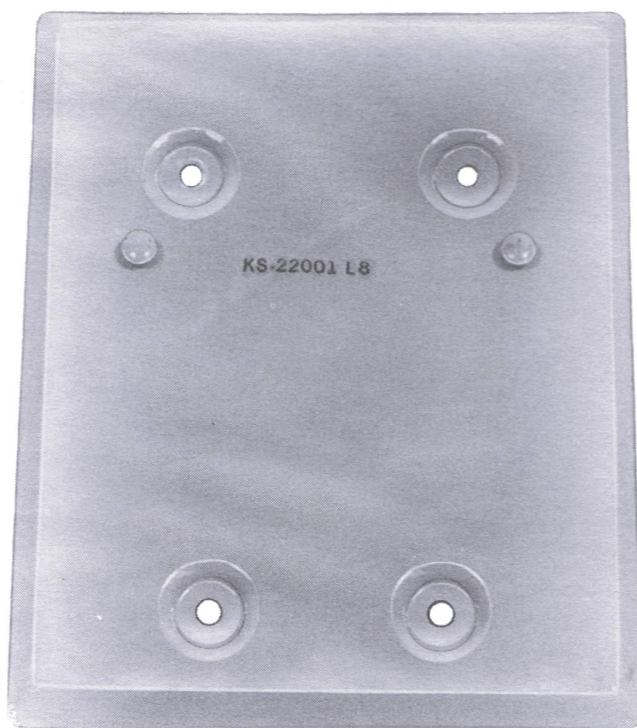


Fig. 6—KS-22001, List 8 Portable Mounting Plate

NOTE:

NEVER PLUG SIGNAL DIRECTLY INTO BACKBOXES
EQUIPPED WITH POWER CORD. RELAY IS ALWAYS
NEEDED BETWEEN SIGNAL AND BACKBOX ON
LIST 8 OR LIST 19 BACKBOXES.

