

PRIVATE BRANCH EXCHANGE SWITCHBOARD



Front View No. 1962 Board—Showing Desk Unit

No. 1962 "Sanitary Type"

This switchboard is a result of the continuous efforts which the Western Electric Company is exerting in order to produce modern switchboards readily adapted to any operating conditions and at the same time maintaining the simplicity of operation, quality of material, skilled workmanship and maintenance economy which are characteristic of Western Electric products.

The No. 1962 switchboard being universally wired is adaptable to the varied requirements of private branch exchange service. It is designed to handle all practical service conditions which have arisen since the advent of the private branch exchange idea.

In addition to including all of the popular features adapted to private branch exchange service the No. 1962 switchboard is of the "Sanitary Desk Type" of construction which represents the Western Electric Company's most recent development and departure from old manufacturing methods. This cabinet has square lines generally, square legs (metal capped at bottom), plain panels and a clearance underneath the cabinet to provide for cleaning, hence the name "Sanitary." This switchboard is evidence of the continuous efforts being exerted by the Western Electric engineers toward the development of modern switchboards which will meet the exacting demands of discriminating buyers, and still retain the simplicity of operation, quality of material, skilled workmanship and low maintenance cost, which have been characteristic of Western Electric products in the past and upon which the company's reputation for service and quality has been built and maintained.

Built along the lines of modern office furniture it will harmonize with the surroundings in any modern office.

Capacity

Central Battery Local Lines.....	200
Trunk Lines.....	8
Cord Circuits.....	12

Framework. The framework is constructed of clear grained, red oak lumber, kiln dried and thoroughly seasoned to prevent warping and cracking and provided with a dull rubbed dark finish.

The stile strips, which hold the jacks and lamps in the face of the switchboard, and the key strips in the keyshelf by means of which the keys are held in place are made of cold drawn steel with a galvanized finish as a protection against moisture, also insuring perfect, rigid alignment of the face and keyboard equipment.

All relays are mounted on a swinging relay gate consisting of one piece of cold drawn galvanized steel equipped with mounting clips of the same material and brass machine screws. The mounting clips hold the relay mounting plates in place and eliminate the necessity of drilling holes in the relay gate. This is a typical Western Electric development which excludes the possibility of broken relay gates. The relay gate is mounted on a heavy steel bracket and presents a very compact appearance when closed as well as bringing the wiring within easy reach when open.

The Line Circuits. The line circuits terminate in jacks and lamps. This circuit is very simple reducing trouble to a minimum. Lines 1 to 20 are arranged for the use of a relay to light the line lamp where the telephone is located a considerable distance from the switchboard. In the remaining lines the relay is not provided for since these lines will be used for the telephones located nearer the switchboard. Ordinarily any stations located over 800 feet from the board require a line relay for lighting the line lamp.

PRIVATE BRANCH EXCHANGE SWITCHBOARD (CONT.)

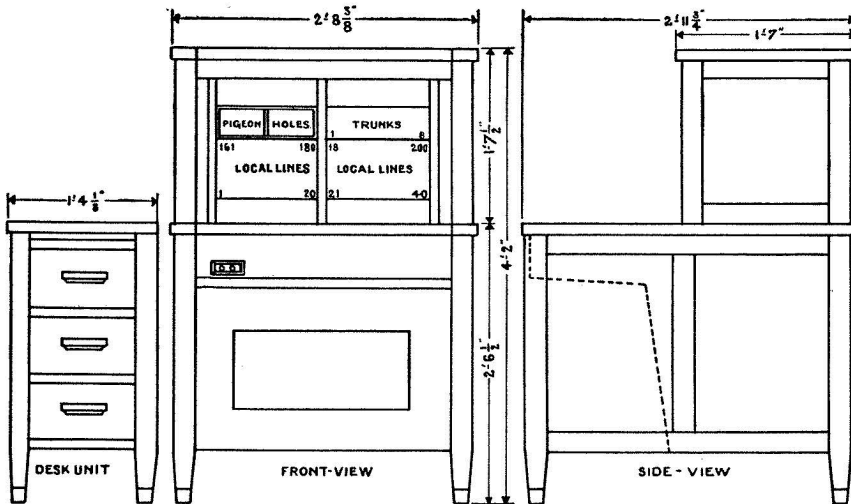
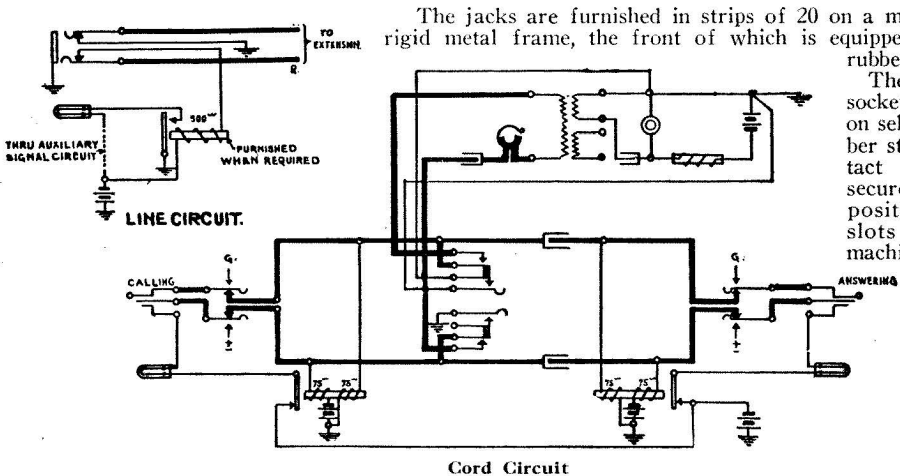


Diagram Showing Dimensions of No. 1962 Switchboard

No. 1962 "Sanitary Type"



Cord Circuit

The Cord Circuits. The cord circuits are of the bridged impedance type which have the talking battery connected in series with two windings of the cord supervisory relay and fed through these windings to the tip and ring of either cord. Each cord has its own supervisory relay and lamp which is controlled by the switchhook in either the called or calling party's telephone, thus having what is technically termed "double supervision."

