REFERENCE

1A2 KEY TELEPHONE SYSTEM

IDENTIFICATION AND ARRANGEMENTS

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1. GENERAL

1.01 The 1A2 KTS enables key stations to connect to any one of a number of central office (CO), PBX, private, or intercom lines by the operation of an associated pickup key. The capacity of any station is determined by the number of buttons available for pickup, switching, or signaling purposes.

1.02 This section is reissued to:

- Add information on KTUs introduced since the last issue: 400G, 471A, 478B, and 479A
- Add above-listed KTUs to Table A
- Add 626A panel to Table C
- Add 215B1 power unit to Table E
- Expand Part 2 to incude information on features of 1A2 KTS (audible signals, intercom, toll restriction, 6B1 and 7B1 Message Waiting consoles)
- Show 400D KTU rated MD and replaced by the 400G
- Show 414A KTU rerated from AT&TCo Standard to Additions and Maintenance Only (A&M Only)

Printed in U.S.A.

- Show 440A KTU rated MD and replaced by the 478B

- Revise Fig. 5 and 6.

1.03 The 1A2 System features miniature 400-series KTUs which consist of miniature relays and solid state circuitry assembled on plug-in type printed wiring boards. Service features are similar to those of the 1A1 System. However, the line circuits of the 1A2 System are arranged for time-out of locked-in visual and audible signals on a ***per line basis*** rather than on a ***system basis.***

1.04 The 400-series KTUs are designed and manufactured to insure reliable operation and good service with extended useful life. Improper or careless handling can result in damaged units. Exercise care when handling, storing, and shipping KTUs to avoid accidental damage to delicate components. These units are shipped in a reusable blister pack.

Always use the blister pack or other suitable container when transporting or storing the KTUs. Overpack when necessary.

1.05 A large or centralized installation of a 1A2 KTS should, where practical, make use of the connecting block arrangement described in Section 518-010-101.

1.06 ***Packaged 1A2 KTS:*** The COM KEY* 718, 1434, and 2152 Systems, which combine 1A2 equipment with specially designed KTUs, key telephones and consoles, are not covered in this practice. Refer to Sections 518-450-100, -102, and -110 for information on these systems.

*Trademark

1.07 This issue of the section is based on the following drawings:

SD-69475, Issue 6—401A KTU

SD-69489, Issue 5—428A KTU

SD-69513, Issue 15—400B (MD), 400C (MD), and 400D (MD) KTU

SD-69530, Issue 6—429A (MD), 429B and 430A KTUs

SD-69552, Issue 4—412A KTU

SD-69559, Issue 9—414A (A&M) Only, 415A, 416A, 418A, 419A, 461A, and 469A KTUs

SD-69561, Issue 2—417A KTU

SD-69567, Issue 14—407B (MD), 407C, 420A, 422B, 423A, 423B (MD), 424A (MD), 424C, and 476A KTUs

SD-69590, Issue 2—413A, 421A, 448A, and 449A KTUs

SD-69595, Issue 8—426A, 427B (MD), and 427C KTUs

◗SD-69651, Issue 1—400G KTU◖

SD-69906, Issue 2—440A (MD) KTU

SD-69917, Issue 1—467A KTU

◗SD-69921, Issue 1—471A, 479A KTUs◖

SD-69922, Issue 1—451B KTU

◗SD-69931, Issue 2—478B KTU◖

If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

1.08 For detailed information on specified KTS equipment and apparatus, refer to the following sections:

518-215-400—Line Service KTUs

518-215-401—Auxiliary Service KTUs

518-215-402—Intercom Service KTUs

518-215-403—Control Service KTUs

◗518-215-404—501-, 502-Type KSUs◖

518-215-405—513-, 514-, 515-Type KSUs

◗518-215-407—550-, 551-Type KSUs◖

518-215-410—583-, 584-Type Panels

518-215-417—597-, 598-Type Panels

518-215-418—601-, 602-, 603-Type Panels

518-215-419—620A, 641A, and 642A Modular Panels

518-215-420—69-Type Apparatus Mountings

◗518-215-421—626A Modular Panel◖

2. IDENTIFICATION

2.01 A 1A2 KTS consists of the following:

(a) Key telephone sets and/or nonkey telephone sets (with or without separately mounted keys) capable of *A* lead control.

(b) 400-series KTUs providing switching and control features.

(c) KSUs, panels, and apparatus mountings, featuring prewired connectors that provide the mounting and connecting facilities for the 400-series KTUs.

(d) Local power supply for talking, audible signal, lamp and relay operation.

(e) Miscellaneous components as required: cabling, distribution terminals, adapters, fasteners, and supplemental apparatus cabinets or relay racks.

FEATURES

2.02 The 1A2 KTS provides the following features:

- Pickup and hold on CO or PBX lines
- Visual signals
- Audible signals
- ◗Intercom (Rotary or TOUCH-TONE® dialing, voice signaling on manual intercom, and HFAI on dial intercom)◖
- Private lines
- Add-on conferencing
- Exclusion
- Station restriction
- Music-on-hold
- Speakerphone
- ◗Toll Restriction (battery reversal or rotary dial)
- 6B1 and 7B1 Message Waiting (MW) consoles.◖

A. Pickup and Hold

2.03 Pickup of more than one line at a station is the basic feature of a key system. Any line appearing at a station can be selected by operating the button assigned to that line.

2.04 The hold feature permits a station to hold a line while using another line. Depressing the hold key connects a resistive holding bridge across the line and releases the station user from that line.