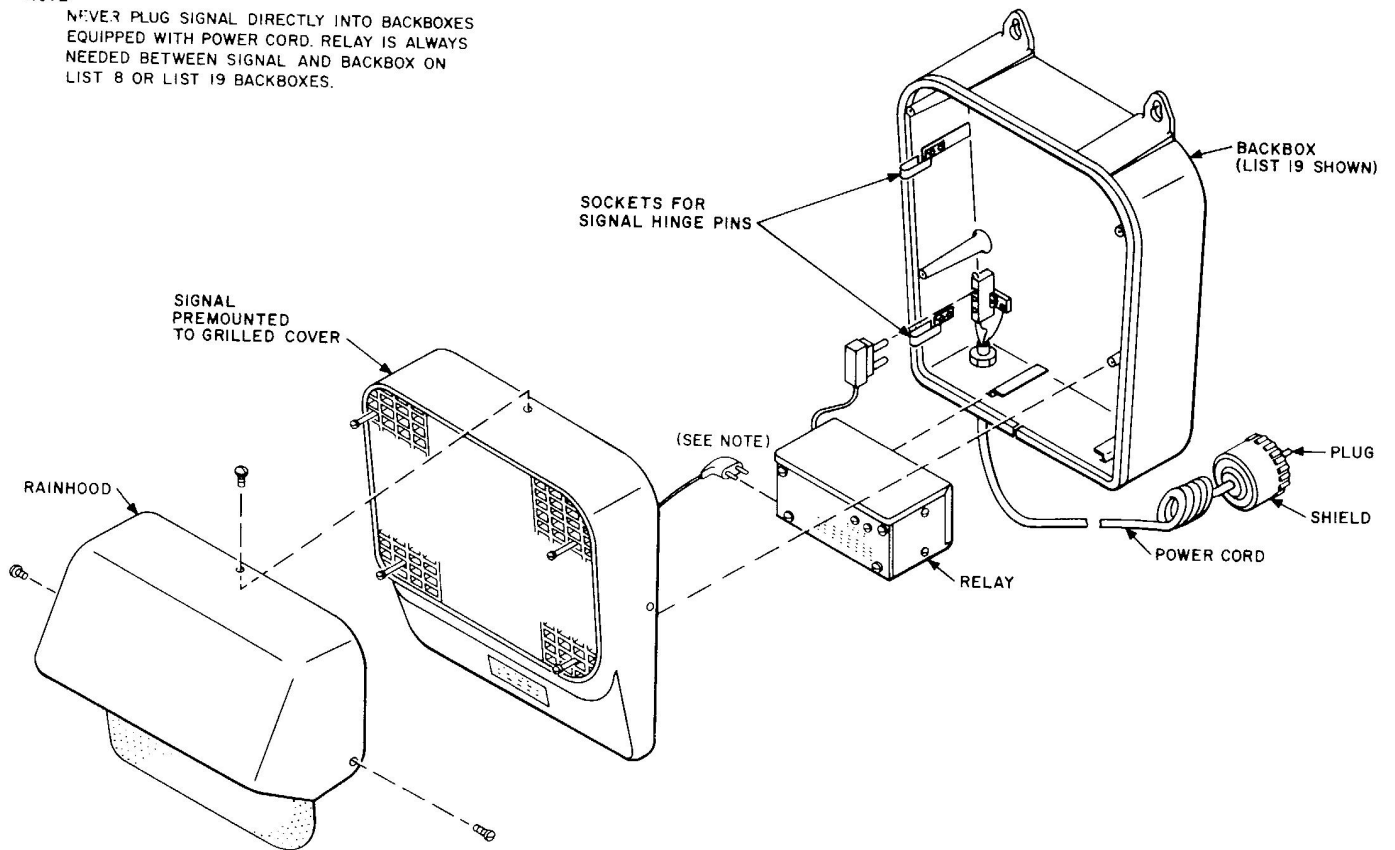


Fig. 7—KS-16301-Type Signal—Exploded Assembly

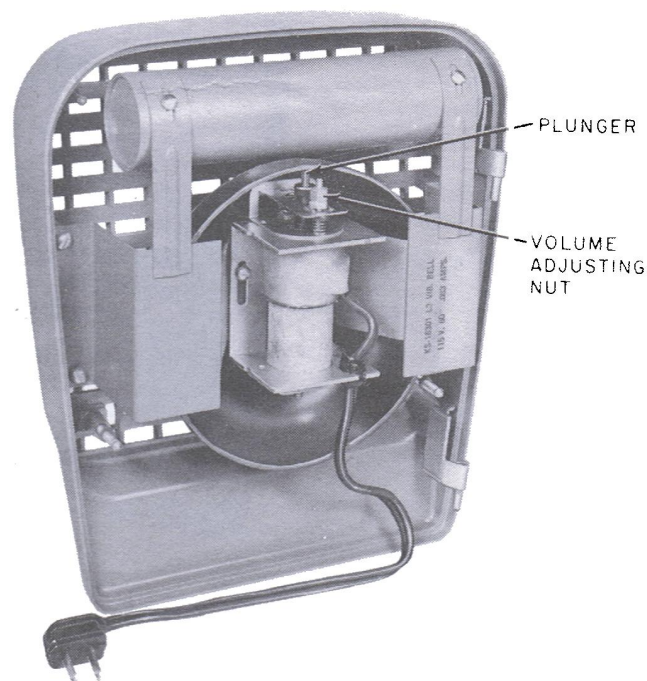


Fig. 8—KS-16301, List 3 Bell

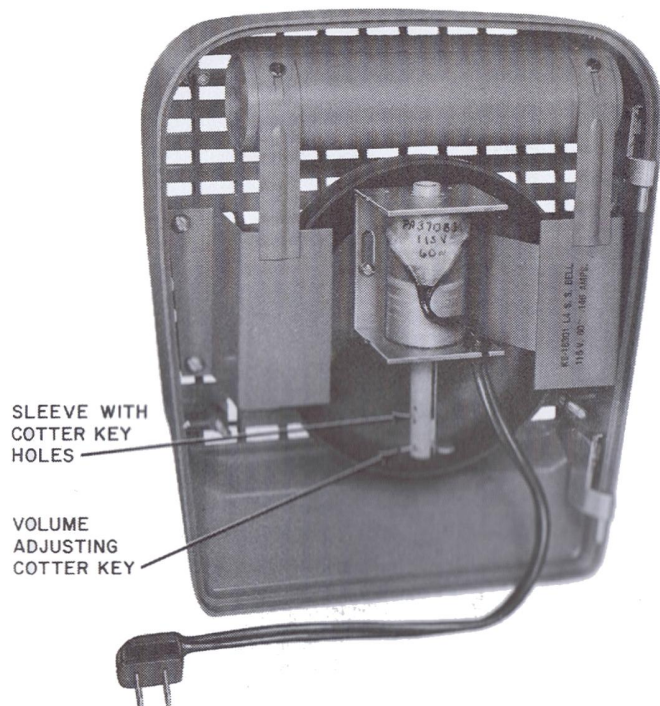


