

Kellogg

*Private Branch Exchange
Switchboards*



BULLETIN NO. 8X

Kellogg
SWITCHBOARD & SUPPLY
Company
CHICAGO

KELLOGG

PRIVATE BRANCH EXCHANGE SWITCHBOARDS



Bulletin No. 8X

(For Cordless P.B.X.'S See Bulletin 8-CX)

KELLOGG SWITCHBOARD & SUPPLY COMPANY

1020-1070 West Adams Street

Chicago, Illinois

Branch Offices and Warehouses

COLUMBUS, OHIO

163 N. Fourth St.

KANSAS CITY, MISSOURI

308 W. 6th St.

SAN FRANCISCO, CALIFORNIA

1054 Mission St.

PORTLAND, OREGON

40-42 E. Seventh St.



The fifteen acre plant of the

KELLOGG SWITCHBOARD AND SUPPLY COMPANY

1020-1070 West Adams Street
CHICAGO, ILL., U. S. A.

KELLOGG P. B. X.

The Business Builder

In the P.B.X. the Telephone Company has one of the best potential money makers.

In practically every community of any size there are commercial and industrial institutions that can use this type of service, but are still using individual lines. If these lines can be converted into trunks connecting with a P.B.X., a very nice additional income can be derived from P.B.X. and sub-station rentals.

Possibly the first objection which might be raised is the apparent necessity for an experienced operator. Most business houses have someone who is expected to meet callers, someone who does part-time filing or someone who does odd stenographic or clerical jobs around the office. This person might very easily take over the P.B.X. operation. It is true that part of his or her time can fairly be charged to the operation of the board, but the most noticeable thing after the installation of the P.B.X. is the discontinuance of the practice of higher priced workers walking from desk to desk or department to department. Many times this walking is merely visiting under the garb of transacting routine business. Aside from this, the part-time operator takes care of the outside calls of the important executives and releases their time for more productive work. A complete check is always at hand on the proper use of long distance calls. In short, the saving in time for the higher priced workers more than pays for the part-time operator.

Another usual objection is that the additional cost of the service is not warranted because of the lack of necessity for intercommunication. It is interesting to check the calls or traffic on a P.B.X. during the first month of operation. At first the calling rate is very low but it imme-

diately climbs to a point thought improbable. This is due to the fact that the employe transacts important matters immediately instead of collecting a number of things before walking to the other department. The whole organization speeds up. Sometimes the saving in time between departments and the general speeding up permits the cutting down of personnel. The time saved due to this speeding up more than pays the additional cost. Ask any company that uses a P.B.X. what they would do without it.

The fact is, most companies who are not using a P.B.X. do not know they need one. If they can be shown that they can save the time of high priced men, that they can keep their employes at their desks, that they can in many cases cut down their unproductive overhead and that they can speed up their whole organization, they are not apt to question the additional cost of telephone service. This cost can be presented to them on the basis of so many cents per hour or day.

It is true that good telephone service, like many other modern facilities, increases in use because it is good. A business executive will transact more of his business over the telephone if it is made convenient and easier.

With these essential points in mind, the Kellogg Company has designed a complete line of Private Branch Exchanges. Kellogg quality is never questioned, but we have gone further than quality of construction and materials. We have built into these instruments the ability to fulfill every expectation of the operating man and the user, from the standpoint of efficiency combined with simplicity of operation.

KELLOGG

P. B. X.

Its Applications

The first step in the selection of a P. B. X. is a careful study of the requirements of the subscriber. Positively the most important thing is the consideration of the possible ultimate growth.

In an industrial plant the growth can be fairly estimated by taking into consideration the number of executives requiring individual instruments, and the number of major departments in the plant and offices. It is well to overlook the opinions of the executives as to this growth for it has been proven that the need for instruments in all of these departments usually exists within the first year after installation of the P.B.X. This is due to the speeding up effect in the plant.

In a commercial institution the growth after the initial installation is apt to be small and to consist mainly of trunks and extensions.

In hospitals, hotels, schools and steamships there is but little growth under ordinary circumstances but it is well in the case of all but the steamships to take into consideration the plans of the Boards of Directors over a reasonable period.

You can readily see that the next important item is the consideration of cord circuits and of trunking facilities.

In the industrial plant, especially one in the smaller city, the calling is mostly interdepartmental. This, of course, requires a larger number of cords than is necessary for a hotel where intercommunication is at a minimum. The number of trunks is usually determined at

the beginning by the number of direct lines they have been using.

In a commercial institution the condition is slightly different. While there is considerable intercommunication, there is also a large amount of outside calling.

In hotels there is very little intercommunication and, consequently, less cords, but there is a large amount of outside calling, requiring an adequate number of trunks.

In steamships the intercommunication is also low, being mostly between officers. Consideration must be given, however, to adequate cords to handle emergencies.

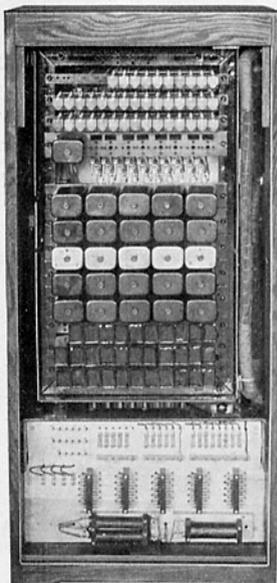
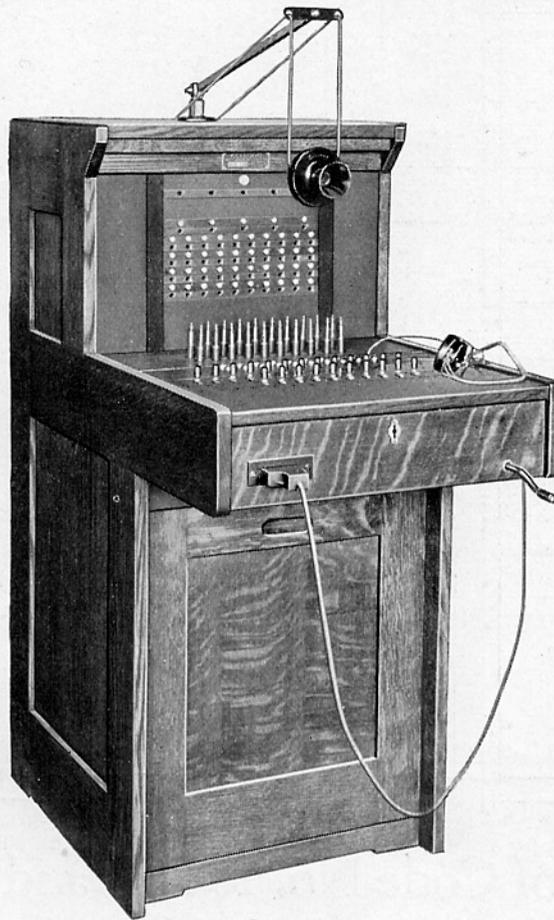
In hospitals the intercommunication is chiefly between departments and floors and the amount of calling is usually very small. It is essential, however, that a careful study be made of the trunk requirements.

In schools neither intercommunication nor trunking is a serious matter under ordinary routine. However, adequate facilities to take care of emergencies should be supplied.

The requirements and conditions on railroads require special study but the Kellogg Private Branch Exchanges can be made to fit these.

The Kellogg Private Branch Exchanges are made in a variety of sizes and equipped to fill almost any condition encountered. Like our well known Service Boards, the Universal boards and the old reliable Magneto boards, the P.B.X. equipment is built to fit actual conditions rather than theoretical ideas.

The No. 1045 P.B.X. Switchboard



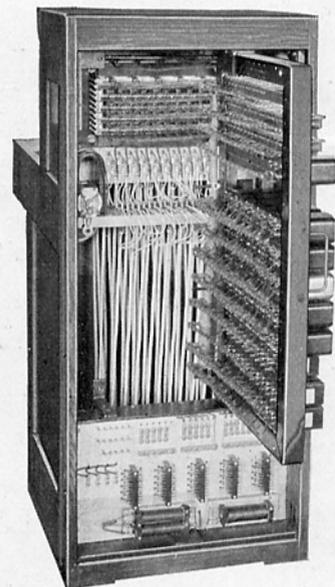
Rear View Showing Relay Gate Closed

No. 1045-P

- 40—Lines
- 6—Cord circuits
- 4—Plug ended trunk circuits

No. 1045-J

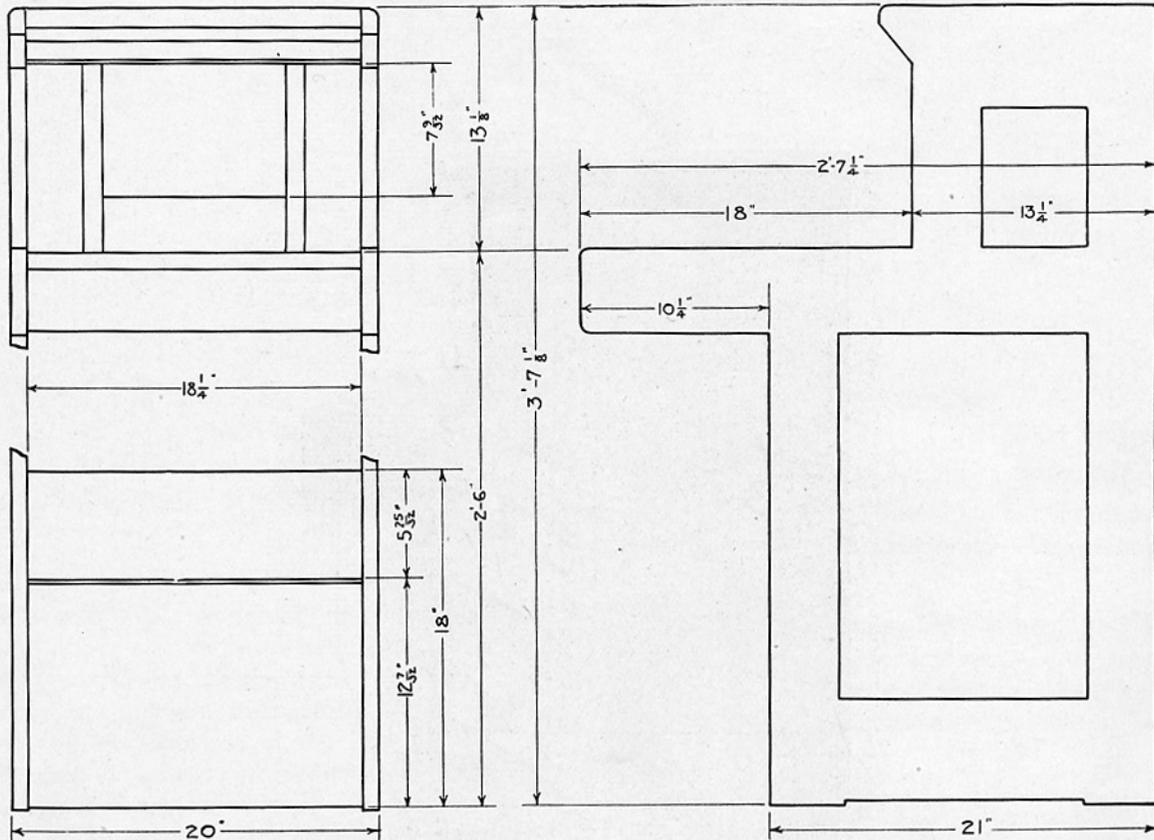
- 40—Lines
- 10—Cord circuits
- 5—Jack ended trunk circuits



