PART V—KEY EQUIPMENT, ORDER TURRETS, SECRETARIAL SERVICES

KEY EQUIPMENT
(Multi-Line Key Cabinets)

GENERAL

A key equipment arrangement consists of one or more small cabinets, equipped with keys and lamps, for use in originating and answering calls on a number of lines at one or more telephone locations. The functions of the equipment are practically the same as those of key telephone systems described in Part IV, but the capacities per telephone location are greater.

Key equipment is used for one of several general purposes. One purpose is to permit secretaries or clerks in an office to readily answer calls for a number of people when they are away from their telephones. In such cases, the key equipment is installed at one or more telephone locations. Another purpose is to give a group of people doing essentially the same kind of work access to a number of lines so they can readily answer and dispose of incoming calls on any line. Telephone orders, service calls, reservations and customer complaints are often handled in this manner. Key equipment is generally installed at several telephone locations. Order turrets, described in Part V, Section 2, have additional features not provided with key equipment which may better serve the requirements of large telephone-call-receiving groups of people.

Some types of key equipment are designed for highly special purposes, such as terminating a number of private lines at one or more telephone locations and perhaps for interconnecting such lines.

Although intercommunicating lines between the telephone locations may be provided, this feature is more or less a secondary feature of the key equipment and is effective only when the intercommunicating volume is relatively small. Also, key equipment is not designed for use where a large volume of the incoming calls must be distributed or transferred to other personnel. For the effective distribution of a large number of incoming calls and handling of more than an incidental amount of intercommunication, PBX service, described in Pare VI, ordinarily is more suitable.

The various types of key equipment available to meet diferent purposes are described in this section.

NO. 100 KEY EQUIPMENT

General—No. 100 key equipment is designed for picking up and holding calls on a number of lines at one or more telephone locations in one office. The equipment consists of one or more attendant's key cabinets and an apparatus cabinet. A number of lines may be terminated in a single cabinet or multipled into a number of cabinets on the same premises.

Attendant's Key Cabinet—Each cabinet has a capacity for six lines. A three-line cabinet is also provided, but is no longer manufactured although still in use at key equipment installations.

Each attendant's cabinet contains a line lamp, a busy lamp, and a three-way key per line, permitting the user to talk on or hold a call on any of the lines. (See exhibits.) A limited number of intercommunicating paths can be provided for communication between positions in the system.

The cabinets may be either single-sided or double-sided. The single-sided key cabinet contains a double row of lamps and a single row of keys. It is arranged for operation by one person and one attendant's telephone is required. The double-sided cabinet, which is designed for operation by two persons adjacent to each other, or facing each other at opposite sides of a desk or table, has an extra row of keys. Two attendant's sets are required, one for each side. Designation strips are provided with each row of keys and are used to identify the line associated with each key.

The cabinets may be mounted flat on the top of a desk or table or tilted slightly toward the user through use of a wedge-shaped block. In some cases the customer may provide recesses so that the boxes may be mounted flush with the top of the desk. In other instances mounting on the side of the desk may be desirable.

Where the requirements exceed six lines per position, two or more cabinets may be placed together side by side to provide for a practical maximum of about 30 lines. Where more than six lines per position are required, the ten-line key unit of No. 101-type key equipment, described later in this section, should be considered, particularly where growth is expected. Even though the 101 key cabinet has a larger capacity, its size is about the same as that of the 100 key unit. However, to save expense and conserve equipment, it may be desirable to increase the line capacity of an existing 100 key equipment installation by adding more 100-type key units at each position where required.

A maximum of 12 lamp appearances per line may be provided. This means that 12 people with single-sided cabinets may have access to a line or 24 persons with double-sided cabinets. More than 12 or 24 positions may be provided, however, by staggering or alternating the appearance of the lines at the positions. Also, special relay equipment may be installed to provide additional appearances.

Attendant's Telephone—A telephone is provided for each attendant or position.

At locations where use is relatively heavy, a headset is employed. Usually the set is plug-ended and a jack is provided. A plug-ended handset handle and a hang-

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up hook may be provided in addition to the headset for off-peak periods. A separately mounted dial is provided where required.

When a headset is provided, switchhook control is accomplished through operation of a key in the box from "NORMAL" to "TALK" or 'HOLD" even when the headset is not plugged in. Therefore, the keys are to be left in the "NORMAL" position when a call is not in progress. A separately mounted key for switchhook control may be provided if required.

Types of Lines—Common battery central office lines, PBX station lines, and common battery private lines may be terminated in 100 key cabinet positions. Magneto lines can be terminated by special arrangement. All lines may be multipled to all positions within the capacity of the equipment.

Intermediate central office ringing equipment is required where a common battery private line terminates in an instrument at one end or where the line extends between 100 key cabinets or between 100 and 101 key equipment on different premises. If these cabinets are on the same premises, the circuits need not be routed through the central office. (See Part X for additional information on terminations of private lines.)

Additional telephones, other than those at the positions may also be connected to the lines terminating in 100 key equipment.

Each line terminating in 100 key equipment requires a unit of line equipment and, in the case of a private line extending between two 100 key systems, a unit of line equipment is required at each end.

Conference connections cannot be provided. When more than one key at a key cabinet is operated to the talk position, only the line associated with the key at the left is connected.

Line and Busy Signals—Each 100 key cabinet is equipped with one line lamp and one busy lamp for each line terminated, except the intercommunicating lines (see exhibits). Where a dial selective intercommunicating line (see Part IV) is employed, line and busy lamps may be provided if required. Multiple appearances of line and busy lamps are provided where lines are terminated in more than one cabinet. Individual or common audible line signals are provided at cabinets as required and may be either buzzers or bells.