Fig. 9—KS-16301, List 4 Bell



Fig. 11—KS-16301, List 1 Chime

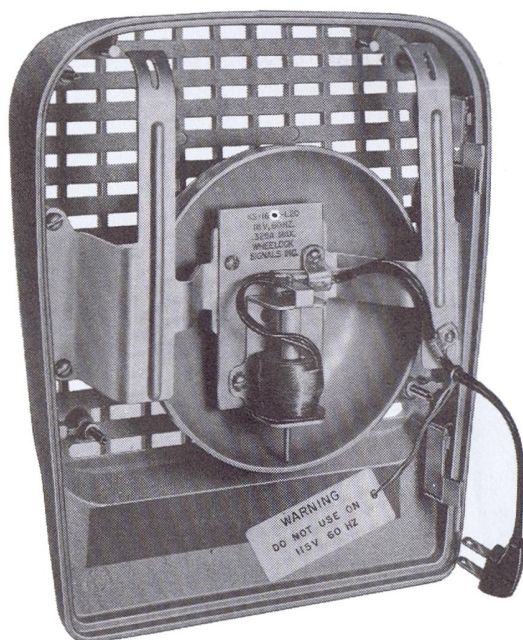


Fig. 10—KS-16301, List 20 Bell

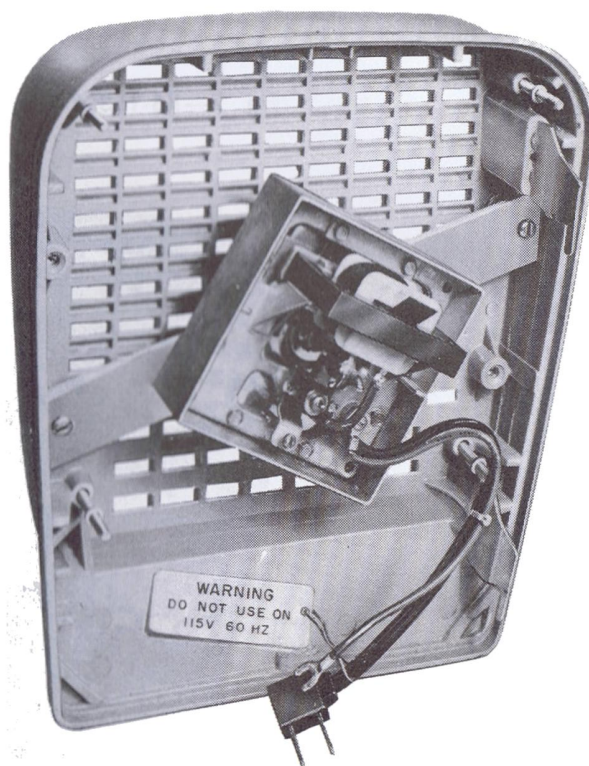
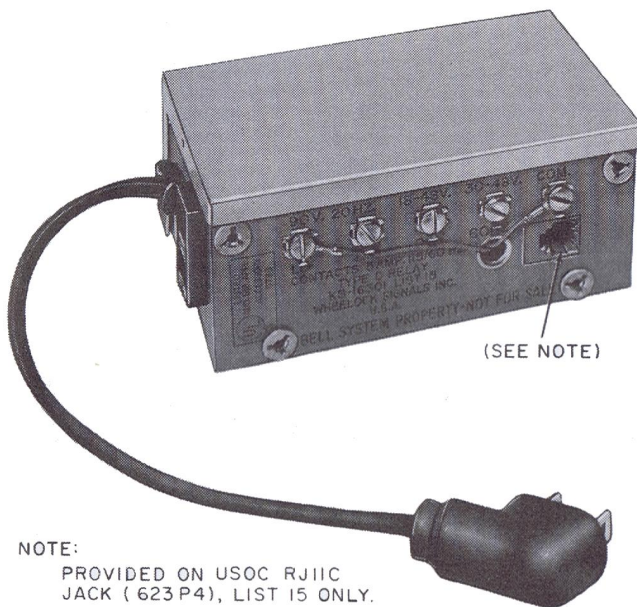