Rear View Showing Relay Gate Open

Kellogg

Dimension of 40-Line Cabinet



Capacities of Code No. 1045-P and No. 1045-J P. B. X. Switchboards

The No. 1045-P private branch exchange switchboard is arranged for plug ended trunks to the main exchange and may be arranged to operate with a common battery, automatic or magneto main exchange equipment as required. This switchboard has a capacity for:

- 40—Lines (10-per strip)
- 4—Plug ended trunks
- 6—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

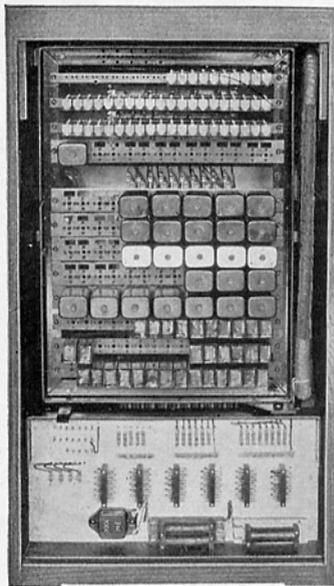
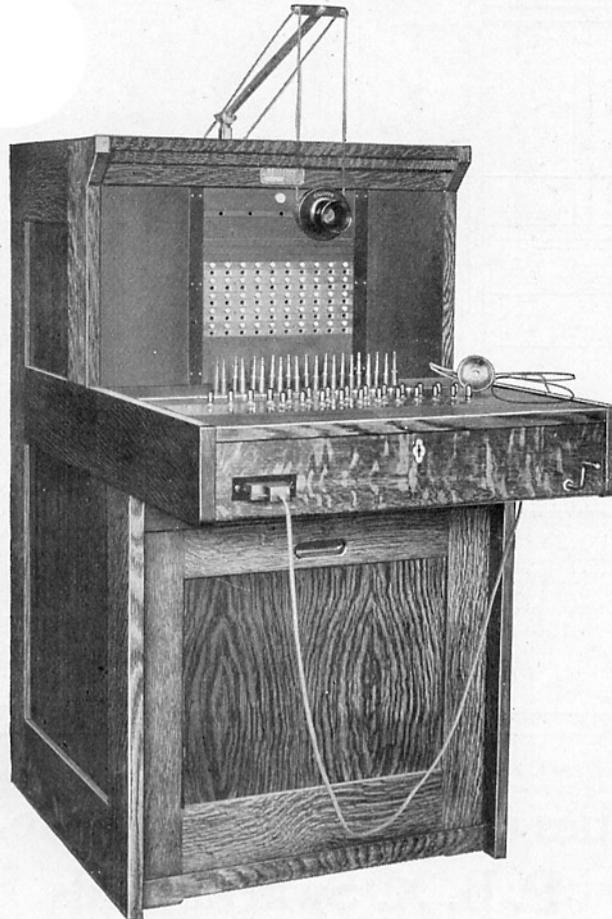
The No. 1045-J private branch exchange switchboard is arranged for jack ended trunks to the main exchange and may be arranged to operate with a common battery, automatic or magneto main exchange equipment as required. This switchboard has a capacity for:

- 40—Lines (10-per strip)
- 5—Jack ended trunks (5-per strip)
- 10—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

ALL LINE CIRCUITS ARE WIRED FOR LINE RELAYS

Kellogg

The No. 1055 P.B.X. Switchboard



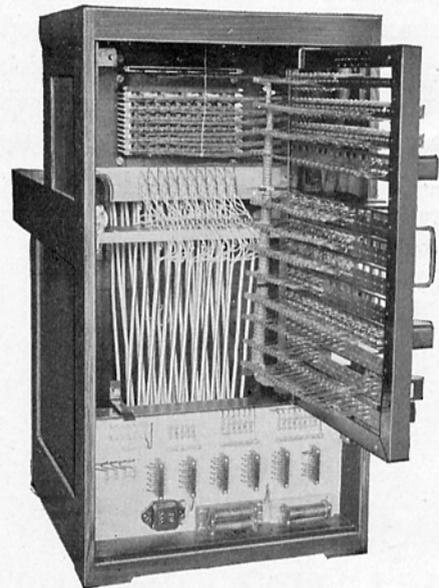
Rear View Showing Relay Gate Closed

No. 1055-P

- 50—Lines
- 8—Cord circuits
- 5—Plug ended trunk circuits

No. 1055-J

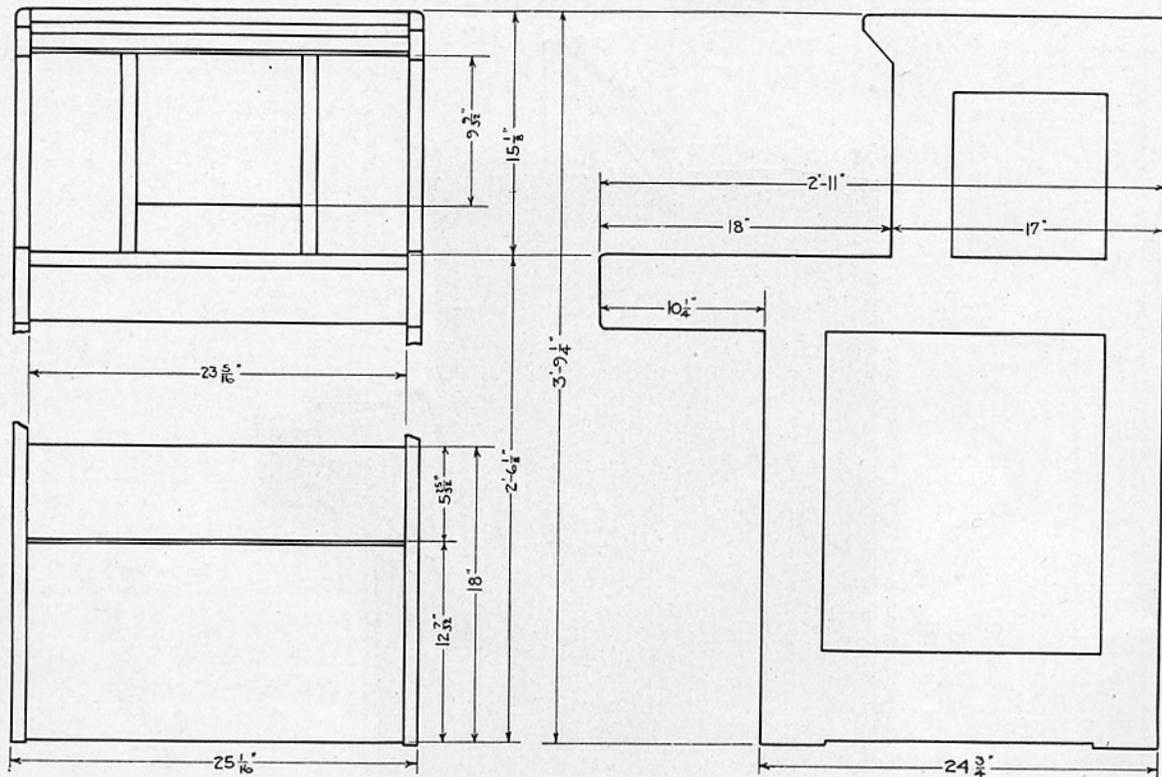
- 50—Lines
- 10—Cord circuits
- 5—Jack ended trunk circuits



Rear View Showing Relay Gate Open

Kellogg

Dimension of 50-Line Cabinet



Capacities of No. 1055-P and No. 1055-J P. B. X. Switchboards

The No. 1055-P private branch exchange switchboard is arranged for plug ended trunks to the main exchange and may be arranged to operate with a common battery, automatic or magneto main exchange equipment as required. This switchboard has a capacity for:

- 50—Lines (10-per strip)
- 5—Plug ended trunks
- 8—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

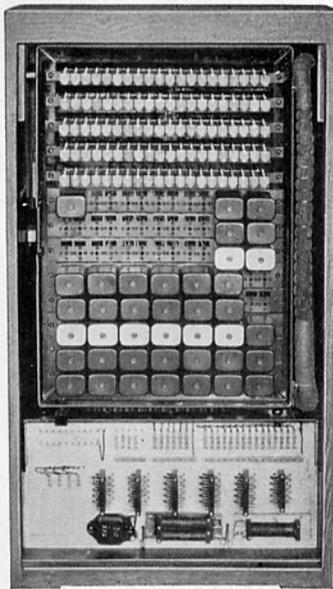
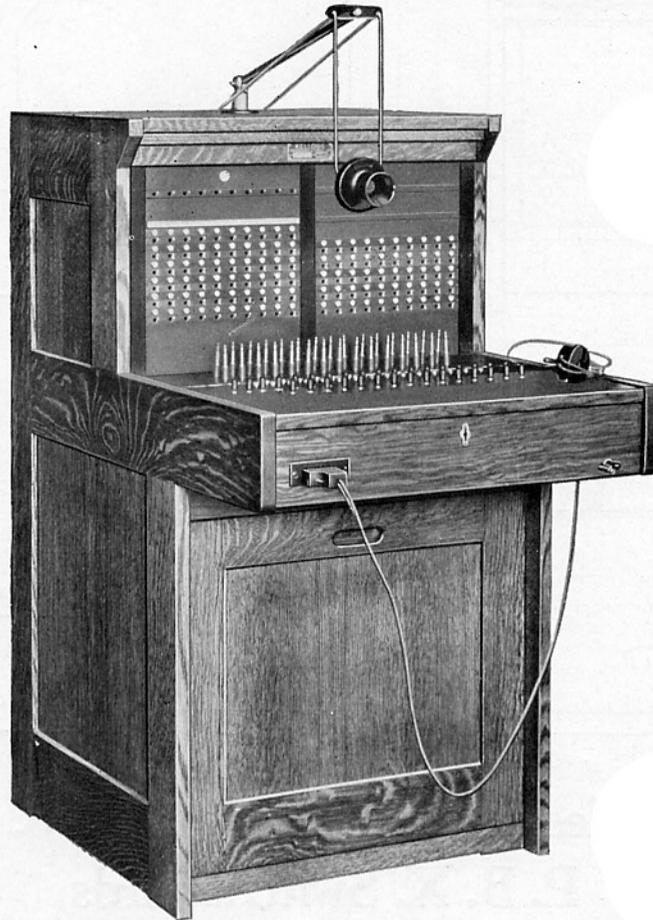
The No. 1055-J private branch exchange switchboard is arranged for jack ended trunks to the main exchange and may be arranged to operate with a common battery, automatic or magneto main exchange equipment as required. This switchboard has a capacity for:

- 50—Lines (10-per strip)
- 5—Jack ended trunks (5-per strip)
- 10—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