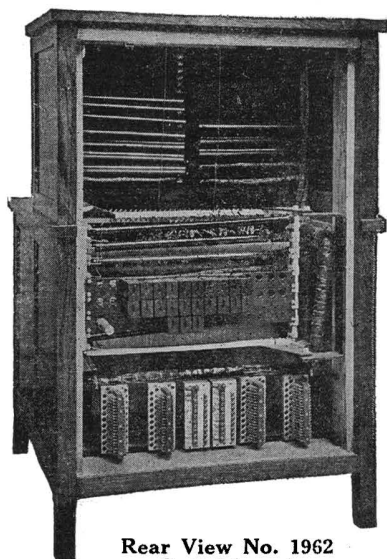
These are arranged for two-way ringing (ring on either cord) and with or without flashing recall on either cord. The flashing recall is a very desirable feature which speeds up the operator on answering recalls by flashing the supervisory lamp in the keyshelf. Some telephone men and the average layman have visions of a complicated mechanical device in connection with the flashing recall feature. Such is not the case, however, for this feature is accomplished by merely adding two relays in the cord circuit and three flashing recall relays which are common to all cord and plug ended trunk circuits in the switchboard. Their function is to interrupt the battery or ground supply to the supervisory lamps thus flashing them.

Flat type relays requiring little mounting space and having spring contacts are used exclusively.

Universal type keys are used having key springs and spring combinations fastened to the key mounting by means of machine screws. The springs are resilient and of suitable length to give the proper contact pressures in the normal as well as operated positions. The action of the levers is smooth and positive, and the design throughout is such as to provide for maximum life. The entire key is easily removed for inspection or repairs.

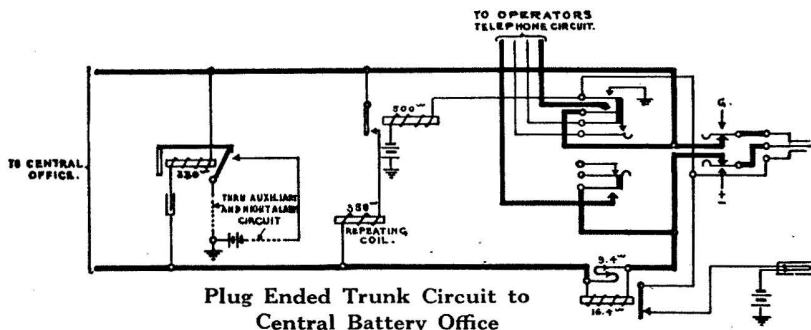
No. 1962 "Sanitary Type"

Type of trunk circuits for which the No. 1962 board is wired:



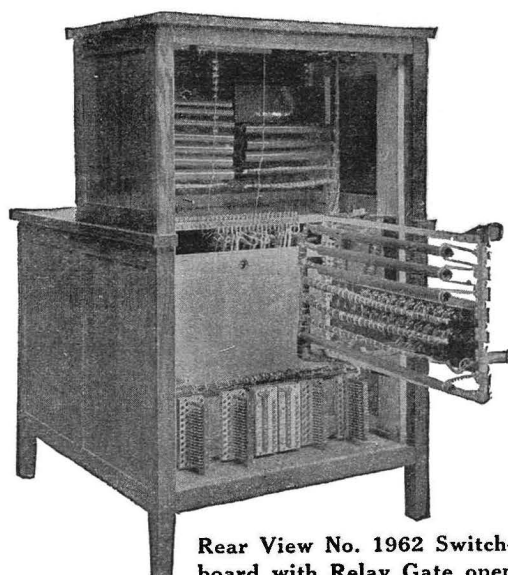
**Rear View No. 1962
Switchboard**

To central battery office
To central battery office with night jacks
To magneto office
To magneto office with night jacks
To automatic office
To automatic office with night jacks



PRIVATE BRANCH EXCHANGE SWITCHBOARD

(CONTINUED)



Rear View No. 1962 Switchboard with Relay Gate open

No. 1962 "Sanitary Type"

The Local Cable. The local cable is carefully constructed, well taped in exposed places as a protection against mechanical injury, and held securely in place by means of leather straps. Coatings of shellac are applied to preserve the insulation.

The Desk Units. This type switchboard is supplied with or without the tier of drawers depending upon the requirements of the purchaser. When furnished the drawer unit may be located at either side of the switchboard as desired. While the drawers are not an essential factor in the operation of the private branch exchange switchboard they are very convenient for keeping records or stationery where the private branch exchange operator has other duties than operating the switchboard. The finish of the woodwork is the same as the switchboard and when assembled as part of the switchboard compares with the usual office furniture.

The Power Plant. Storage batteries provide the best current for operating this switchboard. The storage battery has been rightly termed the heart of the telephone system, consequently great care must be used in the selection of the proper size of the storage battery and charging units.