Fig. 12—KS-16301-Type Horn (List 2 Shown)



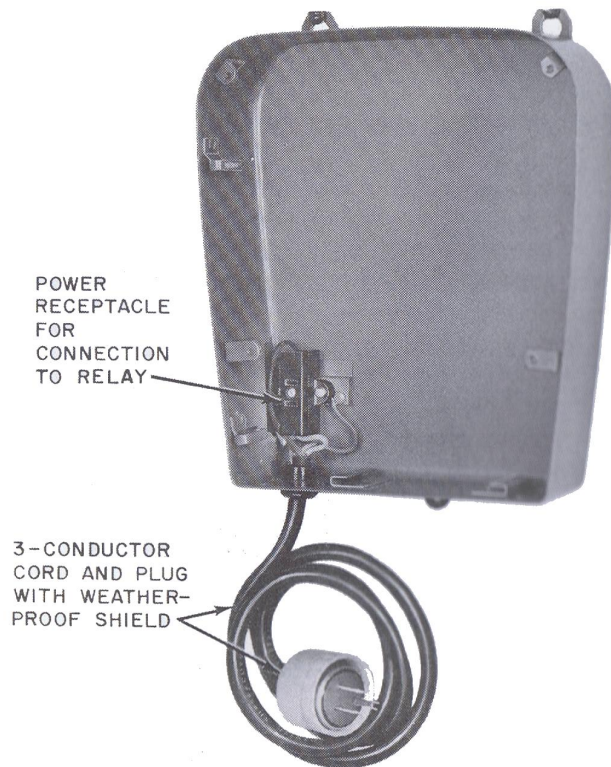


Fig. 17—KS-16301, List 19 Backbox

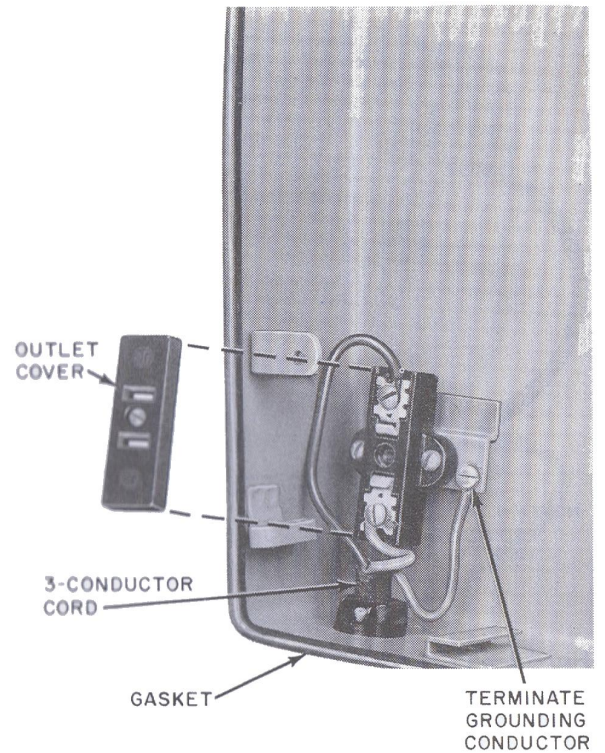


Fig. 18—KS-16301, Backbox, Power Cord Termination

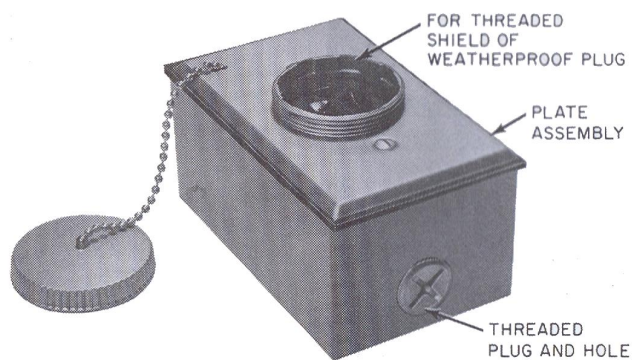