ALL LINE CIRCUITS ARE WIRED FOR LINE RELAYS

Kellogg

The No. 1110 P.B.X. Switchboard



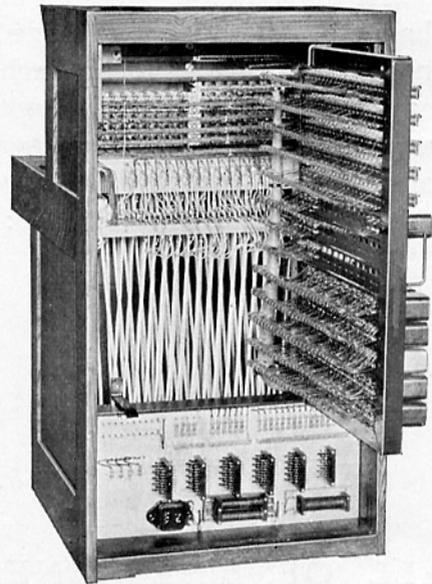
Rear View Showing Relay Gate Closed

No. 1110-P

- 100—Lines
- 10—Cord circuits
- 8—Plug ended trunk circuits

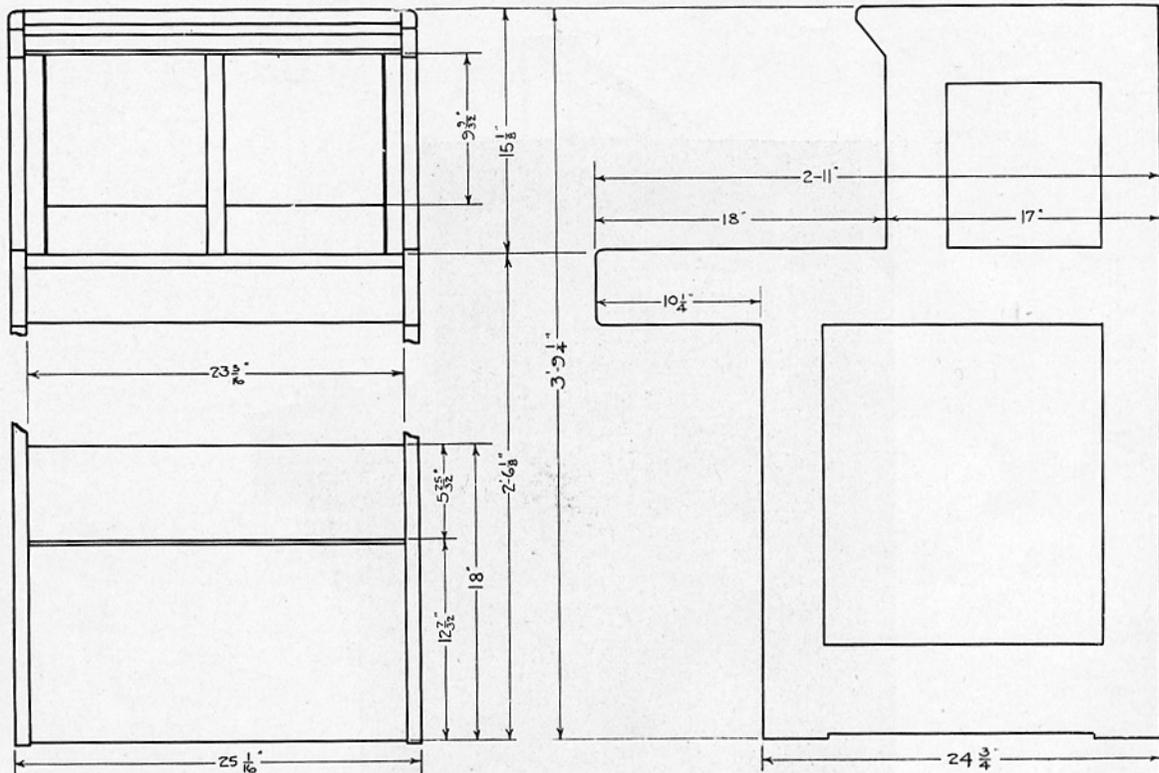
No. 1110-J

- 100—Lines
- 15—Cord circuits
- 8—Jack ended trunk circuits



Rear View Showing Relay Gate Open

Dimension of 100-Line Cabinet



Capacities of No. 1110-P and No. 1110-J P. B. X. Switchboards

The No. 1110-P private branch exchange switchboard is arranged for plug ended trunks to the main exchange and may be arranged to operate with a common battery, automatic or magneto main exchange equipment as required. This switchboard has a capacity for:

- 100—Lines (10-per strip)
- 8—Plug ended trunks
- 10—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

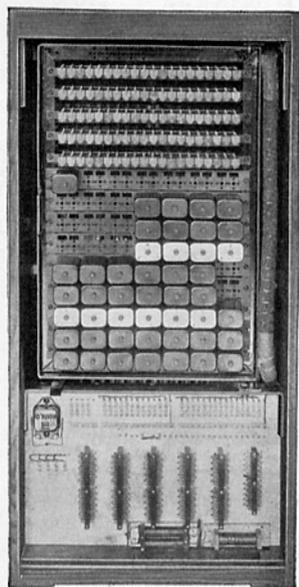
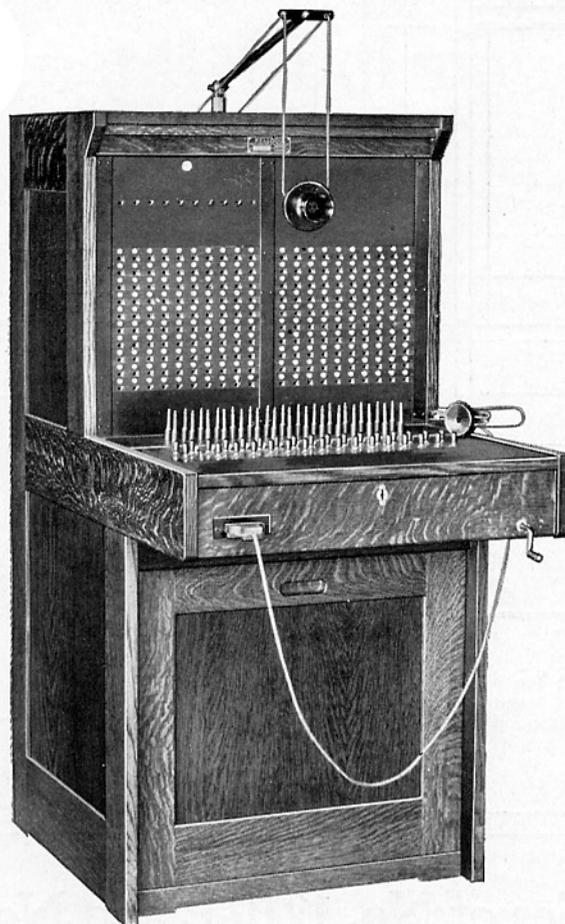
The No. 1110-J private branch exchange switchboard is arranged for jack ended trunks to the main exchange and may be arranged to operate with common battery, automatic or magneto main exchange equipment as required. This switchboard has a capacity for:

- 100—Lines (10-per strip)
- 8—Jack ended trunks (10-per strip)
- 15—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

ALL OF THE LINES ARE WIRED FOR LINE RELAYS

Kellogg

The No. 1210 P.B.X. Switchboard



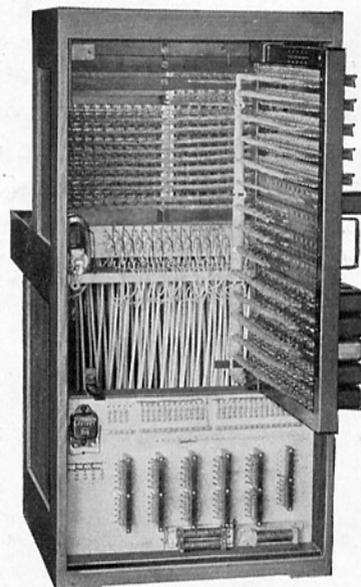
Rear View Showing Relay Gate Closed

No. 1210-P

- 200—Lines
- 12—Cord circuits
- 10—Plug ended trunk circuits

No. 1210-J

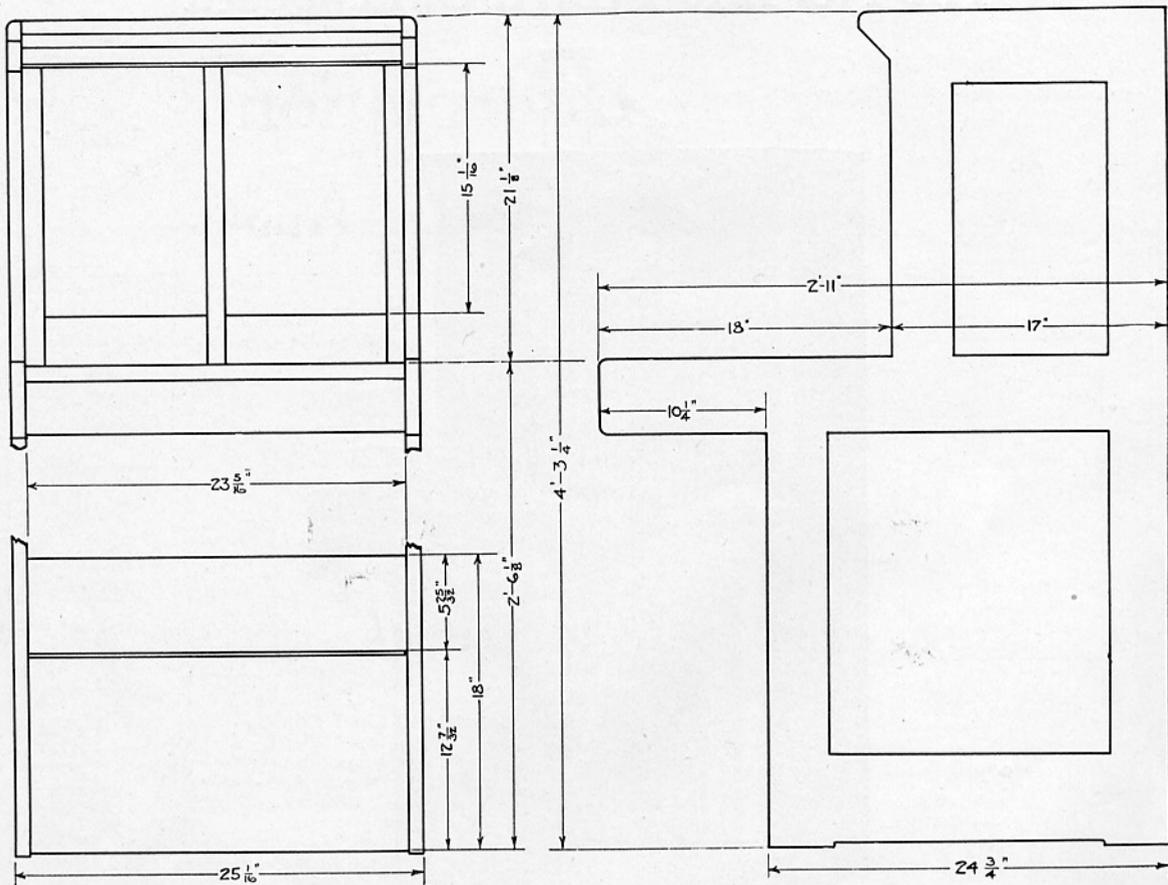
- 200—Lines
- 15—Cord circuits
- 10—Jack ended trunk circuits