The size of batteries may be determined on the basis of the following example of calculation:

1000	Total trunk and local connections per 24 hour day
.015	Current in ampere hours per call (based on call of ordinary duration)
<hr/>	
5000	
1000	
<hr/>	
15.000	Current in ampere hours for calls in 24 hours.

Since the rating of the storage battery is computed on an 8-hour capacity it is necessary to divide the ampere hour rating for 24 hours by 8 hours in order to determine the ampere hour rating of the battery required.

Thus	15.000	Current in ampere hours for calls in 24 hours
		Divided by 8
Equals	1.875	ampere—ampere rating for battery 24 hours
Plus	.1875	10 per cent. safety factor
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Equals 2.0625 Battery rating (basis 8-hour discharge rate)

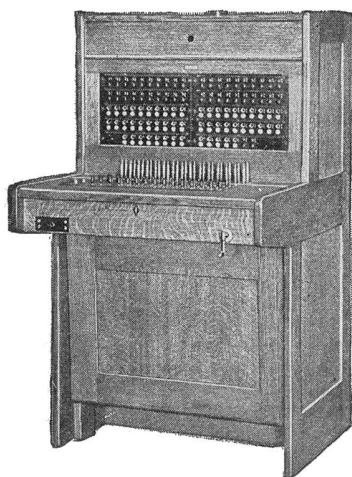
4.1250 Ampere rating for battery 48 hour reserve
(Nearest battery E.S.B. Co.'s type ET cells 4½ amp.)

The charging medium required would be a 5 ampere D.C. motor generator or a rectifier delivering this current at 30 volts. If it is desired to operate an interrupter ringing outfit with the storage battery the size of the latter should be increased from 1½ to 3 amperes depending on the amount of ringing to be done.

A satisfactory method of obtaining battery current for the private branch exchange is to have a direct connection to the main central office storage battery over several cable pairs. This is also true about the ringing current since this plan eliminates the necessity of maintaining the storage batteries and ringing equipment at the private branch exchange.

PRIVATE BRANCH EXCHANGE SWITCHBOARD

No. 550 Type Switchboard



80 Line No. 550B Switchboard

This switchboard has passed the Test of Service and proven Satisfactory and Reliable

This switchboard has the distinction of being a pioneer in the private branch exchange field since the adoption of the modern flat type relays, it being the first private branch exchange switchboard in which the new relays were used. The No. 550B switchboard in both the 30 and 80 line capacities makes an ideal installation in any city or town where the present equipment of the main central office is of the manual central battery type.

The compact cabinet design presents a neat appearance and compares favorably with the furniture in any modern office.

If there is a possibility of a change from manual to machine switching telephone equipment the purchase of the No. 550C switchboard, which has trunks arranged for connection to machine switching offices, including the necessary dialing features, is recommended.

TYPES AND CAPACITY

	550B(30)	550B(80)	550C(30)	550C(80)
Station lines total	30	80	30	80
†Station lines wired for relays	10	20	10	20
Trunk lines	10	15	10	15
*Cord circuits	10	15	10	15

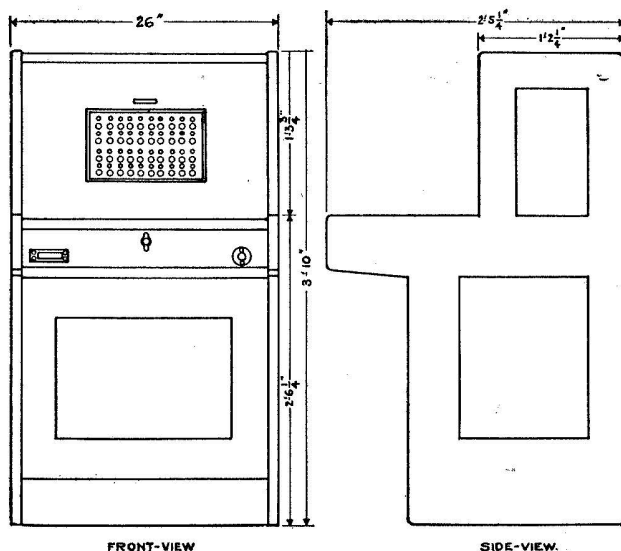
*The cord circuits in the No. 550B board can be equipped for either single or double supervision while those in the No. 550C board are arranged for double supervision only.

†Certain lines are wired for relays to be used on lines where the telephone is located considerable distance (800 ft.) from the switchboard. Relays are not provided unless specified.

The Framework. Red oak lumber with a rich, dark finish or birch with a mahogany finish is used for all exposed woodwork parts. The lumber is kiln dried and thoroughly seasoned to prevent warping and cracking. Iron reinforcing brackets are placed on the inside of the cabinet at the corners giving added strength.

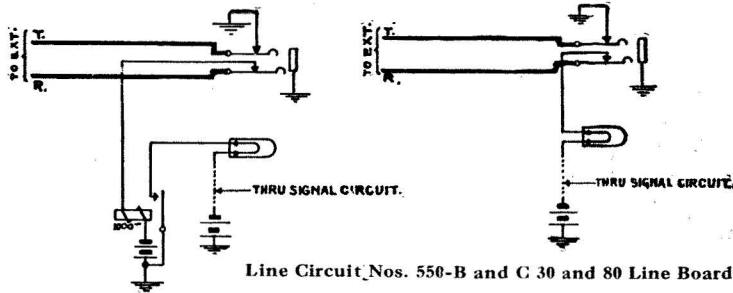
The stile strips which hold the line jacks and lamp sockets in place as well as the key mounting strips in the keyshelf consist of cold drawn galvanized steel. This insures perfect alignment of the face and keyboard equipment also prevents damage from moisture.