Fig. 19—KS-16301, List 18 Weatherproof Outlet

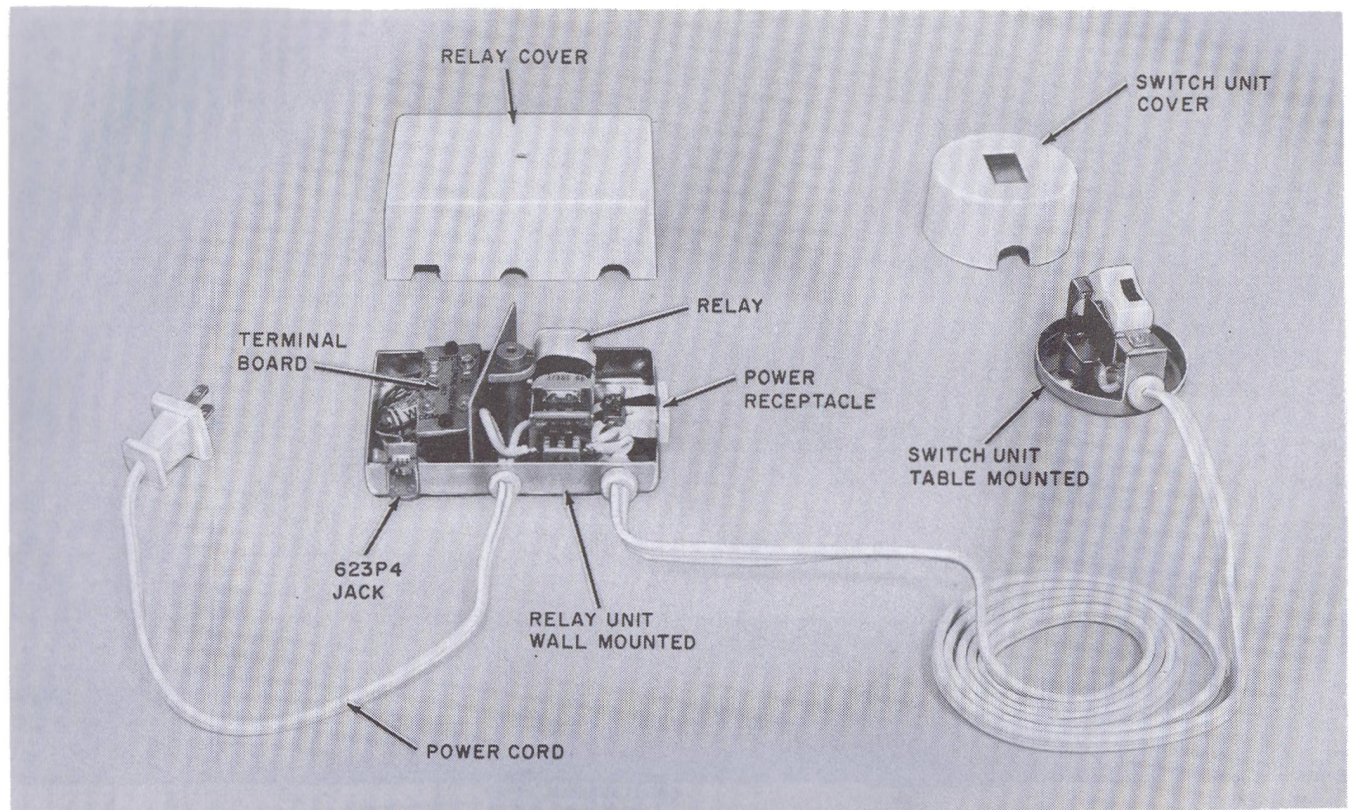


Fig. 20—KS-20614, List 1 Relay Switch

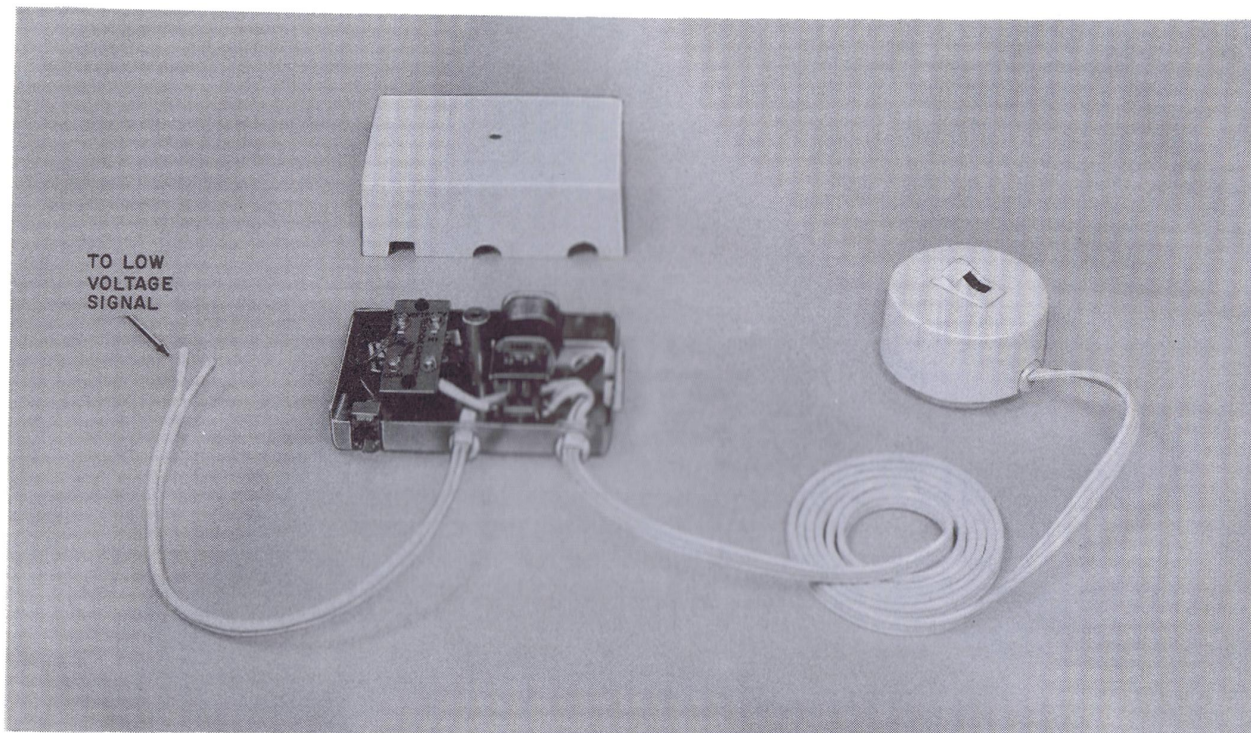


Fig. 21—KS-20614, List 2 Relay Switch