Rear View Showing Relay Gate Open

Kellogg

Dimension of 200-Line Cabinet



Capacities of No. 1210-P and No. 1210-J P. B. X. Switchboards

The No. 1210-P private branch exchange switchboard is arranged for plug ended trunks to the main exchange and may be arranged to operate with a common battery, automatic or magneto main exchange equipment as requested. This switchboard has a capacity for:

- 200—Lines (10-per strip)
- 10—Plug ended trunks
- 12—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

The No. 1210-J private branch exchange switchboard is arranged for jack ended trunks to the main exchange and may be arranged to operate with a common battery, automatic or magneto main exchange equipment as requested. This switchboard has a capacity for:

- 200—Lines (10-per strip)
- 10—Jack ended trunks (10-per strip)
- 15—Cord circuits
- 1—Operator's telephone set
- 1—Generator circuit
- 1—Pilot circuit
- 1—Night alarm
- 1—Battery cut off key

ONE HUNDRED (100) OF THE LINES ARE WIRED FOR LINE RELAYS

Kellogg

General Information

Floor Type—Plug Ended Trunks

Code No.	Lines	No. of Lines That Can Be Equipped With Line Relays When Requested	Trunks	Cords
No. 1045-P	40	40	4	6
No. 1055-P	50	50	5	8
No. 1110-P	100	100	8	10
No. 1210-P	200	100	10	12

Jack Ended Trunks

Code No.	Lines	No. of Lines That Can Be Equipped With Line Relays When Requested	Trunks	Cords
No. 1045-J	40	40	5	10
No. 1055-J	50	50	5	10
No. 1110-J	100	100	8	15
No. 1210-J	200	100	10	15

When trunk circuit No. 35116 is used the trunk capacity of the switchboard is as follows:

No. 1045-J	4-Trunks
No. 1055-J	5-Trunks
No. 1110-J	7-Trunks
No. 1210-J	8-Trunks

Approximate Shipping Weights

	Code Number	No. of Lines Equipped	No. of Cord Pairs Equipped	No. of Trunks Equipped	Approx. Weight Packed
No. 1045-P Type P.B.X. Switchboards wired for 40-lines, 6-cord pairs, 4-plug ended trunks	1045	10	4	2	345
	1045	20	4	3	355
	1045	30	5	3	370
	1045	40	6	4	380

NOTE—All P. B. X. switchboards are equipped to operate on 24-volts unless otherwise specified.

Approximate Shipping Weights

	Code Number	No. of Lines Equipped	No. of Cord Pairs Equipped	No. of Trunks Equipped	Approx. Weight Packed
No. 1055-P Type P.B.X. Switchboards wired for 50-lines, 8-cord pairs, 5- plug ended trunks	1055	10	4	2	350
	1055	20	4	3	365
	1055	30	5	3	375
	1055	40	6	4	390
	1055	50	8	4	400
<hr/>					
No. 1110-P Type P.B.X. Switchboards wired for 100-lines, 10-cord pairs, 8- plug ended trunks	1110	60	8	4	455
	1110	70	8	4	465
	1110	80	10	4	480
	1110	90	10	4	490
	1110	100	10	5	505
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No. 1210-P Type P.B.X. Switchboards wired for 200-lines, 12-cord pairs, 10- plug ended trunks	1210	120	10	5	565
	1210	140	10	5	575
	1210	160	12	5	585
	1210	180	12	10	595
	1210	200	12	10	610
<hr/>					
No. 1045-J Type P.B.X. Switchboards wired for 40-lines, 10-cord pairs, 5- jack ended trunks	1045	10	6	2	345
	1045	20	7	3	355
	1045	30	8	3	370
	1045	40	10	4	380
<hr/>					
No. 1055-J Type P.B.X. Switchboards wired for 50-lines, 10-cord pairs, 5- jack ended trunks	1055	10	6	2	350
	1055	20	7	3	365
	1055	30	8	3	375
	1055	40	10	4	390
	1055	50	10	4	400
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No. 1110-J Type P.B.X. Switchboards wired for 100-lines, 15-cord pairs, 8- jack ended trunks	1110	60	12	4	455
	1110	70	12	4	465
	1110	80	14	4	480
	1110	90	14	4	490
	1110	100	15	5	505
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No. 1210-J Type P.B.X. Switchboards wired for 200-lines, 15-cord pairs, 10- jack ended trunks	1210	120	15	5	565
	1210	140	15	5	575
	1210	160	15	5	585
	1210	180	15	10	595
	1210	200	15	10	610

Operation of a Private Branch Exchange

The operation of a private branch exchange is quite similar to that of a main central exchange in that it is the purpose of both exchanges to establish communicative connections between various stations within its jurisdiction. Where connections are required between these two types of exchanges, trunks are furnished which may be of either the plug or jack ended type depending upon the nature of the traffic to be handled.

The major circuits incorporated in a private branch exchange switchboard are the line, cord, trunk and operator's telephone circuits while the secondary circuits are such circuits as the ringing, battery switching, pilot and night alarm circuits. The narrative of operation of each of these circuits shall be hereinafter described.

Inter-office connections are established by the use of cord circuits while the intra-office connections require the use of cord circuits in addition to the trunk circuits where the trunks are of the jack ended type. Where plug ended trunk circuits are used, these connections are completed direct without the use of cord circuits.

The line circuits as furnished with the private branch switchboards being of the lamp signal type (with or without line relays as desired), provide the same method of signalling as those of the main exchange, the call being answered in the usual manner and the connections completed to another station for an inter-office connection or to a trunk circuit if the call is to be an intra-office connection.

The cord circuits being of the condenser type are arranged for double lamp supervision and equipped with separate listening and ringing keys and where ringback keys are desired and specified they are combined with the ringing keys.

The operator's telephone circuit being of the anti-side tone reducing type can be either arranged for suspended or breast plate type transmitters. This circuit is wired in common to all listening keys of the cord circuits and to the listening keys of the plug ended type trunk circuits when specified.

Night service is usually required on a P.B.X., therefore, all trunks are arranged to furnish this

service. All jack ended trunks, except circuit No. 20108 when used with a magneto main exchange, are equipped with night jacks. The plug ended trunks are also equipped with night jacks, however, circuits No. 23047 and No. 35275 can be used for night connection where but one station is to be connected and without the use of the "night jacks." Circuit No. 35275 can only be connected to line circuits having an instrument equipped with an automatic dial.

On all trunks the connections for night service are made by use of patching or "spider" cords except circuits No. 23047 and No. 35275 when but one station is connected. These spider cords can be arranged for making connections to one or more P.B.X. stations, as may be required, they are not included with a P.B.X. board only when specified. When ordering these cords it will be necessary to specify the number of stations to be connected to each trunk.

Each private branch switchboard being equipped with a generator switching circuit enables the use of power generator supplied from the main central exchange or a local installed generator and can be switched to the hand generator furnished in each switchboard.

The battery supply required for the operation of the private branch exchange may be supplied from a local power plant installed in conjunction with the private branch switchboard where the distance between the private branch switchboard and the main central exchange is such that the voltage drop would be too great to furnish the proper supply at the P.B.X. Where the private branch exchange is located within a reasonably short distance of the main central exchange, the battery supply may be furnished from the main central exchange, over sufficient cable conductors to prevent any great drops in the voltage. Under "Power Equipment" these points are more completely described.

Night Service:

It is usually necessary on P. B. X. switch boards to arrange for having at least one telephone available for both incoming and outgoing calls after the P.B.X. operator goes off duty for the day. (Continued on Page Sixteen)

We have provided in all of our P.B.X. switchboards necessary apparatus to handle this service so that nights, Sundays and holidays at least one telephone is available for incoming and outgoing calls regardless of the type of main exchange switchboard with which it operates.

On our P.B.X. switchboards using either our plug ended or jack ended type of trunk circuits a strip of spring jacks is provided so that one or more telephones can be connected with the main exchange switchboard direct and the telephone operating from the P.B.X. can initiate or receive calls to and from parties outside of the building in which the P.B.X. switchboard is located.

Our plug ended trunk circuits, however, are more easily arranged for this service in that it is only necessary to insert the trunk plug in the jack of the line on which it is desired to furnish night service.

If more than one telephone is desired to be made so available as many lines as there are plug ended trunks on the switchboard may be used. If additional telephones are desired connected our so-called "spider cords" may be used. These cords are arranged with two or more plugs attached as desired.

Our plug ended trunk circuit No. 35353, however, necessarily requires the spider cord arrangement due to its particular operation, but is the only variation in handling the night service feature above described.

On our P.B.X. switchboards using jack ended trunk circuits where night service is required it is necessary in all cases to use "spider cords" entirely.

Where our P.B.X. switchboards operate or connect with an Automatic main exchange and it is desired to arrange for night service, all telephones that are connected for night service must be provided with a dial so that calls to telephones outside can be made direct.

Trunk Circuits:

The selection of the proper trunk circuit to connect P.B.X. subscribers through the main exchange to subscribers in town or for toll calls is very important.

We have described in the following pages several types of trunk circuits of both the jack ended and plug ended type. Our reason for having both the plug and jack ended types is due to the fact that both types are in quite general use and while either type will accomplish the desired results local conditions or preferences largely determine the type of trunk to be used. We find the plug ended type to be more flexible and for this reason is the type we would recommend.

With plug ended trunk circuits it is just as easy for the operator to put up connections on outgoing calls and more convenient on the incoming calls.

They have the advantage of greater accomplishments with considerably less apparatus. Our regular plug ended trunks are direct signaling and battery is fed from the main central office to the P.B.X. subscriber. This arrangement is the best as it furnishes the P.B.X. operator positive supervision and it also furnishes the main exchange operator direct supervision from the P.B.X. subscriber, the same as on a main line telephone and consequently a double disconnect on all P.B.X. connections, this condition is ideal. Ordinarily P.B.X. operators are somewhat slower in taking down their connections than the main office operator and in these instances there are no temporary line lamp signals left on the main switchboard pending the P.B.X. operator taking down the connection. This results in better service and considerably less confusion. This trunk is particularly recommended on all P.B.X. switchboards that operate in connection with a *Kellogg Service Switchboard* at the main exchange which has the multiple line lamp scheme of distribution as permanents create more confusion where the call is projected in front of all operators than where it appears once.

Plug ended trunks make fewer cord circuits necessary as every trunk takes the place of a pair of cords.

Plug ended trunks are immediately available for incoming calls as soon as the connection is taken down at the main exchange whether or not the P.B.X. operator has disconnected the trunk circuits.