Supplementary Hold

2.05 In addition to normal hold, as explained in 2.04, the system may be equipped for supplementary hold which provides a special lamp flutter indication. Supplementary hold is provided by two methods:

- ***Priority hold*** in which all appearances of a line receive the flutter indication.
- ***I hold*** in which the flutter indication is received only at the station initiating the hold.

2.06 ***Priority hold*** serves to alert personnel that an incoming call has been answered (acknowledged only), placed on hold, and should be completed as soon as the first available attendant is able to do so. ***I hold*** enables an attendant having access to a number of lines to readily determine which lines have been placed on hold by the attendant.

B. Visual Signals

2.07 Visual signals may be provided by lamps associated with pickup keys of key telephone sets or separately mounted keys, or by separately mounted lamp indicators.

2.08 The 1A2 KTS provides the following visual line signals at stations:

- Steady lamp for line busy
- Flashing lamp for an incoming call
- Steady or winking lamp for normal hold
- Flutter lamp for "priority hold" or "I hold."

2.09 ***Station Busy Lamp:*** This feature is a function of the switchhook in the telephone set. When the handset is off-hook at a station so equipped, a visual signal is received at a subordinate station or stations. This signal alerts the subordinate station(s) that the master station is off-hook and all incoming calls for the master station should be intercepted.

2.10 ***Fuse and Line Status Indicators:*** Indicator type fuses give a visual indication of fuse status in the KSU. A line status lamp located in the KSU is dedicated to each CO/PBX and intercom line and shows the status of the associated line. This latter feature is available only with 600-series modular panels.

C. Audible Signals

2.11 Three types of audible signals are available with the basic 1A2 KTS: ringers, bells, and/or buzzers. They may be arranged for steady or interrupted operation. Ringers and buzzers can be located in the telephone set or external to it; bells are mounted externally. A station may be equipped with more than one audible signal, depending on services and features required.

2.12 ***Common Audible Signaling:*** This feature provides for the use of one signaling device for indicating incoming calls on any of several lines. In a typical installation, one station may be designated as the attendant position, which will be equipped with common audible signaling; all incoming calls will ring the attendant position and be answered there. Common audible signaling is flexible and can be arranged in various combinations of lines to ringers by the use of diode matrices. Section 518-010-108 contains a detailed description of common audible signaling.

2.13 ***Audible Signal Suppression:*** This feature provides a circuit arrangement to suppress audible alerting signals on a line or lines associated with a multibutton telephone set when that station is in an off-hook condition. Section 518-215-403 provides a detailed description of audible signal suppression.

2.14 ***Multistation CO Line Ringing:*** CO ringing on a given line may be provided at more than one station in a 1A2 KTS. So, in addition to the common audible ringing at the attendant station, other stations can be wired to ring on incoming CO calls. This feature is extremely flexible and can be arranged to fit the customer's specific needs.

2.15 ***Ringing Control:*** Audible signals may also be controlled by delayed or immediate transfer control circuits. The delayed transfer control circuit allows an audible signal to sound for a predetermined interval, then transfers it to an attendant station when the control circuit times out. The immediate transfer circuit is controlled by a key. When the key is operated, ringing is automatically transferred to an attendant station.

2.16 ***Power Failure Transfer:*** When local commercial power supplying the KTS fails, local ringing on CO lines cannot continue. The power failure transfer feature automatically substitutes an external signaling device, operated by CO line ringing current, for the station ringer on a selected line. This allows incoming calls to be recognized and answered while commercial power is down. External ringers are installed on a per-line basis.

D. Intercom

2.17 An intercom line circuit allows two or more stations, usually located on the same premises, to converse with each other over a common talking path, without the use of a CO or PBX line. HFAI can be furnished on manual or dial intercoms using adjuncts. This feature allows the called party to answer an intercom call without going off-hook. See Section 518-010-115 for detailed information.

2.18 Two types of intercom lines are available:

(a) ***Manual:*** Where all stations (on pickup) are connected to a common talking path. Station selection is done manually by the use of pushbuttons and buzzers. A visual signal can be provided at each station to indicate a busy condition. Voice Signaling on manual intercom

can be provided by using a 107B loudspeaker set. See Section 518-010-109 for detailed information.

(b) ***Dial:*** Where a station (on pickup) is connected to a common talking path which is part of a 10- or 19-code selector circuit. Station selection is accomplished by dialing one or two digits. The selector provides rotary dial station selection, a steady visual signal at all stations to indicate the selector is busy, single spurt ringing, and control circuits for additional features as detailed in 2.19.

2.19 The following optional features can be added to the basic dial selector circuit:

- TOUCH-TONE calling
- Flashing lamps at called station
- Interrupted ringing instead of adjustable single spurt
- Direct station selection or signaling by means of a pushbutton instead of dialing
- Long line circuit
- Add-on conferencing
- Preset conferencing by means of a dial code or pushbutton signaling
- Dial tone
- Audible ringback tone
- Station busy tone
- Hands-Free Answering on Intercom (HFAI).

E. Private Lines

2.20 Private lines provide direct communication between two points without the need of a CO or PBX line. With one or two exceptions, KTS private lines require similar or equivalent private line apparatus at both ends.

2.21 A number of private lines are available for the 1A2 KTS. The lines differ only in the type of terminating apparatus used and the means of signaling from one end to the other. Private lines available are:

(a) Arranged for 2-way manual signaling by use of ringdown private line circuits at each end.

(b) Arranged for signaling automatically from either end when the handset is lifted by the use of automatic dc signaling private line circuits at each end.

(c) Arranged to provide manual signaling in one direction and automatic signaling in the other by use of a manual signaling, ringdown line circuit at one location and an automatic signaling, ringdown private circuit at the other.