Line signals may be arranged to operate intermittently with the application of ringing current or continuously until the line is answered. When continuous operation is provided, the equipment may be arranged to automatically retire the line signal four seconds after the ringing current stops. If this arrangement is not provided with continuous type operation, a separately mounted key is furnished which, when operated, usually at the close of the business day, changes the type of operation from continuous to intermittent.

When a line is picked up for either an incoming or outgoing call, the busy lamps associated with the line will light at all positions and remain lighted until the call is terminated. The busy lamps continue to operate while a call is being held.

Where 100 key equipment is combined in an installation with key telephones, the line and busy signals operate differently, as covered in Part IV, Section 1.
Hold Feature—To hold a call on a line, the attendant

operates the associated key to its lowest (locking) position. Two or more calls can be held at the same time. The hold condition remains on the line until the attendant places the key in the talk or normal position. It cannot be released by picking up the line at another key cabinet position. Therefore, when a call is being transferred, the attendant, after notifying the called person, restores the line key to the talk position and remains on the line until the called person answers.

When a 100 key system is associated with a key telephone system, there is a difference in the operation of the hold feature as described in Part IV, Section 1.

Intercommunication—One or more intercommunicating paths between some or all stations in a 100 key system may be provided. The line may be terminated in a key in the key cabinet or in a separately mounted two-position (NORMAL and TALK) locking key. Separate push button and buzzer circuits for signaling between positions may be provided as required. Telephones on the same premises not equipped with key cabinets may be connected to an intercommunicating line as permanent stations, or the line may appear in key telephone equipment.

Termination of the intercommunicating path on the "NORMAL" and "HOLD" positions of all keys is no longer standard because the key in "HOLD" position may cause central office, PBX, or private lines to test busy regardless of whether receiver is on or off the hook.

The dial selective intercommunicating line described in Part IV, Section 1, can be employed with 100 key equipment. This circuit can also be used with combinations of 100 key, 101 key, and key telephone systems.

Order Tone—No. 100 key equipment may be modified to provide an "order tone" to supplement the regular lamp and audible line signals at positions equipped with operator's sets. With this arrangement a tone is heard in the operator's headset when an incoming call

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is received. The tone is not heard if any of the keys at the position are in the "TALK" position. A separate key is provided so that the buzzer may be cut off at the position. When the buzzer is not cut off, the operator hears a steady tone until the call is answered. When the buzzer is cut off, the operator hears a tone only during the time ringing current is being applied to the line.

Apparatus Cabinet—An apparatus cabinet housing the necessary relay equipment is located in the same building as the key boxes, but not necessarily in the same room. The relay equipment associated with each line is known as "line equipment." Additional apparatus cabinets may be required in relatively large installations. Cable is required from the apparatus cabinet to the key's cabinets and between key cabinets.

Battery Supply—The usual source of current for the operation of No. 100 key circuits for small installations involving only a few lines consists either of battery feeders from the associated central office, or a local battery associated with a PBX on the same premises, or a centralized building battery. A power plant associated directly with the 100 key equipment can be supplied with larger installations. It is charged over central office cable pairs or locally by means of a rectifier from local commercial power.

Limitations—There is a limitation of distance to be observed with 100 key installations. Cases where the distance is such that the cable lengths exceed those normally encountered in a small office or compact group of offices should be checked before making a committment to the customer.

NO. 101 KEY EQUIPMENT

General—No. 101 key equipment meets practically the same requirements as No. 100 key equipment for picking up and holding calls on a number of lines, but has additional features:

1. Although the attendant's cabinet is about the same size as the 100 cabinet, it accommodates ten lines instead of six. Thus, the practical maximum of lines per position is greater.

2. Ringdown (magneto) private lines may be terminated in 101 equipment without the use of special equipment.

3. A hold key common to all lines instead of a holding position on each line key is provided.

4. When a line is on "HOLD," the "HOLD" is automatically removed when any station in the 101 system again picks up the line.

When determining whether 100 or 101 key equipment should be provided on a new installation, the above factors, future growth, cost to the customer, etc., should be taken into consideration.

Attendant's Key Cabinet—The walnut finish key cabinet is made in a ten-line single-sided capacity and a ten-line double-sided capacity. Each single-sided box has a row of five three-position keys (TALK, NORMAL and HOLD) and four rows of lamps. One of the "TALK" positions of each key and two of the lamps are associated with each of the ten lines. In the first or initial cabinet at each position ,a sixth three-position key (HOLD, NORMAL and FLASH AND RING) is provided. Any number of lines may be held at the same time at any telephone location. A hold condition on a line will be released when any station in the 101 system again picks up the line. The lower position is "FLASH AND RING," and is used to ring out on a ringdown (magneto) line or to flash on a manual central office or PBX line on whichever line at that position has a key in the "TALK" position. In one cabinet only for the entire installation, two turn-button cutoff keys are provided to cut off the battery and buzzers, respectively. When the buzzer key is turned to "OFF," the audible signals are made inoperative. When the battery key is turned to "OFF," the lamps and audible signals operate only while ringing current is applied to the line (unless the buzzer key is also "OFF," in which case the audible signals are inoperative, and the lamps operate only while ringing current is applied to the line). The battery key is always turned to "OFF" when the 101 system is unattended to prevent the line signals from operating continuously.

An extra wide designation strip, 5" x 5/8", known as the 9A card holder, may be provided at no additional charge where required.

All key cabinets should be on the same premises. Not more than about 300 feet of cable should be used between the apparatus cabinet and the most distant station in the system.

Where the requirements exceed ten lines per position, two or more cabinets may be placed together side by side to provide a practical maximum of about 40 lines.

A maximum of 12 lamp appearance per line may be provided. Thus, 12 people may have access to a line. More than 12 positions may be provided, however, by staggering or alternating the appearances of the lines at the positions or by providing special relay equipment for additional appearances.