Two Way Plug Ended Trunk Circuit No. 30531 P.C.B. Arranged for Common Battery Main Exchange Service

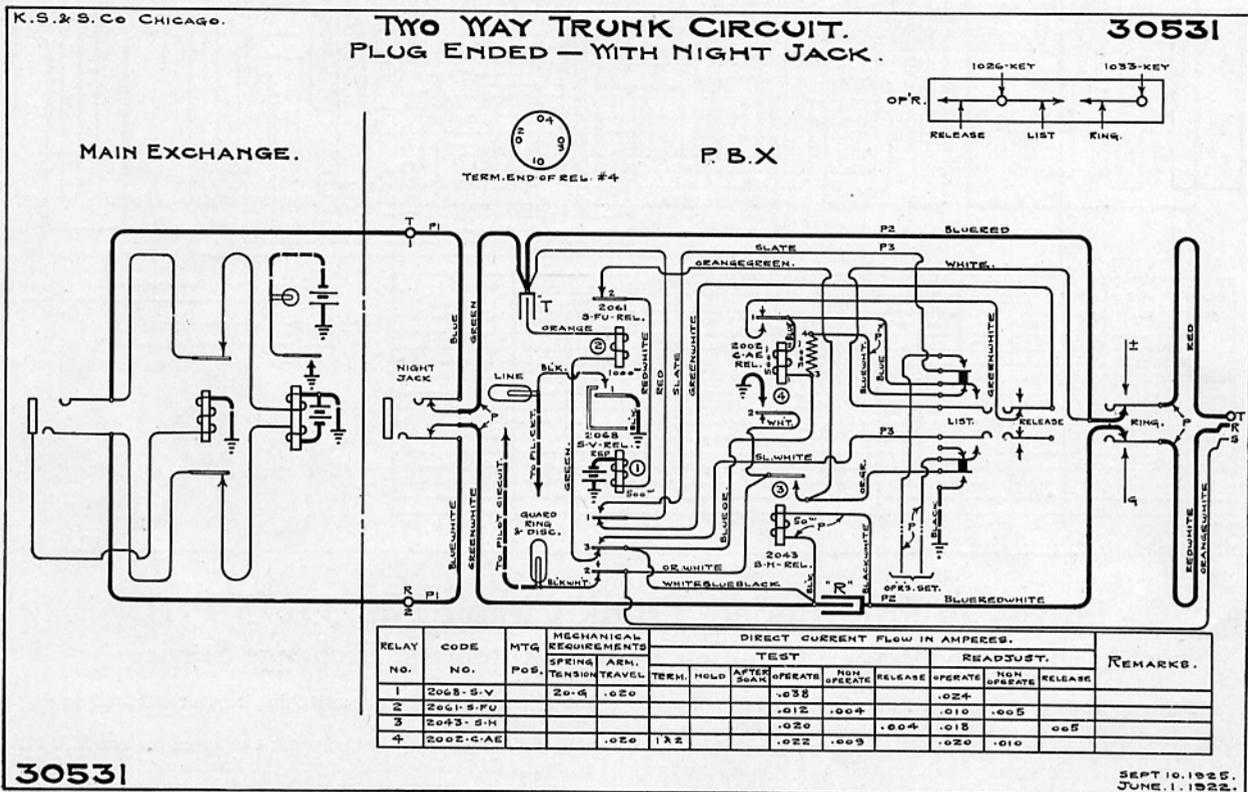
This trunk being of the two way plug ended ringdown type is arranged for completing connections between a P.B.X. switchboard and a common battery main exchange. This circuit is also arranged to furnish through supervision to the main exchange when the P.B.X. party hangs up his receiver, therefore the talking battery to the P.B.X. party is supplied from the cord or trunk circuit at the main exchange, providing transmission which is practically of the same efficiency as though the P.B.X. party was connected direct to the main exchange. Where the toll apparatus at the main exchange is of the 48 volt type, this circuit provides the P.B.X. party with the same added transmission efficiency as received by the main exchange subscribers.

The equipment required at the main exchange consists of a standard line circuit with a double wound line relay coil having 1000 ohms resistance in each winding.

The apparatus associated with each trunk circuit, located in the key shelf, consists of a line lamp, a combined guard, ring and disconnect lamp, a combined listening and release key and a ringing key. The main exchange operator signals the P.B.X. operator by ringing over the trunkline

tripping the line relay which lights the line lamp. The P.B.X. operator in answering, operates the listening key which restores the line relay extinguishing the line lamp. The combination lamp signal is displayed as soon as the trunk plug is inserted in the jack of the local P.B.X. line and remains so until the called party answers and is therefore regarded as the ringing lamp. Upon completion of the conversation this lamp is again displayed as a disconnect signal and is also regarded as a guard lamp on hold connections waiting for completion and can be released by operating the release key.

This circuit not being arranged for the rering feature does not make it possible for the main exchange to signal the P.B.X. party when making a recall over a trunk which has not been disconnected from the line of a previous call at the P.B.X. With this circuit it is also possible for the P.B.X. party to recall the main exchange operator unknown to the P.B.X. operator except for the flashing of the disconnect lamp and for this reason this circuit is not recommended for such establishments as hotels, resorts, etc., where a charge is made for each intra-office call.



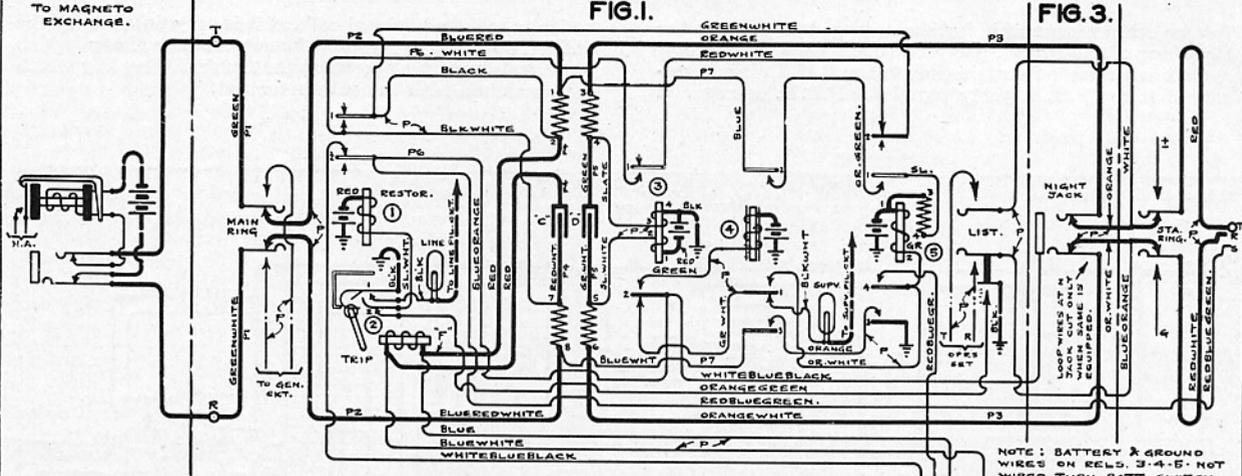
Two Way Plug Ended Trunk Circuit No. 35353 P.C.B.R. Arranged for Common Battery Main Exchange Service

This trunk being of the two way plug ended ringdown type is arranged for completing connections between a P.B.X. switchboard and a common battery main exchange. This circuit is also arranged to furnish through supervision to the main exchange when the P.B.X. party hangs up his receiver, therefore the talking battery to the P.B.X. subscriber is supplied from the cord or trunk circuit at the

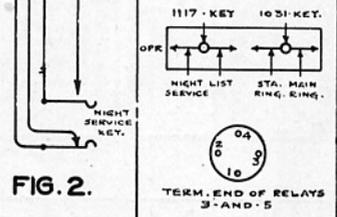
main exchange providing transmission which is practically of the same efficiency as though the P.B.X. party was connected direct to the main exchange. Where the toll apparatus of the main exchange is of the 48 volt type, this circuit will provide the P.B.X. party the same added transmission efficiency as received by the main exchange subscriber.

2-WAY PLUG ENDED P.B.X. TRUNK CIRCUIT.
TO MAGNETO EXCHANGE WITH NIGHT KEY, RINGING FEATURE & DISCONNECT TO MAGNETO EXCH.

35277



RELAY NO.	CODE NO.	COIL RES.	MECHANICAL REQUIREMENTS		DIRECT CURRENT FLOW IN AMPERES								REMARKS
			SPRING TENSION	ARM TRAVEL	TERM.	HOLD	AFTER SOAK	OPERATE	NON OPERATE	RELEASE	OPERATE	NON OPERATE	
1	2064-S-D4	800		.020					.016	.006	.014	.007	
2	2061-S-FU	1000						.012	.004	.010	.005		
3	2092-T-C	1000		.016	SERIES			.014		.013	.005		
4	2081-S-BU	1000	15-4	.015				.014		.013		3/4" OFF SLEEVE RED FOR WDS.	
5	2080-C-B4	1000	15-4	.015	1 & 2			.014		.013			



35277

MAY 14, 1927.

Two Way Jack Ended Trunk Circuit No. 20108 J.M.
Arranged for Magneto Main Exchange Service

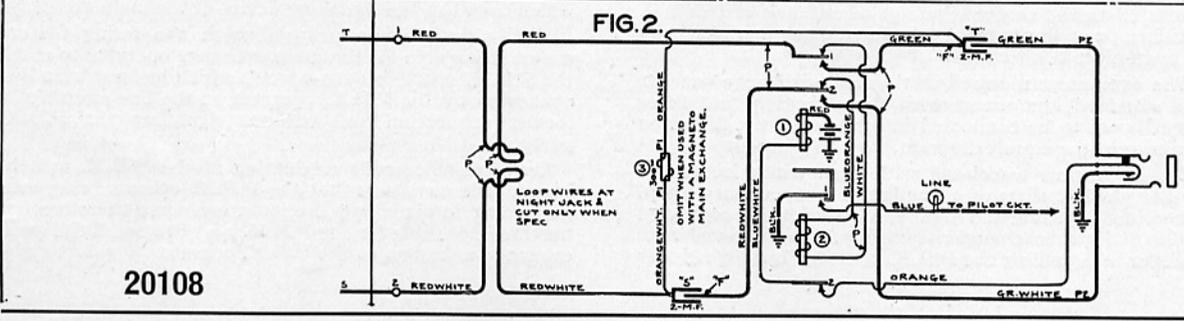
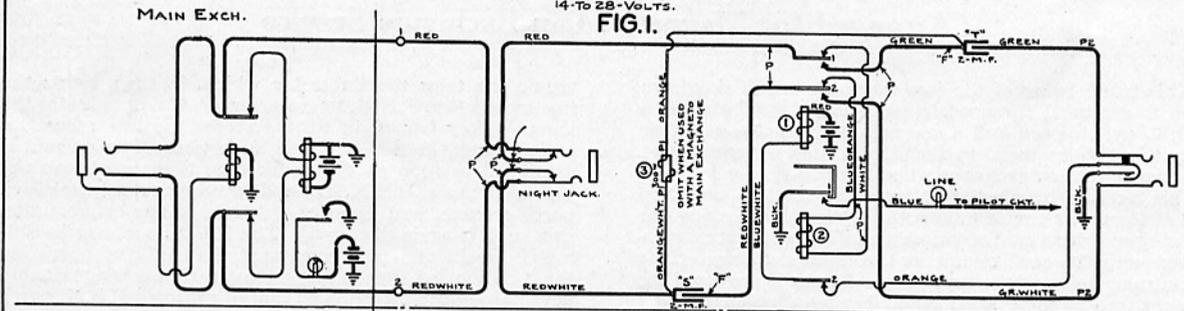
This circuit being of the two way jack ended ringdown type is arranged for completing connections between a magneto main exchange and a P.B.X. switchboard.