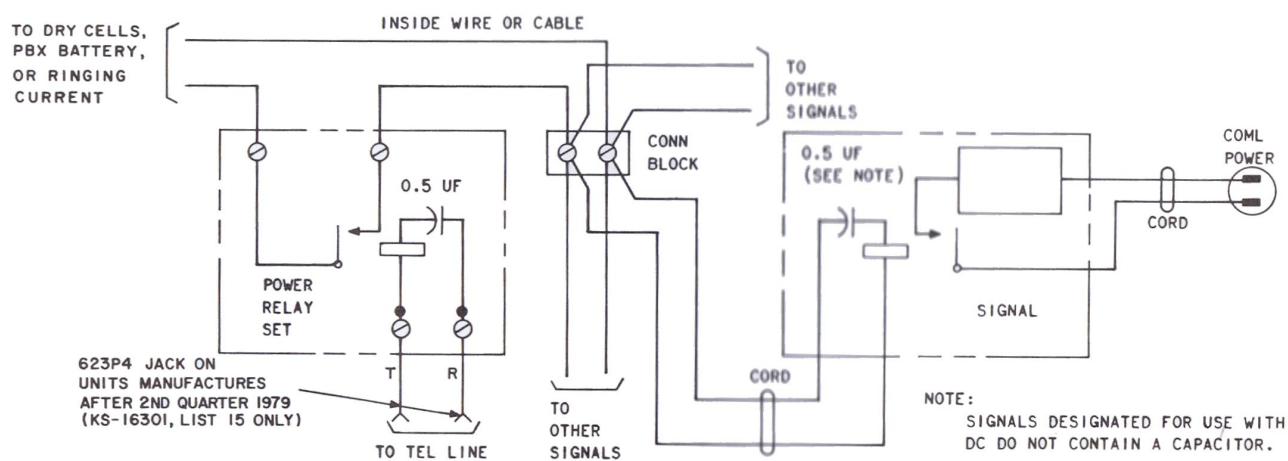


Fig. 22—Multiple Signal Connections

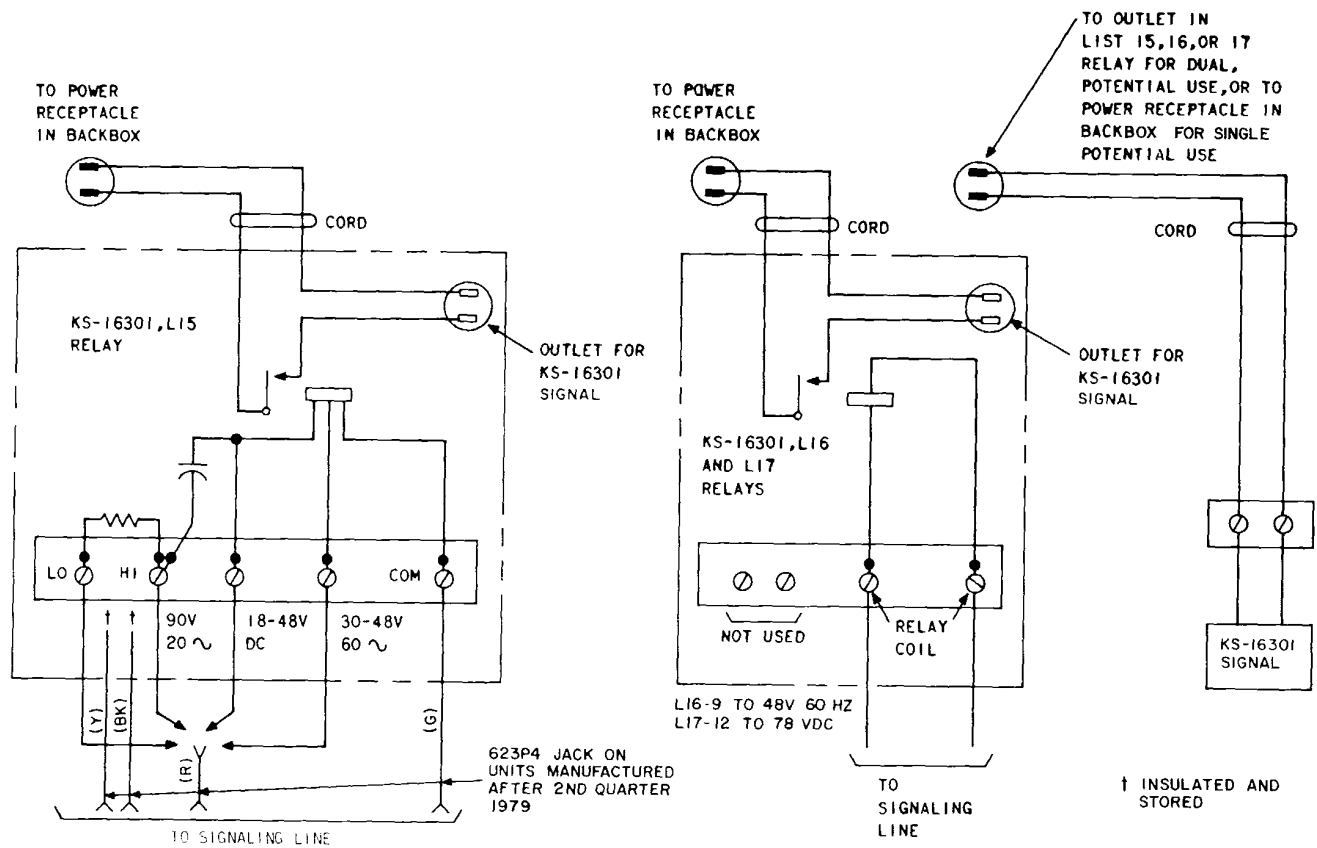


Fig. 23—KS-16301 Signal Connections

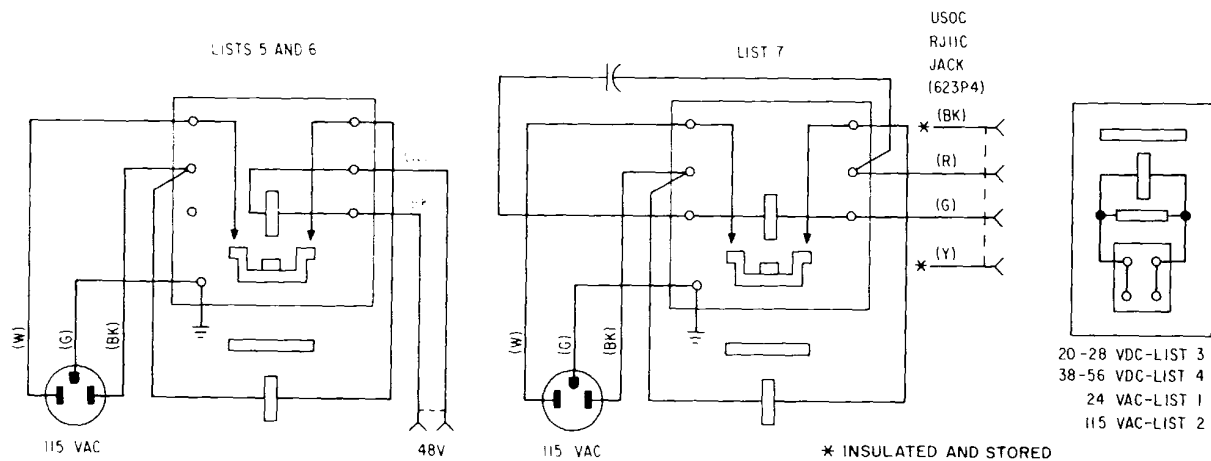


Fig. 24—Connections for KS-22001 Chimes