When the key cabinet is placed on top of a desk with

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NO. 101 KEY EQUIPMENT (Continued)

the face equipment in a vertical position, the arrangement is called a 101A non-flush mounting. When the cabinet is placed in an opening or hole in the desk top with the face equipment in a horizontal position flush with the desk top, the arrangement is called a 101B flush mounting. The flush type mounting frames come in two sizes, one with space to mount two key cabinets (20 lines) and the other to mount four key cabinets (40 lines). Any unused space is covered with a blank face plate.

When a double-position installation is desired for non-flush mounting, two groups of single cabinets are placed back to back. In this case, the "HOLD," and "FLASH" and "RING" keys of the first cabinets will appear at the right of one attendant and the left of the other attendant. If double cabinets are flush mounted, the "HOLD," "FLASH" and "RING" keys can be arranged to appear to the right of each attendant, as the cabinets are wired separately.

Attendant's Telephone—An instrument is provided for each attendant or position. Practically any type of telephone may be provided, including headset as with No. 100 key equipment. A combination telephone with a manually operated automatic restoral plunger exclusion key may be used as an attendant's set where the attendant desires to silence a common buzzer at her location while talking on one line and incoming calls are ringing on the other lines. This feature may be of advantage where the audible signal is annoying or confusing to the attendant while talking on a line.

Types of Lines—Same as No. 100 key equipment except that ringdown (magneto) private lines may be terminated without the use of special equipment. (See Section X for further detail on private line terminations.)

Where a number of lines appear in other telephones (including key telephones) as well as in 101 key equipment and the calls are answered for principals by secretaries or other attendants at the 101 positions, such lines are referred to as secretarial lines (formerly called full-secretarial). Since all lines are looped through the key equipment, all stations involved must be located on the same premises as the 101 equipment.

Where a number of lines appear only in 101 key equipment to enable a group of employees to handle telephone order or service calls, the arrangement is called a non-secretarial installation. Non-secretarial lines may be combined with secretarial lines in the same installation, if desired.

Line and Busy Signals—At each position, a combined line and busy lamp (white) and a hold lamp (green) is associated with each line. Also, an audible signal is usually provided which is common to all lines at that position. Individual audible signals per line may be used at various positions as required. The audible signal is usually a buzzer, but a bell may be provided. Lamp and audible signal operation is the same for each line terminated, regardless of the type of line, except for intercommunicating lines. Line and busy lamps associated with an intercommunicating line usually are inoperative. However, with a dial selective intercommunicating line, visual and audible line signals may be provided. For further detail of line and busy signal operation see exhibit.

For difference in operation when 101 is combined with a key telephone system see Part IV, Section 1.

Hold Feature—A hold key common to all lines is provided at each position. In addition to holding a call on a line, the operation of the hold key controls a hold lamp associated with the line to indicate a hold condition. More than one line can be held simultaneously. The hold condition is automatically released when any station in the system picks up the line. For further description see exhibit.

For difference in hold lamp operation when associated with a key telephone system see Part IV, Section 1.

Automatic Exclusion—An optional automatic exclusion feature enables a principal to exclude 101 attendants from the line when the principal lifts the "receiver." A busy lamp may be provided at each principal's station to prevent inadvertent cutoff of the secretary during an authorized conversation. A combination telephone equipped with the switch hook plunger exclusion key is used at the principal's station to provide manual cutoff and automatic restoral. Manual exclusion of the 101 attendants' telephones may be provided instead of the automatic arrangement where privacy is required only occasionally.

Intercommunication—Same as 100 key equipment. (Also see Part IV, Section 1, for information on dial selective intercommunicating line.)

Order Tone—No. 101 key equipment may be modified to provide an "order tone" to supplement the regular lamp and audible line signals at positions equipped with operator's sets. With this arrangement, a tone is heard in the operator's handset when an incoming call is received. The tone is not heard if any of the keys at the position are in the "TALK" position. A separate key is provided so that the buzzer may be cut off at the position. The tone is intermittent in rhythm with the flashing line lamp, regardless of whether or not the buzzer is cut off.

Use as PBX—The 101-type key cabinet may be used as an attendant's position for a 740E system with rela-

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tively few trunks where simplicity of operation, appearance, and space requirements are controlling factors. It may also be used as subsidiary to a manual position of a small 740E or 710A dial PBX for night or auxiliary attendant services (see Part VI, Section 5).

Apparatus Cabinet—For dimensions of the apparatus cabinet, see exhibit.

Battery Supply—The circuits for 101 key equipment are designed to operate on 14-26 volt battery, and power supply arrangements are dependent upon the size of the installation and its location with respect to existing power sources. Power supply is obtained from the central office over cable pairs, from a PBX battery, from a building battery on the premises or from a local battery power plant.

NO. 103A KEY EQUIPMENT

General—No. 103A key equipment provides for picking up but not holding 10 to 20 lines at a maximum of two positions. It is a relatively simple and inexpensive secretarial arrangement for use where calls can be answered quickly for a number of people when they are away from their telephones. Use of the 103A equipment is somewhat limited because the holding feature is usually required to assure prompt answering of a large number of lines at one telephone location, particularly if some of the conversations are relatively long.

The 103A equipment meets the requirements formerly met by the 101 simple secretarial pickup arrangement.

Attendant's Key Cabinet—No. 103A equipment consists of one or two 10-line key boxes for one or two positions. All apparatus required is contained in the key boxes, except the telephone set and the common buzzer signal.

Each 10-line key box, which is similar in appearance and size to the 101 key box, is mounted in a walnut cabinet with the key plate vertical. No provisions are made for double-sided cabinets or flush typing mounting.