On calls originating at the main exchange, the operator in ringing over the trunk the same as though calling a local subscriber trips the line relay at the P.B.X. lighting the line lamp associated with the spring jack. The P.B.X. operator in answering this call inserts the calling plug of

an idle cord pair into the trunk spring jack operating the restoring relay which extinguishes the line lamp. For calls originating at the P.B.X., the P.B.X. operator inserts the calling cord into the trunk spring jack and rings which energizes the line drop at the main exchange. This circuit provides single disconnect only at each end and is designed for through night service by means of patching cords.

TWO WAY TRUNK CIRCUIT.
JACK ENDED-WITH & WITHOUT NIGHT JACK.
TO MAGNETO & COMM. BATT. EXCH.
14-TO 28-VOLTS.

20108



20108

Two Way Jack Ended Trunk Circuit No. 35114 J.C.B.R.

Arranged for Common Battery Main Exchange Service

This trunk being of the two way jack ended ringdown type is arranged for completing connections between a common battery main exchange and a P.B.X. switchboard and is equipped with the rering feature and a flash key when specified.

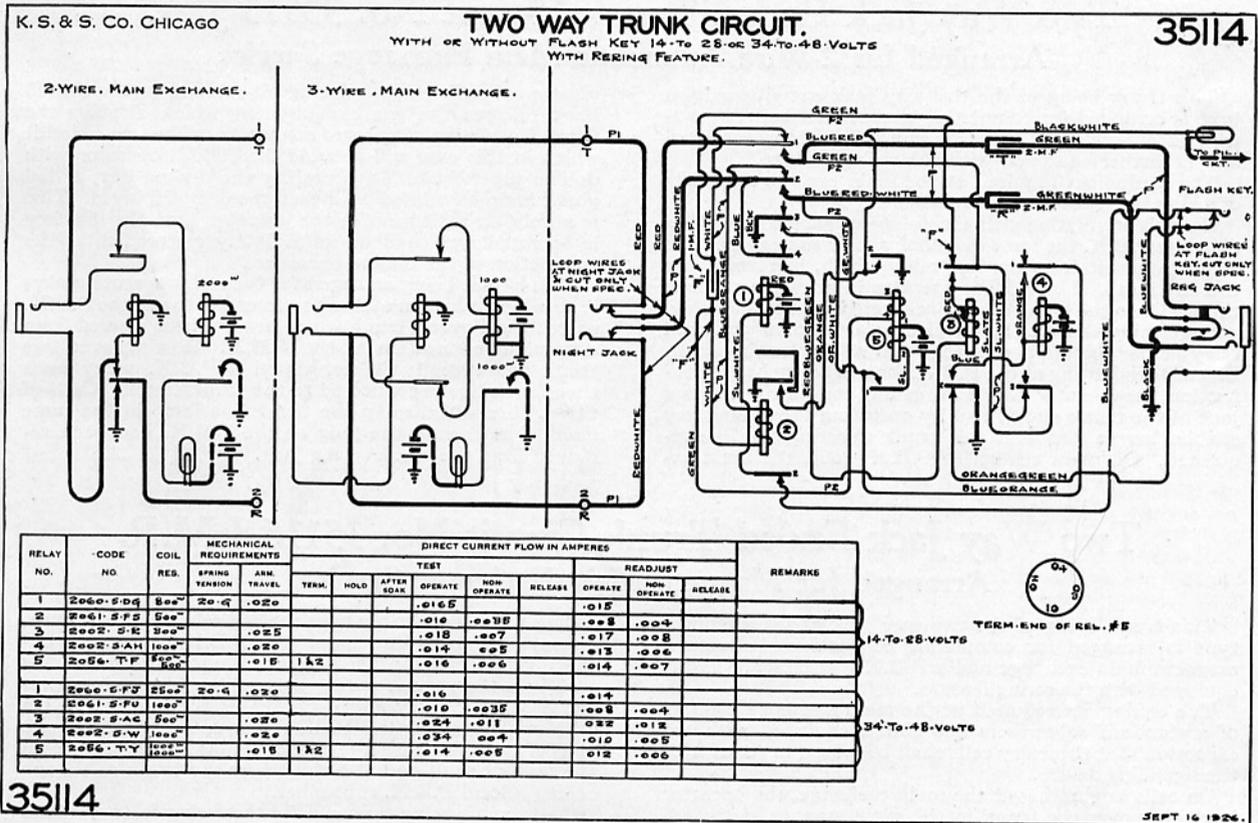
The equipment required at the main exchange consists of the standard subscriber's line circuit equipment with the exception that the line relays are to be changed in accordance with information shown on drawing, i. e., double wound line relays to have 1000 ohms resistance in each winding, single wound line relays to have 2000 ohms resistance.

On calls originating at the main exchange the operator rings over the trunk in the same manner as though calling the local subscriber which, in turn, trips the line relay at the P.B.X. lighting the trunk line lamp. The P.B.X. operator inserting the answering plug into the trunk spring jack operates the restoring relay which extinguishes the line lamp. For calls originating at the P.B.X., the operator inserts a cord into the trunk spring jack which places a 300 ohm shunt across the main exchange end of the trunk circuit lighting the line lamp at the main exchange and in

the event that the P.B.X. operator desires to flash the main exchange operator same is accomplished by operating the flash key which is only furnished per customer's request.

The disconnect signals displayed at the cord circuits used in conjunction with these trunks depend entirely upon the operator who makes the first disconnect. In this case if the main exchange operator is more speedy in taking down her connections, it will provide the P.B.X. operator with a disconnect signal on the cord connected to the trunk spring jack and for this reason all operators should be instructed to take down their connections on a single disconnect lamp.

This circuit being arranged for the rering feature makes it possible for the main exchange to recall over a trunk which has not been cleared from a previous connection at the P.B.X. The ringing over this trunk will not signal the P.B.X. subscriber even though this line is connected to the trunk by the cord circuit at the P.B.X. Calls of this type will display trunk line lamp in the same manner as though the plug was not in the trunk spring jack at the P.B.X.



Generator Circuit No. 20110

This circuit is for the purpose of switching the ringing current from the power

generator to the hand generator furnished with the cabinet.

K.S. & S. Co. CHICAGO.

GENERATOR CIRCUITS.

20110

FIG. 1.

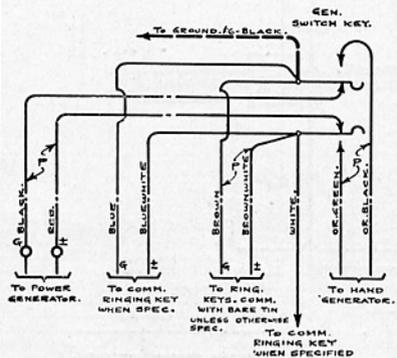
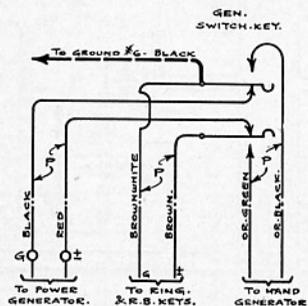


FIG. 2.



20110

Battery Switching Circuit No. 35282

This circuit is used for the purpose of disconnecting the battery supply from circuits which do not require current for night connection.

Figure No. 3 of this circuit provides method of grounding the framework of the cabinet.

K. S. & S. Co. CHICAGO

BATTERY CIRCUIT.

35282

FIG. 1.

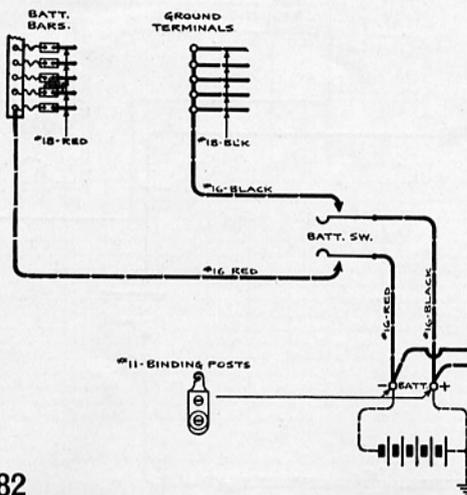


FIG. 2.

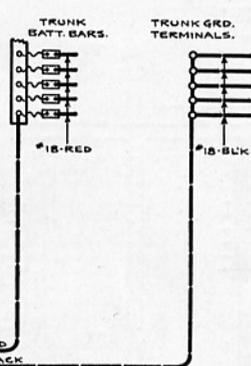
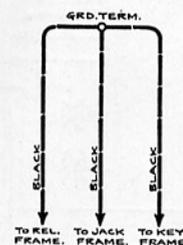


FIG. 3.
GROUNDING CIRCUIT.



35282

P.B.X. Power Equipment—Batteries

A power supply is as we all know, as essentially a part of a P.B.X. switchboard as the switchboard itself. Adequate power equipment is as necessary to the quality of service rendered as the switchboard and other apparatus.

The number of calls required to be handled by a P.B.X. switchboard and its distance from the main exchange or central office rather than the size or number of lines used are deciding factors as to the type and source of power required, although local conditions sometimes play an important part in deciding this question.

If, for instance, the Telephone Company has a cable with plenty of unused or spare pairs of conductors and the board is not located too far from battery they can be economically used but if the cable is nearly full it would be cheaper to install a battery at the P.B.X. rather than install additional cable facilities.

In any case, we would not recommend using more than 8 cable pairs either for battery supply or as charging leads. In practically all cases the annual cost of conductors based on considerable less than 8 pairs, would be greater than the cost of a battery and rectifier located at the P.B.X.

The following table gives the number of pairs of No. 22 B. & S. gauge cable required to furnish battery to a P.B.X. with a varying number of calls and varying distances from the central office.

		Wire length in feet between Central Office Battery and P.B.X.																
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500		
Number of calls per day	200	1	2	2	3	3	3	3	4	4	5	5	6	7	7	8	8	No. 22 B.&S. Gauge Cable Pairs
	300	1	2	2	3	3	4	4	5	6	6	7	8					
	400	1	2	3	4	5	6	8										
	500	1	3	4	5	7	8											
	600	2	3	5	6	8												
	700	2	4	6	8													
	800	2	4	6	8													
	900	2	5	7														
	1000	3	5	7														
	1100	3	6															
1200	3	7																

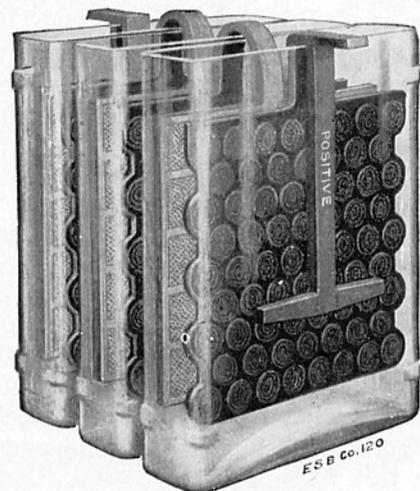
In all cases where the traffic will be greater than 1200 calls per day, a battery should be installed at the P.B.X. switchboard. This will require either a 48-volt battery in the central office (from which the P.B.X. batteries will receive their charge), or a rectifier located at the P.B.X. switchboard to charge the P.B.X. batteries.