(d) A line, usually between two telephone sets located on the same premises, provided by the use of a station line circuit or a short range, private line circuit. The station line circuit is arranged for manual signaling in one direction and automatic signaling in the other. Simple strapping changes to the short range private line circuit can provide automatic signaling in both directions, one-way automatic signaling, one-way manual signaling, or manual signaling in both directions. These lines differ from those described in (a), (b) and (c) in that both ends of the private line terminate at the same KTU.

> ***Note:*** Manual signaling is done by the use of pushbuttons. Pickup keys of some key telephone sets can be modified for use as pushbuttons, or externally mounted keys can be used. An example of the latter is a 551A key mounted on a 77A bracket.

F. Add-On Conferencing

2.22 Add-on conferencing enables a station to bridge two lines for a 3-way conference without the assistance of an operator. An exclusion or nonlocking key is required to control the conference circuit. A visual signal may also be provided to indicate the conference circuit is in operation.

2.23 Three different conference arrangements can be provided:

(1) A CO line and a PBX line

(2) Two PBX lines or two CO lines

(3) A CO or PBX line and an intercom line.

G. Exclusion

2.24 A control station can exclude any subordinate station from the line when privacy is desired. Two types of exclusion are available with the 1A2 KTS: that which is a function of some telephone sets, and that which requires a key telephone unit.

2.25 Single-line exclusion is provided by the exclusion key which is part of the switchhook assembly of some telephone sets. By manually pulling up the plunger, subordinate stations are excluded from the line and are automatically reconnected to the line by restoring the plunger or placing the handset on-hook.

2.26 Multiline exclusion permits control station to exclude subordinate stations from more than one line appearing at that station. One control key can provide control for as many exclusion circuits as are required at a control station. By manually operating the control key, subordinate stations are automatically excluded from an equipped line to which the control station is connected. As an optional feature, a visual signal, usually associated with the control key, can be provided to indicate exclusion is in use. Excluded stations are automatically reconnected to the line when the control station disconnects, either by hanging up or putting the line on hold.

H. Station Restriction

2.27 Individual key stations can be restricted from making outgoing CO or PBX calls. The restricted stations may have intercom line access and can receive calls but cannot break dial tone or tone address if outgoing nonintercom calls are attempted.

I. Music-on-Hold

2.28 This feature transmits music from a customer-provided music source to calling parties on CO/PBX lines that are placed on hold.

J. Speakerphone

2.29 Normal speakerphone service may be provided at any 1A2 KTS station equipped with a suitable telephone set. (BSP Division 512 contains detailed information on speakerphone connections.)

K. ◗Toll Restriction

2.30 ***Battery Reversal Toll Restriction:*** This feature disallows toll calls from restricted stations but allows calls from unrestricted stations. This feature can only be used with CO circuits that provide a polarity reversal on the tip and ring of the line on toll calls.

2.31 ***Rotary Dial Toll Restriction:*** This feature provides toll restriction on rotary dial lines where CO toll diversion is not available. This rotary dial toll restriction circuit may be optionally provided with "piggy-back" circuit modules to provide digit absorption or to allow restricted stations to call foreign number plan areas. May be used for either loop-start or ground-start operation, with ground start providing the most security against nonallowed calls being placed.◖

STATION APPARATUS

2.32 Generally, common battery telephone sets, with or without keys, capable of providing *A* lead control, may be used with 1A2 KTS. Station apparatus may also include separately mounted keys and the station portion of 4A, 5-type, and 101-type key equipment.

◗MESSAGE WAITING (MW) CONSOLES

A. 6B1 Selector Console

2.33 An 18-station selection MW console with station busy (SB) lamps incorporated in the MW buttons.

B. 7B1 Selector Console

2.34 A 34-station selection MW console with SB lamps incorporated in the MW buttons.◖

KEY TELEPHONE UNITS

2.35 The 400-series KTUs feature miniature relays, transistors, diodes, etc, mounted, except as noted, on 4- or 8-inch plug-in printed wiring boards. All circuitry to the KTUs is carried through contacts on the plug end of the unit. Depending on the type KTU, there are 18, 20, or 40 contacts on the 4-inch board and 80 contacts on

the 8-inch board. The 18- and 20-contact boards have contacts on one side of the mounting surface only; the 40- and 80-contact boards have contacts on both sides of the mounting surface.

> *Note:* Contacts are numbered starting with 0, ie, 0-17, 0-19 or 0-39. On 8-inch boards the upper and lower (A and B) contacts are each numbered 0-39.

Fig. 1 and 2 are representative of 4- and 8-inch printed wiring boards.

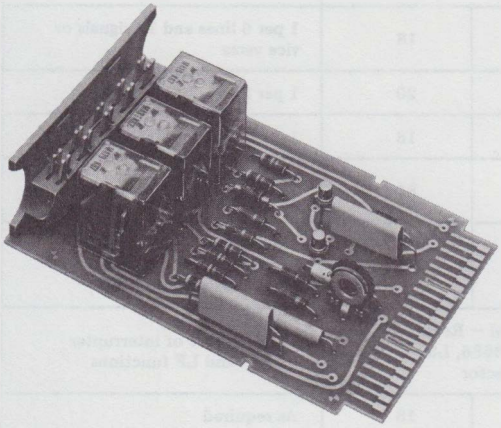

Fig. 1—Typical 4-Inch 20- or 40-Contact 400-Series KTU

2.36 Where practical, the 11 common leads, such as battery and ground, interrupter start (ST), lamp flash (LF), lamp wink (LW), etc, are wired to the same numbered contact on each KTU. This minimizes the amount of strapping required when adding a KTU to a system or changing from one KTU to another.