Each key cabinet contains the necessary keys and lamps for handling calls on 10 lines, as follows:

1. A single row of five locking type lever keys operating in two directions from normal to permit pickup of either of two lines.

2. Two rows of neon type line lamps, five lamps per row, or one per line. Only two appearances of each line lamp can be provided.

3. A turn-button switch for controlling the common buzzer signal (where there are two key units per position, only one unit has the buzzer switch).

Attendant's Telephone—Any kind of handset telephone or headset may be furnished for the attendant's use with 103A equipment. A plug and jack arrangement and a separately-mounted dial, if required, are provided with a headset.

Types of Lines—The central office, PBX, and common battery private lines of principal users may be multipled in 103A key equipment. No provision is made for multipling ringdown (magneto) private lines. Since principal's lines are not looped through the key equipment, principals' stations may be located on different premises.

Lamp and Buzzer Operation—An incoming call on a particular line is indicated by a line lamp and a buzzer signal in the 103A equipment. Both the line lamp and buzzer operate as steady signals (not flashing) only when ringing current is applied to the line. Since the lamp signals light directly from the ringing current, no auxiliary power supply or relay apparatus is required.

No busy lamp indication is given when a line is picked up. The line lamp flashes when an outgoing call is dialed by the 103 attendant or the principal user of a particular line. This is normal operation.

Cutoff Arrangement—Where desired, an optional cutoff or exclusion arrangement may be provided at a principal's station to cut the 103A attendant off the line.

Use With Other Key Equipments—Stations equipped with key telephones arranged for pickup and holding may be combined with 103A equipment. Telephone lines cannot be multipled in both 103A and 101 key equipment.

NO. 109A KEY EQUIPMENT

General—No. 109A key equipment is designed to permit the termination of private lines, both those requiring one local loop and those requiring two local loops from the central office, in the same switching arrangement with central office lines, PBX station lines, and intercommunicating lines. The equipment is designed for use in common battery and dial central office areas.

While the equipment was originally designed for use

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NO. 109A KEY EQUIPMENT (Continued)

by the U. S. Civil Aeronautics Administration, it has found additional application among airlines and industrial firms usually having one or more intercity private line services.

Equipment—The equipment at each position consists of a small externally mounted six-button key. The first five (locking) buttons are used to pick up the various lines terminating in the equipment. The sixth (non-locking) button serves as a common signaling button when any of the private lines is picked up and as a hold key when either a central office line or a PBX station line is picked up.

Although not more than two positions of key equipment are normally required, more may be installed by special arrangement.

Since the attendant at each position usually desires a push-to-talk feature, a hang-up type handset telephone is frequently provided. However, a headset and jack may be provided. The headset can be equipped with a non-locking push-to-talk feature or a locking type transmitter cutout.

If a headset is provided for the attendant, however, one of the key buttons must serve as a release key to disconnect the set from the line at the end of the conversation. This reduces the pickup capacity of the key to four lines.

If the headset is not disconnected after a conversation, a continued busy condition would be placed on the PBX station line or central office line. Also, on a private line equipped for incoming voice signaling, this signaling would be prevented unless the headset is disconnected (see Signaling below).

Signaling—Outgoing signaling on private lines may be accomplished through use of the sixth button, or external selective signaling arrangements can be employed.

Incoming signaling on central office and PBX station lines is by regular ringer. Private lines may be arranged for regular ringer or loud-speaker voice signaling. When a loud-speaker line is picked up by the attendant, the associated loud-speaker is automatically silenced. For an intercommunicating line, push button and buzzer signaling is usually provided.

Apparatus Cabinet—A metal apparatus cabinet for housing the relays and line terminating units and a metal battery cabinet are available in either olive gray or gray green wrinkle enamel finish. The requirements vary for different installations. The equipment required and the floor space layout should be checked locally.

Power—Power may be supplied over central office cable pairs, a PBX or building battery, or by a rectifier using commercial power furnished by the customer.

110A KEY EQUIPMENT

General—No. 110A key equipment is arranged for termination of telephotograph channels and local private lines on the customers' premises. Loud-speakers are usually employed to monitor the picture transmission.

Equipment—The key cabinet, similar in appearance to the 101A and 102A cabinets, has six keys and four rows of lamps. The downward position of the line keys is arranged so that conference connections can be established.

The first key in the cabinet, counting from right to left, is non-locking in both operated positions. It is a ringing key which can be used to ring on any of the lines connected to the box. This key is operated downward to ring on the line after one of the other keys has been operated to connect the main station to a line. The upper operated position is not used.

The second key is associated with the loops of the telephotograph channel, as two local loops are used, one for sending and one for receiving. When this key is normal the line is connected to the telephotograph apparatus for receiving a picture. When it is operated to the up position, the line is connected to the telephotograph apparatus for sending a picture. When this key is operated to the down position the line is connected to the handset telephone.

Keys three to six may be individually assigned to meet the requirements of each installation. One or more of the following features may be assigned to any of the eight operated positions of these four keys:

1. Pick up the local private lines.

2. Control the switching of one telephotograph line to another similar line on a remote control basis.

3. Control volume regulating apparatus where required.

The buzzer cutoff key is located above and the battery cutoff key is located below the ringing key. These keys are of the turn button type.

The white line lamp associated with a private line

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NO. 110A KEY EQUIPMENT (Continued)

shows a steady light upon receipt of an incoming ring. The lamp is extinguished upon operation of the key to the proper position.

An arrangement may be provided which will light the white lamp associated with the telephotograph line upon receipt of an incoming ring. The lamp is lighted during the ringing period only, so that code signaling may be used. The green lamps in the key box are not used.

The handset telephone at the main station is equipped with a non-locking push-to-talk button to reduce the possibility of interference with picture transmission which may be in progress between other main stations.