The equipment, such as relays, resistances, retard coils, etc., associated with the trunk, line, cord, night alarm, dialing, auxiliary and operator's telephone circuits, is mounted on a swinging relay gate which is constructed of a single piece of cold drawn galvanized steel bent in the proper shape and mounted on a heavy steel bracket securely fastened to the switchboard.



Dimensions of No. 550—80 Line Private Branch Exchange Switchboard

PRIVATE BRANCH EXCHANGE SWITCHBOARD (CONT.)



No. 550 Type Switchboard

The gate is equipped with mounting clips and screws. The mounting clips hold the relay mounting plates on the relay gate and permit the use of the one piece relay gate.

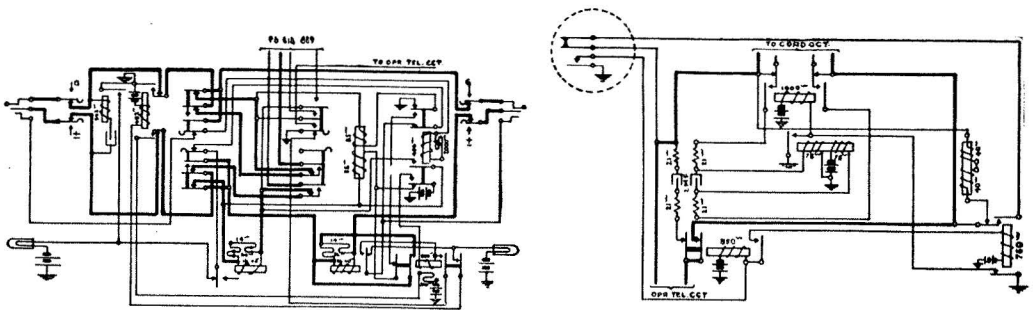
The cabinet is compact and all parts are easily accessible. These switchboards in the 80 line capacity are equipped with removable end panels. This permits the lining up of two boards and makes an ideal installation where several positions are required.

The Line Circuits. The line circuits are simple and terminate on screw terminals located on a hinged connecting rack which can be opened for inspection.

Certain lines are arranged for use with relays and intended to be used for the stations located considerable distance (800 ft.) from the switchboard. The latest standard flat type relays are used throughout which permits placing the maximum amount of equipment in a small space.

Individual line jacks and associated lamp sockets are used in all boards on trunk and line circuits. The number of jacks and lamps required are equipped and the remaining jack and lamp positions plugged with apparatus blanks. The blanks can be removed and jacks and lamps installed at any time. The panels upon which the individual jack and lamp sockets are mounted consists of one piece of dull finished black faced fibre which does not reflect the light. A designation strip is provided below each row of jacks for convenience in numbering. The black faced fibre panel presents a very neat appearance as well as insuring perfect alignment of the face equipment.

The Trunk Circuits. Jack ended trunks are used on all No. 550 type boards. The jacks and lamp sockets are individually mounted as in the line circuits.



CORD CIRCUIT NO. 550 PRIVATE BRANCH EXCHANGE SWITCHBOARD.

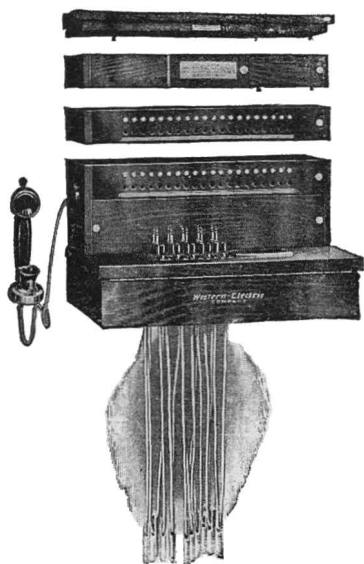
DIALING CIRCUIT NO. 550 C-PRIVATE BRANCH EXCHANGE SWITCHBOARD.

The Cord Circuits. The cord circuits embody all of the features required for the successful operation of the private branch exchange. Connections between stations and from stations to trunks are easily established. On the 550C board each cord circuit is arranged for dialing by the operator from the board and through dialing from any station on the private branch exchange to the machine switching exchange. This through dialing is accomplished by the operator throwing the night key and the through dialing key in the proper position after putting up the night connections. The function of the night key is to cut out all the equipment from the circuit which is not required for night service.

The Dial Circuit No. 550C Board. The dial may or may not be used as desired, it being easily installed when needed. It is connected to the local cable by means of a flexible cord and the dial itself held in place by a spring clip which is screwed to the keyshelf. When the dial is not equipped the hole for the cord is suitably covered with an apparatus blank.

PRIVATE EXCHANGE SWITCH-BOARDS

No. 1801 Sectional Unit Type



**No. 1801 Switchboard
Showing Method of Enlarging**

The No. 1801 has lamps for the line and supervisory signals. Birch lumber, with a mahogany finish, or quarter sawed red oak which has been kiln dried and thoroughly seasoned to prevent warping and cracking is used in the construction of the units.