2.37 Two KTUs in the 400 series have nonstandard connectors:

(a) The 402A KTU (diode matrix) is not a plug-in type unit. It is designed for screw mounting on the lower part of the 31A apparatus mounting of a 501- or 502-type KSU.

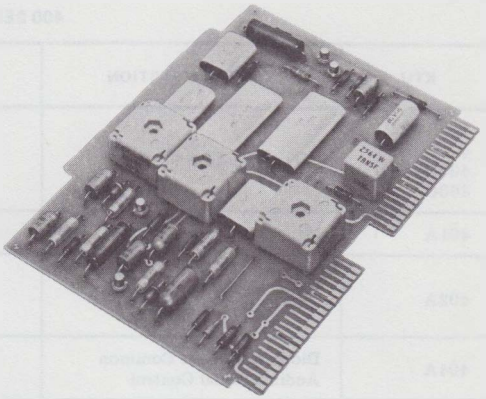

Fig. 2—Typical 8-Inch 80-Contact 400-Series KTU

(b) The 412A KTU (auxiliary lamp relay circuit) plugs into the same receptacle (KS-8586, List 32 connector) as the KS-15900, List 1 interrupter. This unit is designed for use in panels at large installations of 1A2 KTS apparatus where it is desired to have all lamp functions of the system synchronized.

2.38 Table A lists the 400-series KTUs, their functions, size, and number of contacts. Identification information on each KTU is covered in Sections 518-215-400, -401, -402, and -403.

MOUNTING FACILITIES

2.39 Prewired 900-series connectors are used to provide the mounting facilities for 400-series KTUs. Connectors currently in use are:

- 906C (18-pin)
- 913A (20-pin)
- 914A (40-pin).

2.40 The 913A and 914A connectors are identical in size, but differ in that the 913A connector has only one row of 20 contacts (pins) while the 914A connector has two rows of 20 contacts (pins).

♦TABLE A♦

400 SERIES KTU'S

KTU	CIRCUIT FUNCTION	SIZE (IN.)	CONTACTS	QUANTITY
400B (MD) 400C (MD) 400D (MD) 400G	CO or PBX Line	4	18	1 per line
401A	Manual Intercom Line	4	18	As required
402A	Diode Matrix for Common Audible Signal Control	Not plug-in type KTU; mounts on 501 or 502 KSU		1 per 4 lines and 6 signals or vice versa
404A	Diode Matrix for Common Audible Signal Control	4	18	1 per 6 lines and 12 signals or vice versa
405A (MD)	Multiline Exclusion	4	20	1 per 2 lines
406A (MD)	Supplementary Hold Detector	4	18	1 per 2 lines or stations
407B (MD) 407C	Dial Intercom 10-Code Selector	8	80	1 per intercom system
408A (MD)	Flutter Generator	4	18	1 per 100 lamps and 20 supplementary and/or regular hold keys
412A	Auxiliary Lamp Relay	Special — Requires a KS-8586, L32 Connector		Used in place of interrupter for LW and LF functions
413A	Auxiliary Ringup	4	18	As required
414A (A&M Only)	Man Sig, Ringdown Priv Line	4	20	2 per line (1 at originating end; 1 at terminating end*)
415A	Automatic, DC Sig, Priv Line	4	18	
416A	Station Line	4	20	1 per line
417A	Add-On Conference	4	40	1 per conference circuit
418A	Short Range, DC Sig, Priv Line	4	20	1 per line
419A	Automatic Signaling Ringdown Private Line	8	80	2 per line (1 at originating end; 1 at terminating end*)
420A	Dial Intercom Long Line	4	18	1 per off-premise line
421A	Power Failure Transfer Gen Purpose Relay, DSS, or Audible Sig Suppression	4	40	1 per com aud transfers 1 per DSS code 1 per ringer or buzzer or as required
422B	Station Busy Selector	4	40	1 per 10-code intercom 2 per 19-code intercom

♦TABLE A (Cont)♦

400 SERIES KTU'S

KTU	CIRCUIT FUNCTION	SIZE (IN.)	CONTACTS	QUANTITY
423A	Dial Tone, Busy Tone, and Audible Ringback Tone	4	20	1 per intercom system (not for use in modular panels)
424A (MD) 424C	Dial Intercom 19-Code Selector	8	80	1 per intercom system
425B	Flashing Lamp	8	80	1 per intercom system
426A and 427B (MD) (Series 4) or C	TOUCH-TONE Adapter	8	80	1 of each required per intercom system
		8	80	
428A	Multiline Exclusion	4	40	1 per 2 lines
429A (MD) 429B	Supplementary Hold Detector	4	40	1 per 2 lines or stations
430A	Flutter Generator	4	20	1 per 100 lamps and 20 supplementary and/or reg hold keys
440A (MD)	TOUCH-TONE Adapter	8	80	1 per intercom system
448A	Delayed Transfer Control	4	40	1 per 2 lines
449A	Immediate Transfer Control	4	40	1 per 2 lines
451B	Music-on-Hold	4	40	1 per 1A2 System
461A	Manual Signaling, Ringdown Private Line	4	18	2 per line (1 at originating end; 1 at terminating end*)
467A	Low-Voltage Monitor	4	18	1 per system
469A	Lamp Driver	4	18	1 per line per each 20 excess lamps
470A	External Signal	4	20	1 per 2 lines requiring external signaling
471A	Battery Reversal Toll Restriction	4	18	1 per CO line
476A	Dial Tone, Busy Tone, and Audible Ringback Tone	4	20	1 per intercom system (for use in 642A modular panel)
478B	TOUCH-TONE Adapter	8	80	1 per intercom system
479A	Rot. Dial Toll Restriction	8	20	1 per CO line

* Terminating end must be a similar or equivalent tie line unit.