When a loud-speaker is provided for monitoring purposes, it is so arranged that it is disconnected from the line when the push-to-talk button of the handset is depressed. This prevents "howling" which might be caused by the feeding back of sound from the loud-speaker to the transmitter.

Local Line Termination—Local private line may be connected to the telephotograph line in combination with the handset at the main station. A push-to-talk handset telephone with suitable mounting, a ringing key and ringer is usually provided at each remote private line station. A loud-speaker may also be provided at the private line station if desired.

A private line may be connected to any one of the operated positions of keys three to six at the main station key cabinet. It is generally desirable to connect them only to the lower operated positions of these keys so that conference connections can be established.

The private line instrument at the remote location is usually a push-to-talk handset with a ringer, a ringing key and associated apparatus cabinet.

Remote Monitoring—Monitoring loud-speakers or handset telephones may be connected to the telephotograph line at other than the station locations. Where loud-speakers are a sufficient distance away from the instruments to preclude feed back of sound in the transmitters of the instruments they need not be arranged for disconnection upon operation of the push-to-talk buttons in the instruments.

In locations where two or more loud-speakers associated with different lines are close together, a volume control key easily accessible to the attendant may be provided in addition to the volume control switch included in the loud-speaker set. The operation of this key permits the suppression of one loud-speaker to give preference to another and permits quick restoral of the volume to a predetermined level.

NO. 102A KEY EQUIPMENT

General—No. 102A key equipment is designed primarily for use by the U. S. Civil Aeronautics Authority in the operation of airways traffic control offices at the principal airports of the nation, and also in airport control towers operated by CAA. The airways traffic control office, which coordinates the dispatching and movement of aircraft, requires fast private line telephone communication with the dispatchers' offices of airline companies, the airport traffic control tower, the CAA airways communication station, the weather bureau office, local military establishments, and other airports. The airways traffic control office may also have central office or PBX lines. All such lines are terminated in one or more positions of 102A key equipment.

The 102A has also been used at CAA interstate airways communication (INSAC) stations, but the 109A and 111A key equipments, described later, are generally preferred now by CAA.

Equipment—One to four ten-line key cabinets per position are provided, the key cabinets being similar in appearance and operation to 101 key equipment.

Each key cabinet has five locking lever-type keys which operate in both directions from normal to permit pick-up of either or two lines. The initial unit also has (1) a non-locking lever key, one position for ringing or flashing and the other for holding purposes, (2) a battery cutoff key, and (3) a buzzer cutoff key.

Two lamps per line are provided in each ten-line key cabinet. One lamp is a line-and-busy lamp flashing to indicate an incoming call and changing to a steady light when call is answered (also lights steadily when outgoing call is made). The other lamp indicates the line is being held, except where the line is arranged for interconnection with other private lines for conference purposes. On a conference type line (described later) the lamp serves as a supervisory lamp to indicate when the line has been answered at the other end. A buzzer operates intermittently with the line lamp on a non-conference type of line; continuously on a conference type of line.

Mounting Arrangements—Cabinet, flush or tilted mounting of key units may be arranged. The cabinet and flush arrangements are the same as those for 101 equipment. A 20-degree tilt of the face equipment may be provided on either a horizontal or vertical surface (the front edge of the key plate practically flush with a horizontal surface, the top edge of key plate flush with a vertical surface). A mahogany framework encloses the raised portion of tilted units.

Attendant's Telephone—A headset or handset telephone with or without the push-to-talk feature is

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furnished at each attendant's position. Long cords may be required on some attendants' sets to permit freedom of movement between the flight progress board and the map table. Jacks are provided for attendant and monitoring sets.

Apparatus Cabinet—Apparatus cabinets housing the line, telephone and signal relays associated with the key cabinets are located on premises of customer.

Control Office Arrangements—Three different types of 102A equipment positions may be provided in the airways traffic control office:

1. *Conference position*—One or more positions of 102A key units may be installed below the flight sequence board. The keys are so wired that when two or more are operated downward (or toward the attendant), the lines associated with the keys are connected together for conference purposes. Lines connecting the airways traffic control office with the airline dispatchers and airport control tower are ordinarily arranged for conference use. Lines to other points within the airport, to a central office or PBX, and to other airports are terminated on the upward (or forward) positions of the keys and cannot be interconnected for conferences. The attendant's telephone circuit is arranged to operate voice recorders provided by the customer for the recording of all conversations except those over central office or PBX lines.

2. *Non-conference position*—Usually one position of 102A equipment is located at a communications desk in the control offices at the larger airports. All lines terminated at conference type positions are multipled at non-conference positions, except the conference type lines. The attendant's telephone circuit is also arranged for recording of all conversations except those over central office and PBX lines.

3. *Supervisory position*—Usually one position is located on manager's desk and perhaps another position at flight sequence board for use in monitoring the work of attendants at conference and non-conference positions. One key is provided for each position to be monitored. When key is operated downward, supervisor can listen only; when key is operated upward, the supervisor can also talk on the connection. The lamp signals are not used.

Other Points Within Airport—Private lines between the 102A equipment in the airways traffic control office and points within the airport are usually terminated at the other points in hang-up type handsets with the push-to-talk feature. Lifting the handset automatically signals the airways traffic control office. A lamp can be furnished at a conference line station to operate over talking circuit to indicate control office attendant is busy. In emergencies the station user can move switchhook to operate lamp and buzzer at control office on an intermittent or flash basis to obtain attention.

At airport control towers operated by CAA, the attendants may require the use of perhaps ten telephone lines. In such cases the lines may be terminated at two positions of 102A key equipment modified to meet the particular requirements (at smaller airports the 109A key equipment, described earlier, may be used instead of the 102A). Loud-speaker signaling is employed instead of lamp and buzzer signaling. The 102A positions are equipped for termination of both conference and non-conference lines, interexchange lines to traffic control centers at other airports, and a multi-station intercommunicating line connecting local airport points. The tower can also cut off extensions on interexchange lines when desired by use of a separately mounted key.