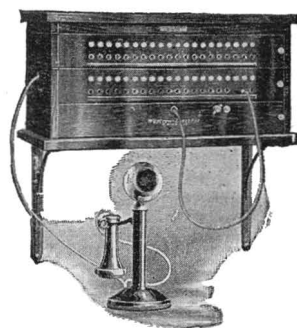
Four systems—"A," "B," "C" and "D" have been devised to handle the various classes of service required in this type of switchboard. Telephones which can be used with the systems are listed under heading: Central Battery Telephones.

SYSTEM "A"

This system provides for communication between the switchboard and stations only. There are no facilities for inter-communication between stations or for connections to a central office.

Direct current is used for ringing the telephone bells, hence a battery is required for ringing as well as for talking current.

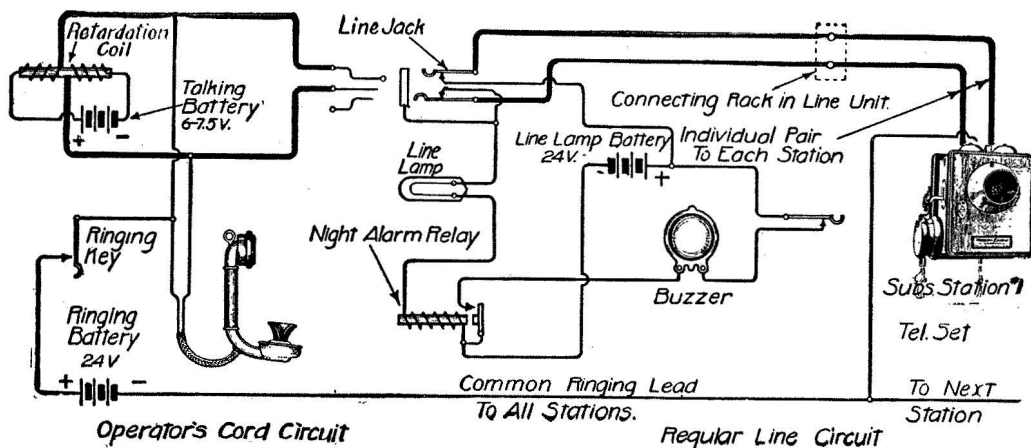
This is a three-wire system, a third wire common to all sets being required in addition to the two wires individual to each station. When a station is being rung, ringing current passes out over the tip side of the line through the bell in the telephone and back over the third wire.



**No. 1801 Switchboard
System "A"**

Consisting of:

- 1—G-1 Top Unit
- 1—HD-1 Line Unit
- 1—JD-1 Cord Unit
- 1—K-1 Supporting Unit



PRIVATE EXCHANGE SWITCHBOARD (CONT.)

No. 1801 Sectional Unit Type

Since the operator is a party to all conversations, no supervision is required.

The telephones used on the lines of this system are equipped with direct current vibrating bells.

The switchboard can be arranged for simultaneous ringing of and talking to all stations.

SYSTEM "B"

This system embodies all of the features of System "A" and in addition has facilities for intercommunication between stations. Five pairs of connecting cords with ringing and listening keys are provided for this purpose.

The method of wiring to the sets is the same as System "A" and the stations are rung in the same manner.

As soon as a connection is set up, the line lamps of the lines connected become supervisory lamps and remain dark as long as the parties have their receivers off the hook and light when they hang up.

Note the simplicity of the cord and line circuits. Since the circuits are simple in design the possibility of trouble is reduced to a minimum. It is to be noted that there are no relays in the line circuits with the exception of the night alarm relay.

Simultaneous ringing and talking feature can be furnished with this system.

SYSTEM "C"

No. 1801 Switchboard
System "B"

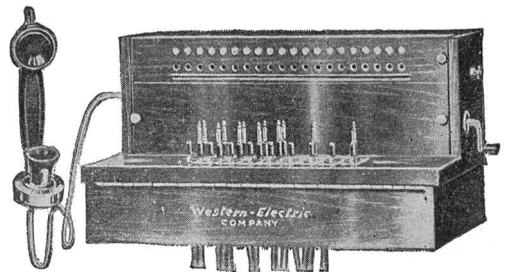
Consisting of:

- 1—G-1 Top Unit
- 1—HA-7 Simultaneous Talking and Ringing Unit
- 1—HD-1 Line Unit
- 1—JC-2 Cord Unit
- 1—K-2 Supporting Unit

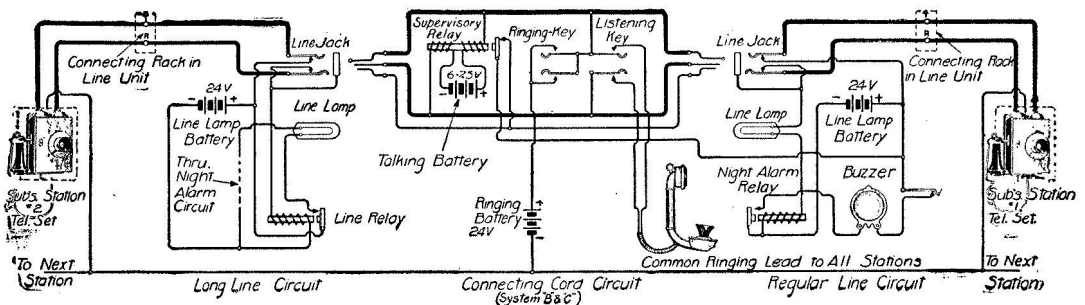
This system embodies all of the features of system "B," and in addition two plug ended trunks are provided which may be equipped for connections to either magneto or central battery central offices.