2.41 Due to the common lead configuration, as explained in 2.36, a 4-inch KTU can be plugged into a connector having the same or larger number of pins than the KTU has contacts. For example, a 4-inch, 18-contact KTU can be plugged into an 18-, 20-, or 40-pin connector, etc. However, in some cases a 4-inch, 40-contact KTU can be plugged into a 20-pin connector for limited use. For example, the 421A KTU is a 4-inch, 40-contact KTU featuring a relay having six sets of transfer contacts. When mated with a 20-pin connector, only two sets of transfer contacts can be used. An 8-inch, 80-contact KTU requires two 40-pin connectors mounted in a vertical plane; the only exception is the 419A KTU which can be plugged into a 69B apparatus mounting which has two 20-pin connectors mounted in a vertical plane.

2.42 The connectors are equipped with index clips that mate with slots on the plug-end of the unit to preclude any possibility of the KTUs being inserted in a wrong manner.

2.43 Various combinations of prewired connectors are available in KSUs, panels, and apparatus mountings. These packages permit a wide latitude in installation flexibility. Some packages are available with interrupters, power units, connecting blocks, and floor stands. KSUs are designed primarily for small to medium size 1A2 KTS installation; panels are designed for large or centralized installations; and apparatus mountings are designed to supplement KSUs, or panels, where additional mounting facilities are required. (See Tables B, C, and D.)

2.44 Two prewired connectors (each wired to a screw terminal field) are also available on a 259-type KTU. This KTU provides a standard 7-inch mounting facility for one or two 4-inch 400 series KTUs, having no more than 20 contacts, and is designed primarily to be mounted in the unused lower half of 501- and 502-series KSUs. Another prewired connector is the 272A KTU. This KTU provides a mounting facility for a single 4-inch, 40-contact 400-series KTU. It is designed to mount in standard equipment cabinets and apparatus mountings.

POWER SUPPLY

2.45 Generally, local power (ac and dc) is provided to a KTS for relay operations, talking, and control of lamp and audible signal functions. The 400-series KTUs require an "A" battery (talk) voltage range of 18 to 26 volts dc and a "B" battery (signal) range of 20 to 26 volts dc for satisfactory circuit and transistor operation.

2.46 The 467A KTU is available to monitor the -24 volt dc supply. When the -24 volt dc supply drops below a predetermined level (-19 volts), a latching circuit operates to turn on a light emitting diode (LED) located on the handle of the KTU. The level is factory set at 19 volts but is adjustable between 17 and 21 volts. This serves as a maintenance aid in areas where low line voltage may be experienced. The 467A KTU can be plugged into any 4-inch connector in place of a 400-type KTU.

Circuits may not operate satisfactorily if the voltage drops below 18 volts or 20 volts dc for circuit supplied by "A" and "B" batteries, respectively. Conversely, transistors may be damaged if any voltage exceeds 26 volts dc. When supplying "A" and "B" batteries from the same source, such as building battery, use 20 volts dc as the minimum voltage.

2.47 Power may be supplied from the following sources:

- Local power units
- CO or PBX battery supply
- Local or building battery supply.

2.48 Local power units recommended for use with the 1A2 KTS are shown in Table E. Refer to Section 518-010-106 for method of selecting proper size power unit.

Caution: Do not supply 400-series KTUs requiring "B" battery (signal) from the "A" battery (talk) source. THIS MAY CAUSE CIRCUIT MALFUNCTIONS.

2.49 When using CO, PBX local, or building battery supply, fuse in accordance with standard practices, as follows:

- One 2-ampere fuse for talking battery designated A

TABLE B

1A2 KEY TELEPHONE SYSTEM KEY SERVICE UNITS

KSU	NUMBER OF CONNECTORS			MAX. NO. OF CO OR PBX LINES	KTUs PRIMARILY WIRED FOR	TYPE MOUNTING
	18-PIN	20-PIN	40-PIN			
501 (MD) and 502 (MD) Type KSU*	6			6†	400-Type, 401A, 415A and 467A	Wall or Floor Stand
513-Type KSU 515-Type KSU		4	4	8‡	All 400 Series	Wall or Floor Stand§
514-Type KSU		4	4	8‡		
550- and 551-Type KSU*	4			4†	400-Type, 401A, 415A and 467A	Wall

* Equipped with KS-19175, List 1 interrupter.

† Reduce line circuits by one for each 401A, 415A, or 467A KTU used.

‡ Reduce line circuits by one for each 4-inch KTU used (other than a 400-type KTU) or by two when an 8-inch KTU is used.

§ 77B (MD) or 77C apparatus mounting.

- One 2-ampere fuse for signaling battery designated B
- One 2-ampere fuse per maximum 50-signal lamps (51A)
- One 2-ampere fuse for dc audible signal supply.

Note: When the same dc source is used for talking and audible signal operation, a noise suppression capacitor, such as the 23A KTU, should be installed across the battery supply.

2.50 Some 400-series KTUs are interrelated electrically, and it is recommended that the dc power for any given 1A2 KTS arrangement be provided from a common source.

Note: When using a local power unit and the minimum voltage cannot be assured when adding KTUs to an existing system, the power unit should be replaced by a larger capacity unit.