A headset, jack and a three-position key for monitoring the calls at the two 102A positions may also be required at the control tower.

Other Airports—Each private line between the 102A equipment in the airways control office and another airport serves one or more locations at the distant airport, each location equipped with a hang-up type handset and a loud-speaker. Since the loud-speakers are always ready to receive calls, no audible or visual signals are needed. When the push-to-talk handset is lifted to anwser the call, the loud-speaker is cut off. The stations can intercommunicate with each other, signaling over the loud-speaker.

The user at the distant airport can code signal the control office by means of a buzzer arrangement. Or, a two-tone selective two-way signaling arrangement may be provided with interexchange lines, whereby a user, at either the traffic control office or at the distant airport can dial over the talk channel to select any one of the 102A key positions at the opposite end of the line.

NO. 111A KEY EQUIPMENT

General—No. 111A key equipment is designed for use by the Civil Aeronautics Authority in the larger interstate airways communication (INSAC) stations for termination of central office, PBX, and private lines in the customer-owned air-ground operating console.

The 111A key unit, which has a capacity of five lines, is mounted as a telephone key panel in the operating console which has other panels containing radio control and signal equipment.

KEY EQUIPMENT
(Multi-Line Key Cabinets)

NO. 111A KEY EQUIPMENT (Continued)

At smaller INSAC stations where only about two telephone lines are terminated at the operating console and some of the features of the 111A are not required, the 109A key equipment mounted on the side of the console desk may be used instead of the 111A (as indicated in the description of 109A earlier in this section).

Key Panel—Five lines may be terminated in the 5¼" x 19" 111A telephone key panel which is mounted in the operating console. The customer-owned console is a long cabinet with a sloping front mounted on an office desk.

There are two basic lamp and key arrangements on the key panel:

1. A line lamp and a line pickup key for termination of one central office or airport PBX line (first key from left).

2. Aline pickup key, a conference switch key, a volume control, and a busy lamp indicator for each termination of four private lines (or central office and PBX lines with part of equipment inoperative).

Also provided on the telephone key panel are:

1. A dial for use on central office, PBX, and dial selective private lines.

2. A common hold lamp indicator associated with all lines equipped for hold feature.

3. A ring-hold key with the ring position common to all lines requiring 20-cycle ringing and the hold position common to all lines with hold feature.

4. A mute-all key for muting all telephone circuits associated with the common loud-speaker.

5. A buzzer which operates in conjunction with line lamp on lines with incoming 20-cycle signaling.

Attendant's Telephone—A hang-up type handset with the push-to-talk feature and a retractile cord is provided. It is mounted on left side of console desk.

Common Loud-Speaker—The loud-speaker which is associated with lines that are arranged for incoming voice signals is suspended from the ceiling of the INSAC station. The loud-speaker can be connected to a maximum of eight lines where there is more than one position of 111A; four lines where there is only one position. Where lines appear at several 111A positions, volume control of the loud-speaker appears only at the first position.

Associated Apparatus—The relay apparatus associated with the 111A key panel is usually mounted on suitable racks located in an adjacent equipment room.

Multipling of Lines—The lines appearing at a 111A key equipment position may be multipled to other 111A positions or the positions of other types of key equipments. Some of the earlier 111A installations were not arranged for multipling and cannot be readily changed. In such cases the installation may have to be re-engineered if multipling is required.

The CO or PBX line appearing at 111A positions may also appear at a telephone on the supervisor's desk, if desired, with associated line and busy signals where required.

CO or PBX Lines—This is a two-wire manual or dial line connecting the INSAC station to a local central office or to an airport PBX. The first key from the left on the 111A panel is a line key used to connect and disconnect the attendant's hang-up handset to and from the CO or PBX line, and also to silence the audible line signal when desired. To keep the attendant from leaving the handset connected to the line and making the line busy, the equipment is arranged so that the line cannot be picked up without first removing the handset from the switchhook.

On an incoming call the associated lamp indicator flashes as a line signal and changes to a steady light as a busy signal.

Where more than one CO or PBX line is required, the private line lamp and key terminations are used, with some of the equipment inoperative.

Interphone Lines—Incoming signaling is by loud-speaker voice calling. On two-wire lines, outgoing signaling is by 20-cycle ringing. On four-wire lines, outgoing signaling is 600-1500 cycle two-tone selective. When line is picked up by the 111A attendant to answer an incoming call, the loud-speaker is disconnected from the line and the attendant's handset is connected. At the same time the transmission levels of all other lines employing loud-speaker signaling are automatically reduced or muted at the loud-speaker. A mute-all key is also provided for use when it is desired to mute the lines at other times.

The associated lamp indicator on the 111A equipment is lighted by a voice-operated busy signal whenever there is speech on the line, regardless of source. The busy lamp signal enables the attendant to associate the loud-speaker voice signals with the appropriate line.

Four-wire interphone lines (not two-wire lines) may be interconnected at the 111A key panel by operation of all the associated conference switch keys. Where only two lines are to be interconnected, operation of

KEY EQUIPMENT
(Multi-Line Key Cabinets)

NO. 111A KEY EQUIPMENT (Continued)

either of the two associated switch keys will effect the conference connection.

Upon hearing a loud-speaker request for a conference connection, the 111A attendant can make the switch without removing or restoring his handset.

The volume control key associated with each line may be used to adjust the voice levels of the incoming voice signals at the loud-speaker (only at first position of multi-position arrangement).

The holding feature is not provided for interphone lines.