We use and recommend batteries manufactured by the Electric Storage Battery Company of Philadelphia, Pennsylvania. The Electric Storage Battery Company are leaders in the

manufacture of all types of storage batteries and their products have been standard in the telephone industry for years.

The C.T. 12 ampere hour, P.T. 24 ampere hour or the E.T. 36 ampere hour couple type batteries are usually used with the P.B.X. switchboard except in cases where these have not sufficient capacity in which case we move up into the larger or Tee strap type of batteries.

The couple type batteries are furnished complete with positive and negative type terminal plates, glass jars, glass covers, bolt connectors, floating hydrometer, a small syringe for adding water and the necessary electrolyte.



Type "ET" Cells

In the table below is shown the type of batteries most generally used with P.B.X. switchboards and the maximum number of calls each battery will handle per day.

Type of Battery	No. of Calls
C. T.....	900
P. T.....	1800
E. T.....	2700
D 5.....	3000

When a storage battery is furnished for a P.B.X., the battery should be located as near the switchboard as possible. We do not recommend locating batteries farther than 200 feet away from the switchboard. In the table below is shown the size of wire required for the discharge leads between the battery and the P.B.X. in distances up to and including 200 feet.

Type of Battery	Distance in Feet of Battery from P.B.X. Switchboard			
	50	100	150	200
C. T.....	No. 16	No. 14	No. 12	No. 12
P. T.....	No. 14	No. 12	No. 10	No. 8
E. T.....	No. 12	No. 10	No. 8	
D 5.....	No. 12	No. 10	No. 8	

Battery Charging Equipment

Rectigon Rectifier

When a rectifier is required for charging the batteries at a P.B.X. switchboard (and 110, 115 or 125 volt, 60 cycles S.P.A.C. is available), we use a Westinghouse 3 ampere Rectigon rectifier, unless some other type of rectifier is specified by the customer.

The Rectigon rectifier is a small compact and efficient rectifier that was designed and built by the Westinghouse Company for the Kellogg Switchboard and Supply Company.

It consists essentially of a transformer and two argon filled hot cathode bulbs. These operating parts are mounted inside of a steel case approximately 10" high, 6 $\frac{3}{4}$ " wide and 8 $\frac{3}{4}$ "



Rectigon Rectifier

deep provided with a hinged cover. The Rectigon may be mounted on a wall or placed upon the floor. If it is desired that the Rectigon be mounted on a wall, the wall must be solid and free from vibration.

The transformer insulates the battery circuit from the line, reduces the line voltage to a value suitable for charging an 11-cell battery, provides sufficient reactance to give the proper

regulation characteristics to the direct current output and furnishes exciting current for the filaments of the bulbs.

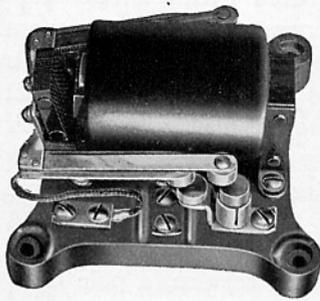
The two bulbs are identical and each consists of a spherical glass blank or shell in which are sealed, with proper leading in wires, an anode and a filament all being mounted on and supported by an ordinary lamp base. The bulbs can be removed or replaced by raising the lid of the rectifier cover and unscrewing the bulb from the lamp base.

Rectigon battery chargers are peculiarly suited to the charging of small batteries because of the compact arrangement of parts, small size, neat appearance, freedom from all chance of trouble due to moving parts as no parts move in operation. It is self starting with the application of line voltage, high efficiency compared to other low voltage equipment and low cost.

The Rectigon rectifier was originally designed for charging 11 cells of P.T. battery at a 3-ampere rate. It can, however, be arranged for charging 11 cells of C.T. battery at a 1 $\frac{1}{2}$ -ampere rate by inserting a No. 35-A resistance coil in one of the alternating current supply leads. This No. 35-A resistance coil will be described later.

The primary or line side of this rectifier is entirely insulated from the secondary. In controlling the rectifier, the opening of the primary circuit also opens the secondary or direct current through the operating bulbs. With this feature it is practical to control the rectifier from a distance, it being merely necessary to

place a signal relay in the circuit for opening the A.C. current at the P.B.X.



Signal Relay

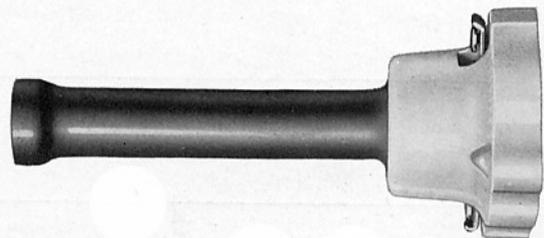
The relay the Kellogg Company recommends for this purpose is known as the signal relay. By connecting the A. C. circuit for the Rectigon through the relay contacts and connecting the operating coil of the relay to ground and to one side of a cable pair at the P. B. X. end, with the office end of the cable going to a battery through a locking key on the wire chief's desk or in any other suitable location, the

charger can be completely controlled from the central office.

We recommend our No. 167 key for this purpose. It can be conveniently mounted in the wire chief's desk. The other side of the cable pair may be used as a potential tap. This, in connection with the normal high resistance voltmeter that every wire chief's desk is equipped with, will allow the wire chief to supervise the voltage of the P.B.X. battery at all times.

This arrangement saves the cost of the cable pairs necessary for P.B.X. charging many times. It also has the added advantage of having the P.B.X. batteries directly under the wire chief's supervision.

No. 35-A RESISTANCE COIL

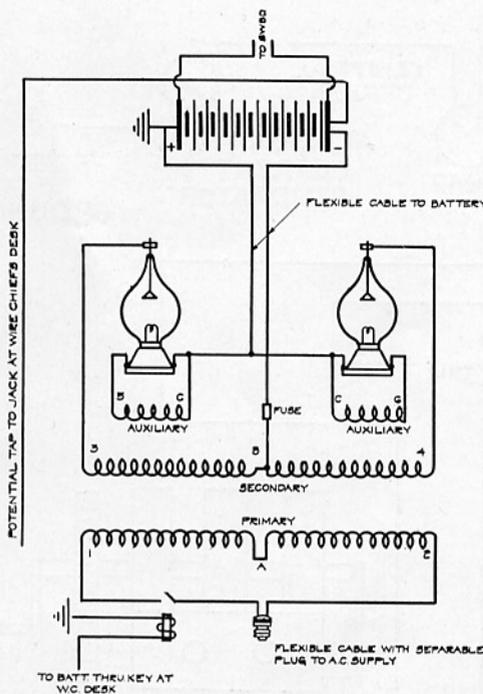


Resistance Coil

This resistance unit reduces the charging rate of the 3-ampere Rectigon rectifier to a point where it is suitable for charging a C.T. battery at a 1½-ampere rate.

It consists of a cylindrical Ward-Leonard resistance unit about 5¼ inches long with diameter of 1¼ inches and threaded on one end for a lamp socket.

The screw end is inserted in a regular porcelain base mounting lamp socket which is wired



Circuit Showing Connection of Signal Relay

in one of the alternating current leads to the 3-ampere Rectigon rectifier. This places the resistance in series with the rectifier in the alternating current side of the circuit cutting down the current as stated above.

MERCURY ARC RECTIFIERS

The Mercury Arc rectifiers we use for charging eleven cells of lead battery are of Westinghouse manufacture. These rectifiers are entirely self contained, being equipped with insulating transformer and series reactance coil so that a battery can be charged at the same time it is being discharged without causing noise in the telephone circuits.

These rectifiers can be furnished in several different sizes, the 10 and 30-ampere size being carried in stock.

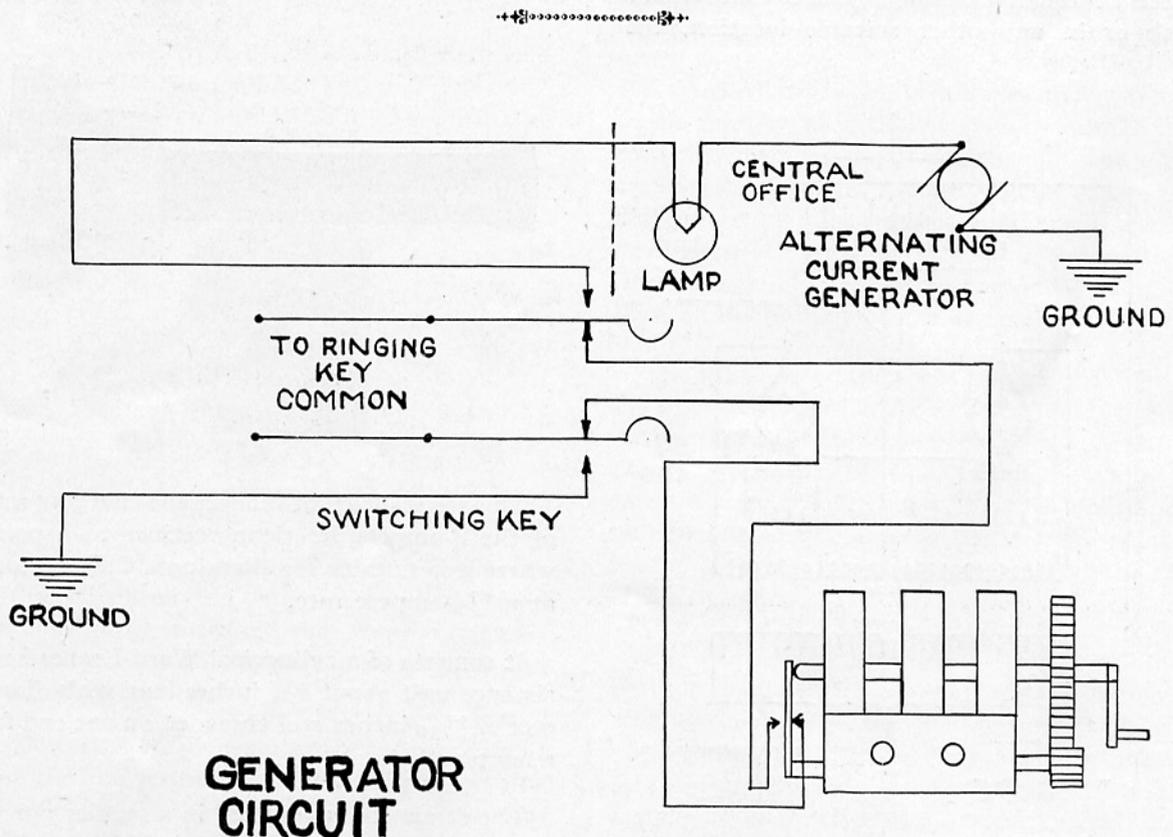
P. B. X. RINGING

Where the private branch exchange switchboard is located within a reasonable distance from the central office, power generator can be supplied from the bus bars of the main generator over a cable conductor. A low resistance lamp should be placed in series with the circuit. This is necessary to protect the main generator should the lead to the P.B.X. become grounded.