2.51 Power (ac) for lamps and audible signals may be supplied from a number of different sources, provided each source used serves a separate circuit or a separate group of circuits; ***ac sources should never be connected together except for common grounds.***

2.52 A reserve power supply, coded the 47C power unit (battery reserve), is available for the 1A2 KTS. Also available is an optional 116A frequency generator for plugging into the 47C power unit. The 47C power unit is arranged for the addition of a plug-in KS-20390,L1 (nickel cadmium) battery which must be ordered separately.

TABLE C

1A2 KEY TELEPHONE SYSTEM PANELS

PANEL	NO. OF CONN	KTUs PRIMARILY WIRED FOR	SIZE (IN.)	TYPE MOUNTING
583A (MD)	15 (18-Pin)	400-Type 401A, 415A, 461A, 467A, 469A, 471A, and 479A	4 x 23	Relay Rack or Apparatus Cabinet
584-Type	13 (18-Pin)			
597A (MD) 597B	14 (20-Pin)	400-Type 401A 413A 414A (A&M Only) 415A 416A 418A 420A 421A 423A 430A 461A 467A 469A 471A 479A	4 x 23	
598A (MD) 598B	14 (40-Pin)	400-Type 401A 413A 414A (A&M Only) 415A 416A 417A 418A 420A 421A 422B 423A 428A 429A (MD) or 429B 430A 451B 461A 467A 469A 471A 479A	4 x 23	
601A	6 (40-Pin)	407B (MD) or 407C 424A (MD) or 424C	8 x 6	
602A	6 (40-Pin)	407B (MD) or 407C 422B 423A 424A (MD) or 424C 425B	8 x 6	

TABLE C (Cont)

PANEL	NO. OF CONN	KTUs PRIMARILY WIRED FOR	SIZE (IN.)	TYPE MOUNTING
603A	4 (40-Pin)	426A 427B (MD) Series 4 or 427C	8 x 4-1/2	Relay Rack or Apparatus Cabinet
620A*	8 (40-Pin)	400-Type 401A 413A 414A (A&M Only) 415A 416A 419A 461A 467A 469A 471A 479A	8-1/2 x 18-3/8	Mounts on Wall
626A*	8 (40-Pin)	424B or C 440A (MD) or 478B 444A 454B 460B	8-1/2 x 18-1/2	
641A*	4 (40-Pin)	407B (MD) or 407C 424A (MD) or 424C 425B 440A (MD) or 478B	4-1/4 x 18-3/8	
642A*	4 (40-Pin)	417A 418A 420A 421A 422B 428A 429A (MD) or 429B 430A 440A (MD) or 478B 448A 449A 451B 476A 479A	4-1/4 x 18-3/8	

* Modular panel.

TABLE D

1A2 KEY TELEPHONE SYSTEM, 69-TYPE APPARATUS MOUNTINGS

APPARATUS MOUNTING	NO. OF CONN		MAX NO. OF COOR PBX LINES	PRIMARILY WIRED FOR	SIZE (IN.)	TYPE MOUNTING
	20-PIN	40-PIN				
69B*	2		2‡	4-inch 18- or 20-contact KTUs §	2 x 8	Relay rack or standard apparatus cabinet
69D*		2	2‡	All KTUs except 407B, 424-type, and 425B		
69G*		2	—	407B, 424-type, and 425B		
69E†		2	2‡	All KTUs except 407B or 424-type		One may be added to 514 KSU
69F†		2	2‡			3 may be added to 513A1 KSU

* Requires an A25B connector cable to extend wiring to distributing point.

† Equipped with 6-foot cable tail for connection to external connecting block outside KSU.

‡ Reduce line circuits by one for each 4-inch KTU used other than a 400-type KTU or by two when an 8-inch KTU is used.

§ Will also accept the 8-inch 419A KTU.

LIMITATIONS

2.53 Normal loop ranges, such as ringing, talking, lamp, etc, of the plug-in KTUs are covered in the CDs and SDs and in Sections 518-215-400, -401, -402, or -403. These limits should not be exceeded or failure of the apparatus could occur.

2.54 In a 1A2 KTS where common audible and visual signals are provided by means of locally furnished power, interruption of this power supply will render all common audible and visual signals inoperative during the period of power failure. Incoming service during periods of power failure can be maintained by providing any of the following features:

- Reserve power source such as the 47C power unit and the 116A frequency generator. See Section 167-449-101.
- Power failure transfer circuits.
- Connection of line ringers.

The installation of any of the above features should be made only in accordance with the service order or local practices.

2.55 Outgoing calls will not be affected by a power failure. Whenever the CO or PBX line circuit is in an idle condition, a path is established that connects the telephone sets directly to the CO or PBX.

3. ARRANGEMENTS

3.01 System arrangements are shown divided into four basic services:

- Line (Fig. 3)
- Auxiliary (Fig. 4)
- Intercom (Fig. 5)
- Auxiliary control (Fig. 6).

3.02 The type, size, and method of installation of any 1A2 KTS arrangement is dependent upon the following:

- Immediate needs of the customer
- Future requirements of the customer
- Number and type of 400-series KTUs to provide the required services and features
- Adequate size mounting facility (KSU, panel, etc) designed to accept the required KTUs
- Number and type of telephone sets required
- Type and size of the power plant
- Available space for safely mounting apparatus cabinets, relay racks, power plants, connecting blocks, etc.
- Availability of 110-volt ac power outlet.

Note: All of these factors must be taken into consideration in order to provide for the orderly growth of any arrangement.

3.03 Where feasible, consideration should be given to centralizing the installation. Large centralized installations should make use of the connecting block arrangement covered in Section 518-010-101.