Local Private Lines—A two-wire local private line connects the INSAC station to a local airline station or to other stations in the immediate vicinity. The incoming signal may be either loud-speaker voice calling or 20-cycle ringing. A buzzer and a single lamp line-and-busy signal arrangement associated with the 111A equipment are employed when 20-cycle ringing is used for the incoming signal; and the volume control, of course, is not required.

The automatic muting feature operates where loud-speaker voice signaling is provided.

The conference switching and holding features are not provided.

Two-Wire Intercommunicating Lines—This type of line is used for intraoffice communication at the INSAC station. Two types of lines are available—the loud-speaker and the dial types.

Features of the loud-speaker type of intercommunicating line are the same as those of the interphone line, except that conference switching is not provided.

The features of the dial type of intercommunicating line are similar to those of the central office line. The dial line is usually a dial PBX station line. An audible buzzer, flashing incoming line signal, and a steady busy signal are associated with the 111A key equipment. The volume control and conference switching features are not required. However, the holding feature is used.

Two-Wire Dial Selective Private Lines—This line is used where an Air Traffic Control Center is located in the immediate vicinity of the INSAC station and the 111A attendant is required to select a desired sector controller in the Air Traffic Control Center.

The arrangement and features are the same as those for dial intercommunicating lines and central office lines.

Modification and Use of 102A and 111A Equipment—While the foregoing descriptions of these items of equipment and their use are intended to represent what might constitute a typical arrangement, it is to be realized that various modifications might be encountered.

Further, while these items of equipment were originally designed primarily for the use of the U. S. Civil Aeronautics Administration, there is also a field of use, with or without modification, among various business and industrial firms.

KEY EQUIPMENTS

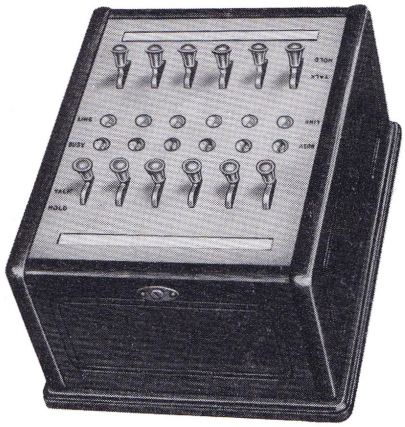
100 Key Equipment

3 LINE—SINGLE-SIDED

6 LINE—SINGLE-SIDED

For picking up and holding calls on any one of several lines at one telephone. Each line may be multipled to 12 cabinets.

For installations of more than 6 lines, key cabinets may be placed side by side. Single-sided cabinets may be tilted slightly toward attendants through use of sloping mounting blocks.



6 LINE—DOUBLE-SIDED

DIMENSIONS

Line Capacity	Single-Sided Width	Height	Length	Double-Sided Width	Height	Length
3 lines	5 ″	4½″	7¼″	5 ″	4½″	9¼″
6 lines	7⅜″	4½″	7¼″	7⅜″	4½″	9¼″

Double-sided key cabinets with additional row of keys are provided for two attendants facing each other across a desk. Double-sided cabinets have a designation strip for each attendant.

Key cabinets are finished in walnut with old brass face plates.

OPERATION

Each key has normal, talk, and hold positions.

INCOMING CALLS—The amber line lamp lights and the audible signal operates. The attendant operates the line key, the line lamp goes out and the green busy lamp burns.

OUTGOING CALLS—The attendant operates the line key, the busy lamp lights.

HOLDING—The busy lamp continues to burn when the line key is operated from the "talk" to the "hold" position. When the line is picked up again by operating the line key, the busy lamp remains lighted.

APPARATUS CABINETS

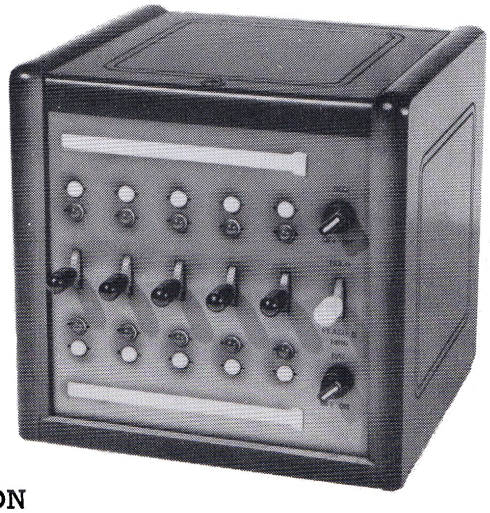
The necessary asociated aparatus cabinets may be placed in an out-of-the-way location near the key cabinets. For 3-line installations, the apparatus cabinets are about 21″ wide, 11″ high, and 11″ deep; for 6 lines, 25″ x 35″ x 11″.

KEY EQUIPMENTS

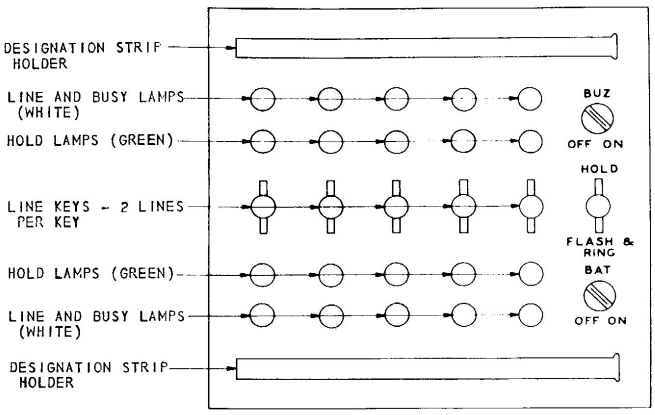
101 KEY EQUIPMENT

The 101 key equipment permits one or more attendants to answer, originate, and hold calls on a comparatively large group of central office, PBX, and magneto or common battery private lines. A maximum of 40 lines may terminate at each attendant's position. Each line may appear at 12 positions.