These trunk circuits are provided with holding, ringing and listening keys and the operators' telephone circuit is equipped with an induction coil to insure good transmission on trunk connections. The stations are rung, and supervision obtained in the same manner as in system "B."

When trunk circuits to central battery central offices are equipped they are connected to a regular subscribers' line circuit at the central office. When the trunk is plugged into a line on which the party has removed the receiver from the hook, the central office operator will receive the signal in the usual manner. The private exchange operator can also signal the central office operator by manipulating the holding key.

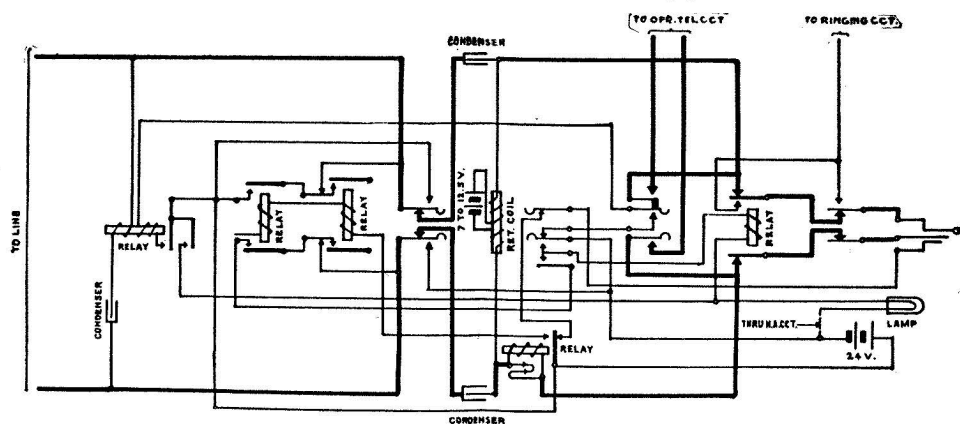


No. JC-5 Cord Unit

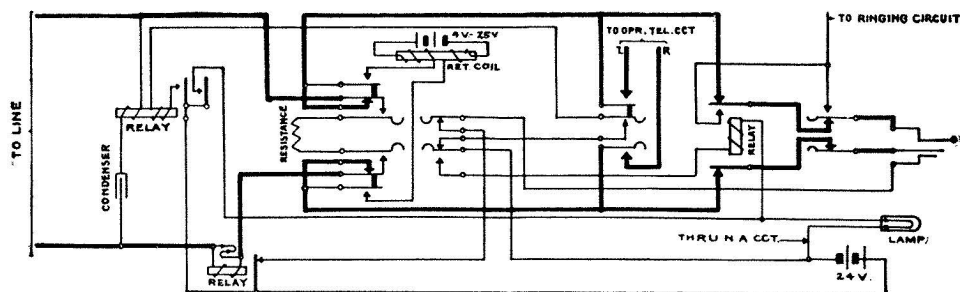


PRIVATE EXCHANGE SWITCHBOARD (CONT.)

No. 1801 Sectional Unit Type



**TRUNK CIRCUIT TO MAGNETO CENTRAL OFFICE.
NO. 1801 SWITCHBOARD.**



**TRUNK CIRCUIT TO CENTRAL BATTERY CENTRAL OFFICE.
NO. 1801 SWITCHBOARD.**

To signal the private exchange operator, the central office operator rings out on the line in the usual manner. This action lights the trunk lamp which remains lighted until the listening key is operated. Talking current is obtained from the central office on trunk connections, except when the holding key is operated.

The holding key enables the operator to hold a trunk connection while she converses with the party desired or until the party desired can be connected.

A night key is provided to prevent battery from flowing when the trunk is set up for night or thru connections.

When the trunks are arranged to handle connections to a magneto central office, the central office operator signals the private exchange by ringing on the line in the usual manner. Talking current for the stations is furnished by the trunk circuit, and supervision is the same as when a connection is made with a cord circuit. A key is provided to ring the stations and a separate key to signal the central office. A night key is provided which has the same function as the night key in the central battery trunks. The trunk circuit is so arranged that on a thru or night connection the action of removing the receiver from the hook will kick down the drop at the central office.

The telephone sets used with this system are similar to those used with systems "A" and "B" except that they are also equipped with an induction coil.

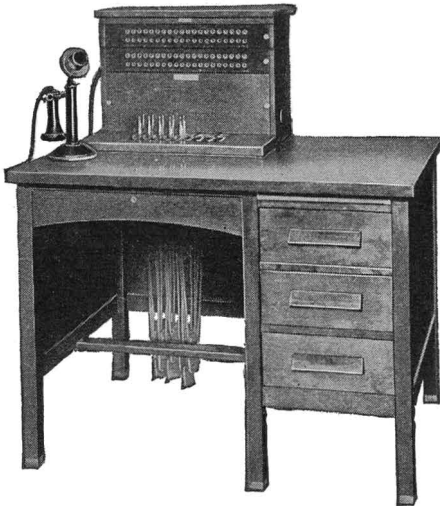
The simultaneous ringing and talking feature can be furnished with this system.

PRIVATE EXCHANGE SWITCHBOARD

(CONTINUED)

No. 1801 Sectional Unit Type

SYSTEM "D"



No. 1801 Switchboard System "D"

Consisting of:

- 1—G-1 Top Unit
- 1—HD-1 Line Unit
- 1—JD-7 Cord Unit
- 1—K-3 Supporting Unit

This system has all of the features of system "C" except that it employs the regular two wire line circuit, and alternating current is used for ringing purposes. A ringing interruptor can be supplied for furnishing alternating ringing current. All cord units are equipped with a No. 22 hand generator.