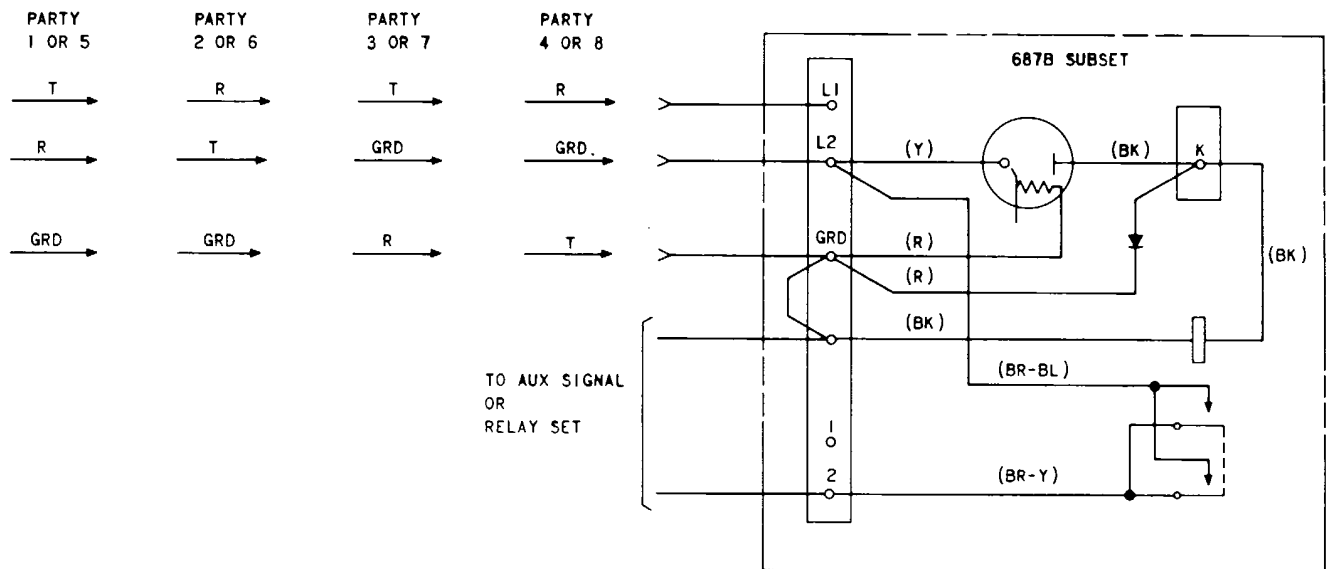


Fig. 25—Connections for Auxiliary Signals on Party Line Using CO Ringing Power

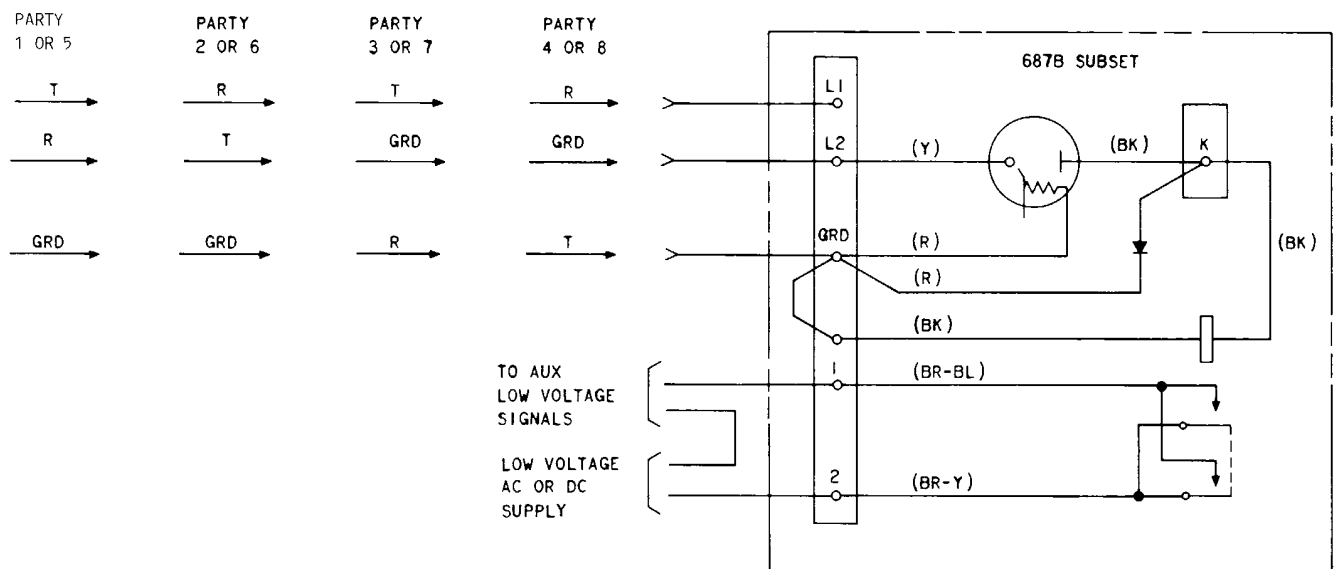


Fig. 26—Connections Party Line Low Voltage Auxiliary Signal Using Auxiliary Power