10 LINE—SINGLE-SIDED
Walnut Finish with Old Brass Faceplate



OPERATION



INCOMING CALLS—The line lamp flashes and the audible signal operates. The attendant operates the line key, changing the line lamp to steady, and connecting the attendant's telephone circuit. (On non-locking secretarial service the line lamp lights only while an incoming ring is being received.)

OUTGOING CALLS—The attendant operates the line key, the line lamp lights steadily. On ring-down lines operation of the common key to the flash-and-ring position will signal the distant end. On common battery or automatic lines this key may be used to flash the distant end. The line lamp remains lit as long as the line key is operated, except on non-locking signal type of secretarial service.

HOLDING—Operation of the common key to the hold position with the line key operated will extinguish the line lamp and light the hold lamp steadily. The hold lamp remains lit after the line key is restored. When the line is picked up again by operating the line key, the line lamp lights steadily and the hold lamp is extinguished.

DIMENSIONS FOR 101-A NON-FLUSH TYPE

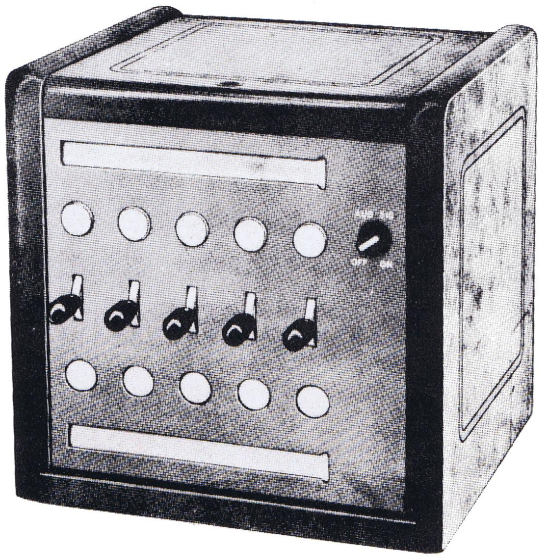
Line Capacity	Single-Sided Width	Height	Depth	Double-Sided Width	Height	Depth
10	7¼″	7⅜″	6¾″	7¼″	7⅜″	12¼″
20	14 ″	7⅜″	6¾″	14 ″	7⅜″	12¼″
30	20½″	7⅜″	6¾″	20½″	7⅜″	12¼″
40	27 ″	7⅜″	6¾″	27 ″	7⅜″	12¼″

The frame for the 101-B flush type equipment is 14½″ long for 20 lines and 27½″ long for 40 lines. Blank faceplates are used to fill out the frames in 10 and 30-line installations.

APPARATUS CABINET DIMENSIONS

Approximate floor space: 11″ x 25″.
Approximate heights of steel cabinets: 12″, 23″, and 35″ (height depends on number and type of lines, and number of attendants' positions.)

KEY EQUIPMENTS



103-A 10-LINE
KEY CABINET

103-A KEY EQUIPMENT

Provides a pickup only arrangement for the answering of a number of central office or PBX station lines at a central point when the normal users of these lines are not available. It is similar in appearance and practically identical in service features to the 101-A key equipment arranged only for pickup. The line signals, neon type lamps, light directly from ringing current and remain lighted only during the ringing interval.

All equipment is housed in the key cabinet except the common audible signal which may be a ringer or buzzer. The cabinet is available in two sizes: 10 lines and 20 lines arranged for operation from one side only. When two positions are required, duplicate key boxes may be provided since two appearances of line lamps can be provided.

102-A KEY EQUIPMENT

Designed to meet the intercommunication requirements for the Airways Traffic Control Offices which the U. S. Civil Aeronautics Authority operates at principal airports throughout the country.

The equipment is similar in appearance and operation to the 101 type. It provides private line intercommunication between the airways traffic control office and various points to which prompt access is required at all times. Conference type private lines connect the Traffic Control Office with airline dispatchers, the control tower, the weather bureau, and other points involved in traffic control. Non-conference private lines connect to loud-speakers at distant airports. In addition to private lines to various points, central office and PBX lines may be connected for general administrative use.

109-A KEY EQUIPMENT

The 109-A is designed primarily for CAA Airways Communications Station Offices for terminating a central office or PBX line, an intercommunicating line to local airport points, and three private lines to Traffic Control Centers at distant airports. The 109-A may also be used in airport towers at the smaller airports where use of 102-A equipment would not be warranted. The equipment consists of a 6-button key together with the necessary relay apparatus and a hang-up handset or a headset. Five buttons are used for line pick-up and the sixth as a common signaling or holding key. When headset is used, one button is used as a release key to disconnect the headset from a line at the end of a conversation.

110-A KEY EQUIPMENT

The 110-A key equipment provides for terminating telephotograph channels on customers' premises in a manner that the channel may be used either for telephoto sending or receiving, or for talking purposes. The key cabinet resembles the 101 and 102-A key cabinets. It contains five two-way lever keys with associated line lamps, and a sixth common ringing key (the right hand key). The fifth key from the left is associated with the telephoto channel. The first, second, third and fourth keys are associated with extension stations and special switching arrangements. The normal position of the fifth key connects a channel to telephoto machine for receiving; up, for sending. Down position disconnects telephoto machine and connects channel to handset. The first to fourth keys, inclusive, provide eight connections to extensions and other telephoto channels. Conference arrangements may be made on down positions. Associated with the key cabinet is a push-to-talk handset. A loud speaker may also be associated for monitoring the tones on the telephoto line.