3.04 A 1A2 KTS should be arranged to permit maximum flexibility. Accordingly, ***all*** leads from the connectors of mounting facilities, such as panels, apparatus mountings, etc, should be terminated at a connecting block termination field as covered in Section 518-010-101. This should result in a standard termination at ***every*** installation and permit ease of wiring and strapping, not only during the initial installation but for any subsequent rearrangements and changes.

TABLE E

CURRENT AND VOLTAGE RATINGS OF POWER UNITS RECOMMENDED FOR 1A2 SYSTEM ARRANGEMENTS

TYPE POWER UNIT	TYPE OUTPUT	VOLTAGE RANGE	AMPERES AT MIN. VOLTAGE	NO. OF FUSES*	USE
101J† (MD)	DC	20-26	4.0	6	Use 24V tap for circuits requiring talk bat and/or relay operation
	AC (60 Hz)	10-11	5.0	7	Lamp operation max 125 lamps (51A) ¶
		17-19	1.6	1	Buzzer and/or bell operation
101G (J86731B)	AC (60 Hz)	10-11	17	16	Lamp operation max 425 lamps (51A) ¶
20-type 19-type	DC TALK	18-26	0.6 / 1.5 (1.5 total)	1	Circuits requiring talk bat (A BAT.)
	DC SIGNAL	20-26	1.5	1	Relay operation (B BAT.). Total dc load cannot exceed 1.5 amps
	AC (60 Hz)	8.75-11	4.5 / 1.4 ‡	2 24B (3AMP)	Lamp operation max 112 lamps (51A) if 18V ac tap is not used ¶
		16-20		1	Buzzer and/or bell operation
	AC (30 Hz) 113A FREQ GEN	110-125	—	—	Operates 1 to 16 ringers with series diodes (diode matrix) or 1 to 6 ringers with series capacitors
30-type 29-type	DC TALK	18-26	1 / 4 (4 total)	1	Circuit requiring talk bat (A BAT.)
	DC SIGNAL	20-26	4	6	Relay operation (B BAT.). Total dc load cannot exceed 4 amps
	AC (60 Hz)	8.75-11 or 9.75-12	12	6 24B (3AMP)	Lamp operation max 300 lamps (51A) ¶
		16-20	1.6	1	Buzzer and/or bell operation
		8.75-11	—	1	Interrupter operation
	AC (30 Hz) 113A FREQ GEN	110-125	—	—	Operates 1 to 16 ringers with series diodes (diode matrix) or 1 to 6 ringers with series capacitors
101G (J86731) Modified for 1A2 Operation	DC TALK	18-26	0.6 / 1.5 (1.5 total)	1	Circuits requiring talk bat (A BAT.)
	DC SIGNAL	20-26	1.5	1	Relay operation (B BAT.). Total dc load cannot exceed 1.5 amps
	AC (60 Hz)	9-11	1.4 or 2.8	1 §	Lamp operation max 36 lamps (51A) at 1.4 amps or 72 lamps at 2.8 amps ¶
		16-20	1.4	1	Buzzer and/or bell operation. Do not use when 10V tap is double fused
	AC (20 Hz)	75-110	—	—	Ringer operation max 8 ringers without capacitor when using diode matrix or max 2 ringers with capacitors
34-type	AC (60 Hz)	8.75-11 or 9.75-12	25 continuous 35 intermittent	15 24B (3AMP)	Lamp operation max 625 lamps (51A) ¶
		8.75-11	—	1	Interrupter Operation

TABLE E (Cont)

TYPE POWER UNIT	TYPE OUTPUT	VOLTAGE RANGE	AMPERES AT MIN. VOLTAGE	NO. OF FUSES*	USE	
34-type	AC (60 Hz)	8.75-11 or 9.75-12	25 continuous 35 intermittent	15 24B (3 AMP)	Lamp operation max 625 lamps (51A) ¶	
		8.75-11	—	1	Interrupter operation	
67B1	AC (60 Hz)	10-11	10	5 24B (3 AMP) 1 24C (2 AMP)	Lamp operation 250 (51A) lamps ¶	Wall Mounted
		10	0.3		Interrupter operation	
67C1		10-11	10		Lamp operation 250 (51A) lamps ¶	Rack Mounted
		10	0.3		Interrupter operation	
79B1	DC SIGNAL	20-26	1.5	24B (3 AMP)	Relay operation (B BAT.)	
	DC TALK	20-26	0.6	1	Circuits requiring talk battery (A BAT.)	
	30 Hz AC	110-125	—	—	Operates 1 to 16 ringers with series diodes (diode matrix) or 1 to 6 ringers with series capacitors	
	30 Hz AC INTERRUPTED	110-125	—	—		
	AC 60 Hz	8.75-11	5.5	24F (5 AMP)	Lamp operation max 162 lamps (51A)	
	AC 60 Hz INTERRUPTED	8.75-11	5.5	24F (5 AMP)		
79B2	DC SIGNAL	18-27	1.9	24B (3 AMP)	Relay operation (B BAT.)	
	DC TALK	18-27	0.6	1	Circuits requiring talk bat (A BAT.)	
	30 Hz AC	110-125	—	—	Operates 1 to 16 ringers with series diodes (diode matrix) or 1 to 6 ringers with series capacitors	
	30 Hz AC INTERRUPTED	110-125	—	—		
	AC 60 Hz	8.75-11	5.5	24F (5 AMP)	Lamp operation max 162 lamps (51A)	
	AC 60 Hz INTERRUPTED	8.75-11	5.5	24F (5 AMP)		
90B1	DC SIGNAL	20-26	4.0	1	Relay operation (B BAT.)	
	DC TALK	18-26	1.0	1	Circuits requiring talk bat (A BAT.)	
	30 Hz AC	110	—	—	Operates 1 to 16 ringers with series diodes (diode matrix) or 1 to 6 ringers with series capacitors	
	30 Hz AC INTERRUPTED	110	—	—		
	AC 60 Hz	8.75-11	12.0	24F (5 AMP)	Lamp operation max 300 lamps (51A)	
	AC 60 Hz INTERRUPTED	10	12.0	24F (5 AMP)		
215B1	AC (60 Hz)	15-18	2.4	3 24C (2 AMP)	MW lamps on Message Waiting consoles	

* 24C (2 AMP) fuse unless designated otherwise.