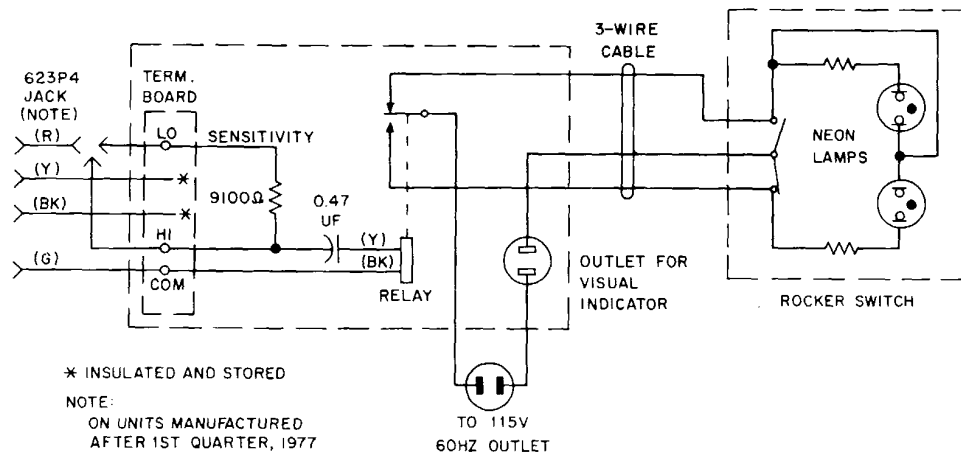


Fig. 27—KS-20614, List 1 Relay Switch—Schematic

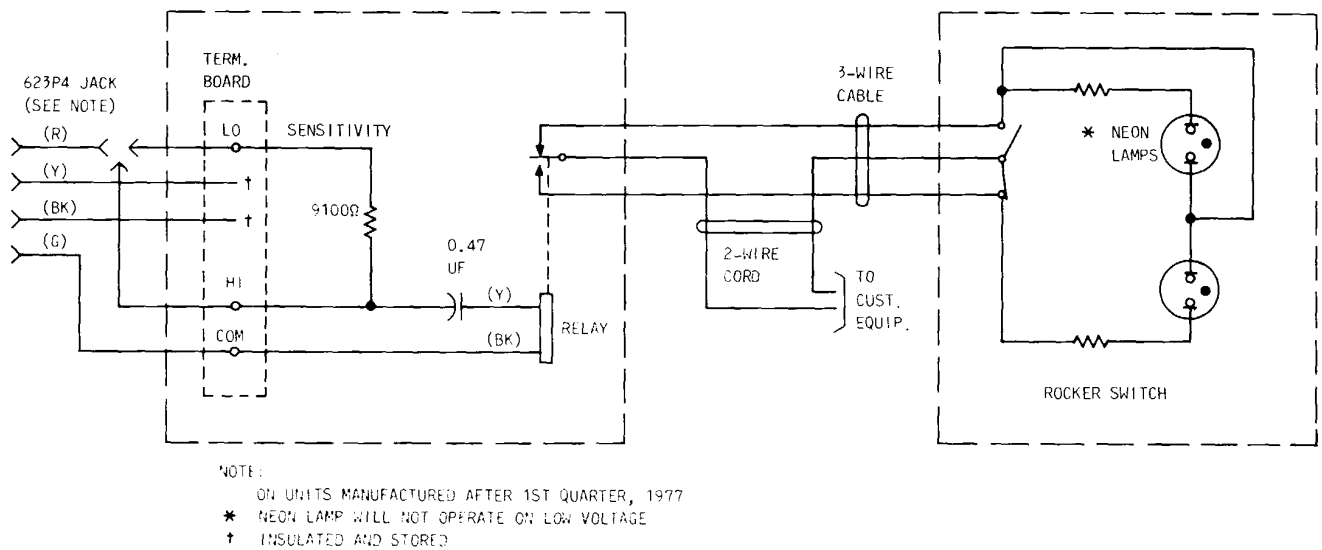


Fig. 28—KS-20614, List 2 Relay Switch—Schematic

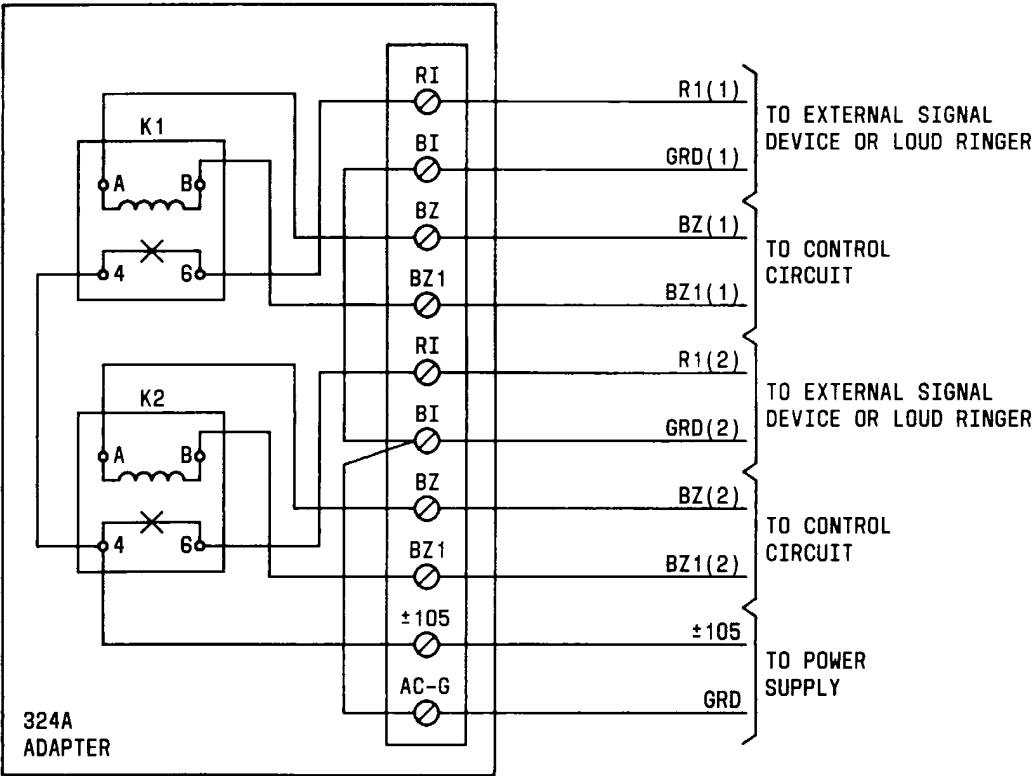


Fig. 29—Connections for 324A Adapter

AUXILIARY SIGNALS

IDENTIFICATION, INSTALLATION, OPERATION, MAINTENANCE, AND CONNECTIONS

1. GENERAL

1.001 This addendum supplements Section 463-110-100, Issue 13. Place this pink sheet ahead of Page 1 of this section.

1.002 This addendum is issued to revise information in Table A.

2. CHANGES TO SECTION

2.001 On Page 7, Table A, on the line for the unit KS-16301, L4 in the column designated

OPERATING VOLTAGE, remove the footnote symbol (\$) as it does not apply (see Table A).

2.002 On Page 7, Table A, on the line for the unit KS-16301, L20 in the column designated OPERATING VOLTAGE, 48-volt ac should be 18-volt ac \$. The footnote symbol (\$) does apply on this line (see Table A).

2.003 On Page 7, Table A is obsolete. A new Table A is provided in this addendum.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

TABLE A
ORDERING GUIDE

UNIT	LOCATION	STROKE	OPERATING VOLTAGE	MAXIMUM CURRENT (AMPERES)	OUTPUT (dB)	MAXIMUM OUTPUT VOLTS	RELAY OPERATION†	SEE FIG. NO.
BELL KS-8547, L1	Hazardous-Indoor	Vibrating	115-volt ac	0.21				1
KS-8547, L2	Hazardous-Outdoor	Vibrating	115-volt ac	0.21				1
KS-8547, L3*	Hazardous-Indoor	Single	115-volt ac	0.12				1
KS-8547, L4*	Hazardous Indoor-Outdoor	Single	115-volt ac	0.12				1
KS-16301, L3	Indoor-Outdoor	Vibrating	115-volt ac	0.125	100.0		Table C	8
KS-16301, L4	Indoor-Outdoor	Single	115-volt ac	0.350	98.0		Table C	9
KS-16301, L20	Indoor-Outdoor	Vibrating	18-volt ac §	0.325	85.0		Table C	10
KS-20375, L1‡	Indoor	Vibrating	18-volt ac	0.325	101.6			2
CHIME KS-8229, L13 (MD)	Indoor	Single	115-volt ac	0.07			48-volt dc	3
KS-8229, L14 (MD)	Indoor	Single	115-volt ac	0.07			48-volt ac	3
KS-8229, L15 (MD)	Indoor	Single	115-volt ac	0.07			90 volt, 20 Hz	3
KS-8229, L23 (MD)	Indoor	Single	115-volt ac	0.07				3
KS-16301, L1	Indoor-Outdoor	Single	115-volt ac	0.400			Table C	11
KS-22001, L2	Indoor	Single	115-volt ac	0.07	75.0			4
KS-22001, L5	Indoor	Single	115-volt ac	0.07	75.0		48-volt dc	4
KS-22001, L6	Indoor	Single	115-volt ac	0.07	75.0		48-volt ac	4
KS-22001, L7	Indoor	Single	115-volt ac	0.07	75.0		90 volt, 20 Hz	4
HORN KS-16301, L2	Indoor-Outdoor		115-volt dc §	0.031	100.0		Table C	12
KS-16301, L5	Indoor-Outdoor		115-volt ac	0.450	105.0		Table C	12
KS-16301, L6	Indoor-Outdoor		48-volt ac §	1.30	100.0		Table C	12
KS-16301, L21	Indoor-Outdoor		48-volt dc §	1.30	86-96		Table C	
SWITCH, RELAY KS-20614, L1	Indoor			5A		40-130 volt, 20 Hz	90 volt, 20 Hz	20, 27
KS-20614, L2	Indoor			3.2A		40-130 volt, 20 Hz	90 volt, 20 Hz	27, 28

* May be ordered equipped for 115-volt dc operation.

† • 48-volt ac relays will operate on 9-volt minimum.

• 48-volt dc relays will operate on 17-volt minimum.

• Ringing current relays will operate on 53-volt minimum with wide airgap and 54-volt minimum with close airgap.

‡ A KS-2189 transformer or 215A power unit or power supply of local key system may be used to supply 18-volt ac as long as capacity of power supply is not exceeded.

§ Do not plug into 115 volts, 60 Hz.