The telephone sets used with this system are the regular central battery sets used with central office systems.

The operation of trunk circuit either to Central Battery or magneto exchanges is the same as for System "C" except that no No. 127A set is required at the stations for night or through connections.

If no trunk circuits are desired, the cord units are furnished with wiring only for those trunks and the apparatus spaces properly blanked.

Description of Units. To make up a complete No. 1801 switchboard one supporting unit, one cord unit and one top unit are required. If line or miscellaneous units are required to handle the service they can be added at any time.



G-1 Top Unit



HD-1 Line Unit

(Used with all top and cord units)

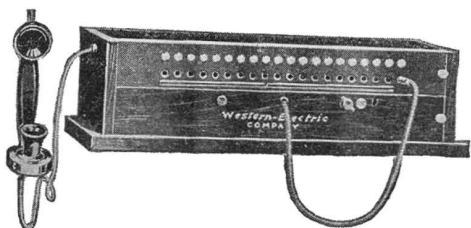
Line Units. The line units are all wired for twenty lines, the only difference being in the number that are equipped. All unequipped jack and lamp positions are plugged with apparatus blanks. The jacks and lamp sockets are singly mounted and are easily installed when a few lines are to be added. The following shows the equipment of the various units:

Code No.

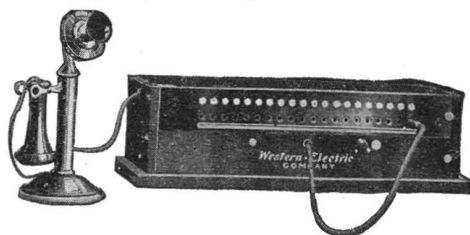
- HA-1 wired for 20 lamp signal line circuits, with equipment for 5
- HB-1 wired for 20 lamp signal line circuits, with equipment for 10
- HC-1 wired for 20 lamp signal line circuits, with equipment for 15
- HD-1 wired and equipped for 20 lamp signal line circuits.

PRIVATE EXCHANGE SWITCHBOARD

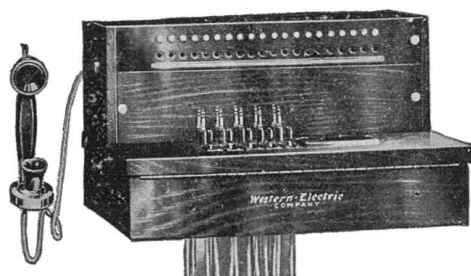
No. 1801 Sectional Unit Type (Cont'd)



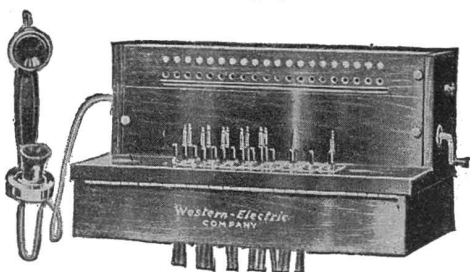
JC-1 Cord Unit



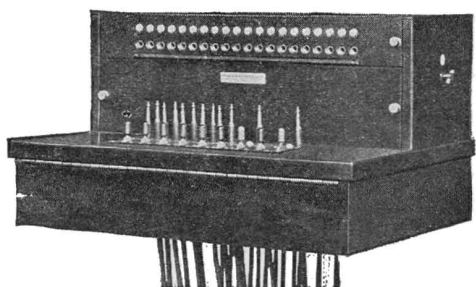
JD-1 Cord Unit



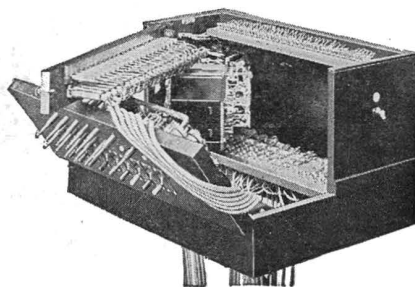
JC-2 Cord Unit



JC-4 Cord Unit



No. JD-3 Cord Unit



No. JD-3 Cord Unit—Showing Gate

Cord Units. Each cord unit is equipped with an operator's telephone circuit (either hand set or desk-stand) and night alarm circuits as well as the equipment outlined below. All cord units are adapted for use with all line and line relay units.

On units which are equipped with five cord circuits, five simultaneous connections may be established.

Care is used in the construction of the units to attain the maximum degree of accessibility. The keyshelf is mounted with a piano type hinge, a feature which insures perfect keyshelf alignment. The trunk and cord relays are mounted on a swinging gate which screws rigidly in place by means of brass machine screws.

All battery fuses are located in the cord unit.

Code No.	System	Operator's Ans. and Call Cords	Conn. Cord Cts. with 1 Way Ring and List Keys	Operator's Set Type	Central Battery Lines	Plug Ended Trks. to C. B. Exchange	Plug Ended Trks. to Mag. Exchange
JC-1	A	1	..	Hand set	20	..	..
JD-1	A	1	..	Desk stand	20	..	..
JC-2	B	..	5	Hand set	20	..	..
JD-2	B	..	5	Desk stand	20	..	..
JC-3	C	..	5	Hand set	20	2	..
JD-3	C	..	5	Desk stand	20	2	..
JC-4	B	..	5	Hand set	20	2	..
JD-4	B	..	5	Desk stand	20	2	..
JC-5	C	..	5	Hand set	20	..	2
JD-5	C	..	5	Desk stand	20	..	2
JC-6	D	..	5	Hand set	20	..	2
JD-6	D	..	5	Desk stand	20	..	2
JC-7	D	..	5	Hand set	20	..	..
JD-7	D	..	5	Desk stand	20	..	..