† Should be placed a minimum of 3 feet from apparatus.

‡ Combined total output not to exceed 39 volt-amp.

§ For 2.8 amp output double fuse 10V tap.

¶ Maximum number of lamps that may be operated at same time.

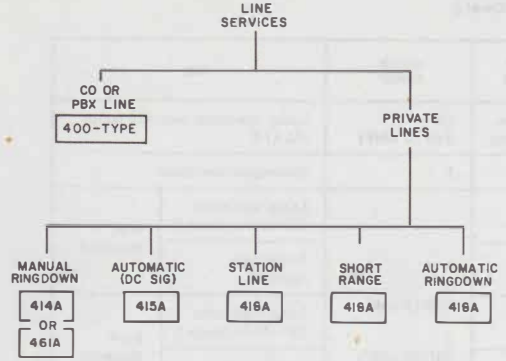

Fig. 3—Line Services

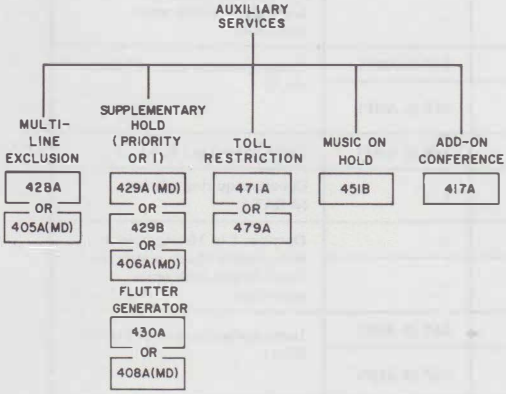

Fig. 4—◗Auxiliary Services◖

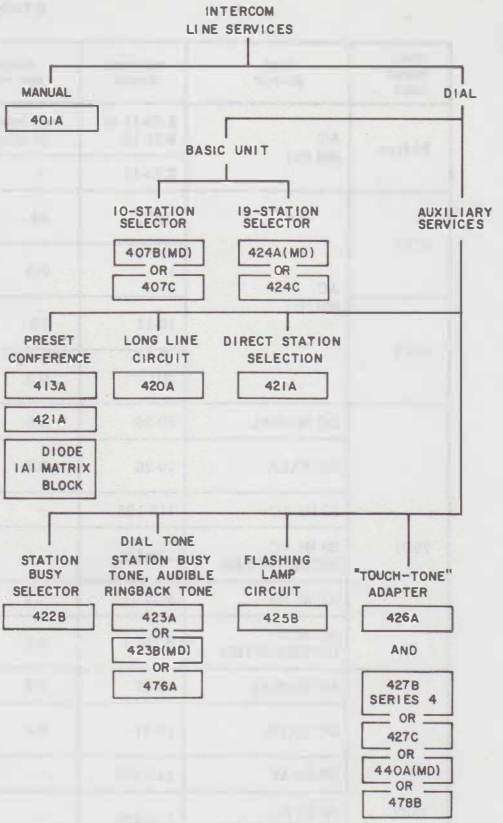

Fig. 5—◗Intercom Services◖

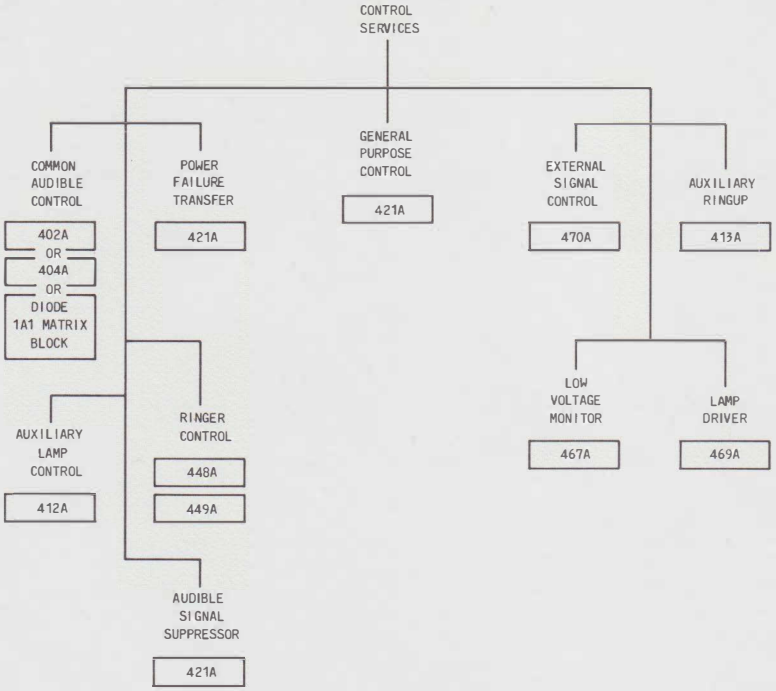

Fig. 6—Auxiliary Control Services