PRIVATE EXCHANGE SWITCHBOARD (CONTINUED)

No. 1801 Sectional Unit Type



No. HA-7 Simultaneous Ringing and Talking Unit, Open

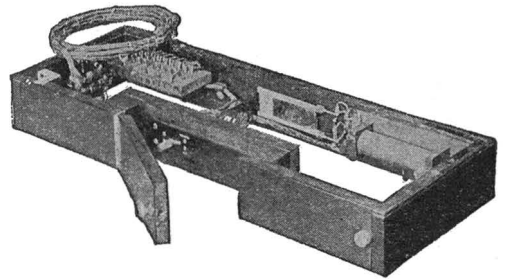


No. HA-7 Simultaneous Ringing and Talking Unit, Closed

SIMULTANEOUS TALKING AND RINGING UNIT FOR USE WITH SYSTEMS A, B and C

It is sometimes desirable to have facilities for ringing and communicating with all stations at once. This unit provides the feature of "simultaneous ringing, listening and talking" which has proven to be of great value at the time of a fire or at any time when it is necessary to send out a "general alarm." This feature has also been used with very good success in schools for ringing the bells at the end of study periods, and in sanitariums and prisons for "spreading an alarm" when one of the inmates has escaped. The only operation necessary to communicate with all stations is the manipulation of the ringing and listening keys. No cords and plugs are used with this feature which reduces the time required for sending an alarm and incidentally reduces the cost of construction. Fire insurance companies consider the simultaneous ringing, listening and talking features very favorably. Since this is a feature which will increase the value and efficiency of the system as a whole, it is advisable that it be included in each installation.

Line Relay Unit. The question of furnishing adequate service, particularly signaling, to stations located a considerable distance (over 800 ft.) from the switchboard frequently arises. The HA-2 line relay unit takes care of this condition. Five relays constitute the equipment in each unit and since the first five lines circuits in each cord unit are wired for conversion to long line equipment it is a simple matter to change to long lines as required. The relays are wired to screw terminals in the rear of the unit.



No. HB-6 Incoming Call Transfer Unit (Open and Closed Views)



No. K-2 Supporting Unit

Incoming Call Transfer Unit. The incoming call and transfer unit is arranged so that all calls can be received at a designated station when an operator is not on duty at the switchboard. This increases the flexibility of the switchboard and makes the system more valuable to the owner. Adapted for use with systems "A," "B," "C" and "D."

Supporting Units. No. K-1. Consists of two japanned iron brackets for supporting the switchboard against a wall.

No. K-2. A shelf supported by two brackets and a casing for enclosing the cords. Used when the switchboard is mounted against the wall.

No. K-3. A flat-topped desk with one tier of drawers, so arranged that the cores are concealed by a wooden panel.

PRIVATE EXCHANGE SWITCHBOARD

(CONTINUED)

No. 1801 Sectional Unit Type

TABLE OF UNITS AND PARTS

	System "A"	System "B"	System "C"	System "D"
Top unit.....	G-1	G-1	G-1	G-1
Line unit.....	HA-1	HA-1	HA-1	HA-1
Line unit.....	HB-1	HB-1	HB-1	HB-1
Line unit.....	HC-1	HC-1	HC-1	HC-1
Line unit.....	HD-1	HD-1	HD-1	HD-1
Line relay unit.....	HA-2	HA-2	HA-2	HA-2
Simultaneous				
Talking and ringing..	HA-7	HA-7	HA-7	—
Incoming call transfer	HB-6	HB-6	HB-6	HB-6
Cord unit.....	JC-1	JC-2	JC-3	JC-4
Cord unit.....	JD-1	JD-2	JD-3	JD-4
Cord unit.....	—	—	JC-5	JC-6
Cord unit.....	—	—	JD-5	JD-6
Cord unit.....	—	—	—	JC-7
Cord unit.....	—	—	—	JD-7
Supporting unit.....	K-1	*K-1	*K-1	*K-1
Supporting unit.....	—	K-2	K-2	K-2
Supporting unit.....	—	K-3	K-3	K-3
Talking battery.....	6 dry cells in series	6 dry cells in series	‡6 dry cells in series	‡6 dry cells in series
Ringing battery.....	‡20 dry cells in series	‡20 dry cells in series	‡20 dry cells in series	—
Line lamp battery....	‡20 dry cells in series	‡20 dry cells in series	‡20 dry cells in series	‡20 dry cells in series
Ringing interrupter...	—	—	—	—
Telephone sets—Wall.	1527A	1527A	1533M	1533A
Telephone sets—Desk.	6034AU	6034AU	6000AE	6054A

*While the K-1 unit can be used with systems "B," "C" and "D," it does not conceal the cords and one of the other units is recommended.

‡If 60 to 100 lines are equipped, furnish 2 strings connected in parallel, each string consisting of 20 cells in series. One battery may be used for both ringing and line lamps in System "A," "B" and "C."

‡8 cells in series (instead of 6) should be provided if trunks to magneto central office are equipped.

Cord units used with system "D," are equipped with a No. 22 hand generator for ringing.