Where the distance is too great to give satisfactory ringing service, a pole changer should be installed to furnish the required ringing current necessary for the switchboard.

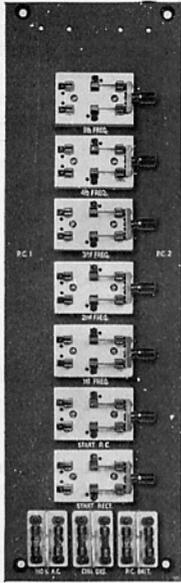
STANDARD NIGHT ALARM EQUIPMENT

Every circuit in common with the night alarm relay circuit will respond when energized by



local call, trunk call or supervisory disconnect or recall. This circuit is controlled by the night alarm switching key. The night alarm can be connected or disconnected by throwing the key.

SMALL SIZE POWER BOARDS



No. 33483

Our small power board No. 33483 is carried in stock and suitable for handling current requirements for small exchanges. The panel is ebony asbestos and is recommended for its excellent qualities and durability. This power board is arranged for wall mounting, the panel measures 9 x 30 inches, contains seven switches, and embodies the same high class workmanship as our large power board. This power board is drilled for a voltmeter and an ammeter, which can be furnished if desired.

SINGLE FREQUENCY RINGING

The No. 36-A type pole changer is a combined pole changer and transformer equipment, arranged to operate from 24-volt storage battery and furnishes 100-volt, 20-cycle ringing current. Its use does away with the necessity of conducting ringing current for private branch installations through cable from the main exchange, saving cable pairs and eliminating generator noise in the cable. The pole changer is small yet durable and efficient, no dry cells or additional transformer is necessary. A No. 41-A retardation coil is used in connection with the above No. 36-A pole changer. This coil is connected in the circuit between the main storage battery and the No. 36-A pole changer to retard or hold back any pole changer noise from the batteries.



No. 36-A Pole Changer



Installing and Maintaining

The apparatus used throughout the construction of a private branch exchange is of our standard design as used in our various types of large common battery multiple switchboards. Therefore, the maintenance on these switchboards is reduced to the minimum.

The general arrangement of the apparatus as located in our private branch exchanges makes the apparatus more accessible for maintenance purposes. The relay gate being of the side swinging type provides easy means for replacing the worn cords.

The connecting rack on which are located the line and trunk terminal strips as well as the main battery and power generator terminals is of the stationary type located below the swinging relay gate. This feature reduces the size of the key cable required at the gate, therefore providing ample space for a scientific distribution of the various relays and other equipment required for cord, trunk and line circuits.

The installing of the private branch exchange is often times more important than the average person realizes. The best material should be used and due consideration given the method in which the cable or wires are run to the various telephones. Wherever possible cables should be used terminating at a junction block which provides means for distributing wires to the various telephones. This cable being given the proper care in connecting it to the various terminals and at the switchboard will not cause any trouble in operation after the completion of installation.

The labor required in installing private branch exchange switchboard has been reduced to a minimum due to the

fact that all private branch exchange switchboards when leaving the factory are completely wired and connected to all circuit apparatus. The only equipment which is not assembled in the cabinet is such items as operator's transmitter (when suspended type transmitter is furnished), switchboard lamps and lamp caps.

The terminal strips for the line and trunk circuits as well as the terminals for the main battery and power generator, is designated in a very distinctive manner and will aid the installer in locating these circuits with ease.

The manner in which the line and trunk terminals are located eliminates the necessity of making up an elaborate form of the wires or cables leading to the various telephones. These wires going to each terminal strip can be readily located and connected.

Testing and Workmanship:

All equipment going into the assembly of a Kellogg P. B. X. switchboard is manufactured in our own factory by experienced workmen and under the supervision of an expert foreman.

In addition to the rigid inspection test each piece of apparatus is subjected to as it leaves the workman's bench, the entire switchboard is given a thorough inspection and test just before packing and shipping.

The Kellogg Company guarantees satisfactory operation and protects its customer against all inherent defects for a period of one year after the purchase of the switchboard

Construction

Cabinet:

All cabinets are of wood frame construction designed in various sizes according to the capacities desired.

The height of the cabinet from the floor to the top of the key shelf is such as to permit the use of a standard office or desk chair.

Woodwork:

All exposed woodwork in the cabinet is of a selected grade, well seasoned and properly finished.

The inside woodwork of the cabinet is given a shellac finish.

Cord and connecting racks are of maple with a shellac finish.

All woodwork is carefully fitted and joined.

Door Panels:

The cabinet is equipped with removable panels to facilitate access to the apparatus and wiring for maintenance or inspection purposes. The front panel is located below the key shelf and the rear panel is full length. These door panels are of the lift type.

Face of Cabinet:

All unoccupied space in the face of the cabinet is filled with maple panels which have an ebonized finish. These panels are of a suitable size and are readily removable when it is desired to add additional units of equipment to the ultimate capacity of the switchboard.

Piling Rail:

The piling rail located between the plug shelf and directly below the face equipment is faced with black bakelite and is high enough to prevent cords being fractured due to sharp bending when answering calls.

Jack Frame:

The jack frame is constructed of steel and is of the slotted type for securely holding all equipment in its proper location.

Finishing Stiles:

On the front of each stile strip which secures the jacks and other equipment in the face of the switchboard is mounted a bakelite finishing stile having a dull black finish. This is securely held in place by means of machine screws.

Plug Shelf:

Each plug hole drilling is equipped with a removable fibre bushing to prevent wearing of the plug shelf from impact of the plugs. Worn bushings can readily be replaced when necessary.

Plug Seats:

Plug seats of the strip type are used. One strip for each position is furnished, fastened in place by means of wood screws. Two extra strips per position are furnished to replace the original when worn out.

Key Shelf:

The material used in the construction of the key shelf is of wood and is finished to match the woodwork of the cabinet and is constructed so as to prevent warping or splitting and is attached to the plug shelf by means of a full length piano hinge.

Each key shelf is the length of one position and is equipped with a key board lock and key holding the shelf securely in place.

The supervisory lamp jacks are located on that part of the key shelf between the key escutcheon and the piano hinge. Each lamp jack drilling is fitted with a brass bushing to securely hold the lamp cap in place.

Key Frame:

Each key shelf is equipped with metal strips, fitted to the key shelf so that the top of all key escutcheons mount flush with the surface of the key shelf to prevent the accumulation of dust. All keys are fastened to the metal strips by means of machine screws and clamps permitting the removal of any key from the top of the key shelf.

Key Box:

Completely enclosing the wiring and working parts of the keys and supervisory lamp jacks, a key box is fitted underneath the key shelf. Located on the front of this key box at the left is the operator's receiver jack.

Cord Rails:

Cord rails are made of maple and located so that all cord fasteners mounted thereon are readily accessible from the rear of the cabinet. They are strong and rigid enough to carry the full load of cords and cord weights without sagging.

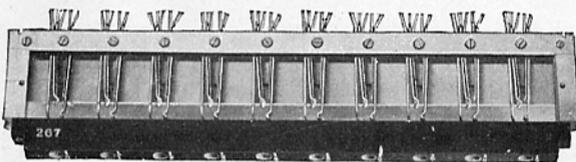
Relay Gate:

A relay gate of the side swing horizontal type is fitted in each position of switchboard. This is constructed of steel painted with black asphaltum paint. It is arranged so that it can swing open allowing access to the terminal side of the equipment located thereon, and all other apparatus located in the rear of the cabinet.

Connecting Rack:

Below the swinging relay gate is fitted a connected rack constructed of maple given a shellac finish on which is mounted battery fuse bars, ground terminals, generator punchings and terminal strips to which the line wiring will be formed and attached.

Spring Jacks:



The spring jacks for the line circuits shall be assembled ten (10) per strip unless otherwise specified. The line jacks shall be numbered from one up to the number of equipped lines.

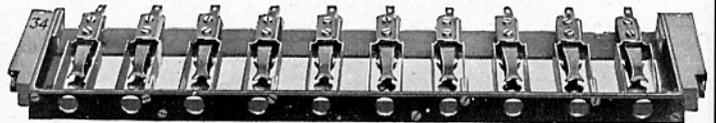
Spring jacks can also be furnished having removable type of number plates which can be engraved with not more than four digits or letters as may be desired.

The spring jacks for the jack ended trunks are either five (5) or ten (10) per strip determined by the number of trunks wired.

The springs of each jack are formed from the best grade of German silver and of sufficient strength to assure uniform contact pressure on the plugs at all times. That part of the tip and ring springs which engages with the plug shall have a concave surface of large area.

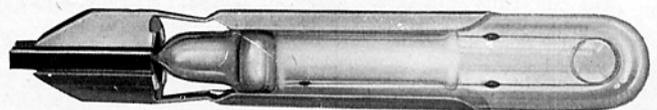
The sleeve ferrule is formed of one piece of German silver securely fastened to the hard rubber face strip. The ferrule of this sleeve is flared at the face of the jack. The insulation used between the springs and adjacent parts are of a bakelite or hard rubber.

Lamp Jacks:



The line lamp jacks for local lines are assembled ten (10) per strip unless otherwise specified and the trunk lamp jacks for the jack ended trunks are either five (5) or ten (10) per strip as may be determined by the number of trunks wired. Heavy gauge German silver springs, separated with bakelite insulation, engage the terminals of each lamp and hold it securely in correct position. The face strip is of metal, black enamel finish, and provided with suitable drillings for inserting line lamps and caps. Separators are arranged so that the light from one lighted lamp will not illuminate the opal of an adjacent lamp jack, tending to furnish a false signal.

Lamps:



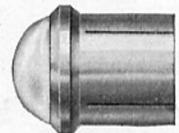
The lamps used are of one-third candle power having an average life of 1,000 lighted hours. All lamps are of the Kellogg tipless type with sliding base contacts.

Kellogg tipless lamps are scientifically constructed to project the light straight ahead through the lamp cap and to produce the necessary illumination with a minimum of current consumption.

Kellogg lamps have the highest vacuum obtainable which tends to give them long life and greatly reduces the conduction of heat from the filament to the adjacent apparatus.

Lamp Caps:

The lamp caps consist of a brass frame spun around an opalescent cap of convex section which makes it possible for an operator to see a lighted lamp even though she may not be directly in front of her position. The brass container of frame is designed to hold the opal securely in place. All lamp caps fit snugly into the line lamp jacks or individual type of lamp jacks and are readily removable.



The pilot lamp cap is constructed similar to the lamp caps described above, but is approximately $2\frac{1}{2}$ times the size in diameter.

Relays:

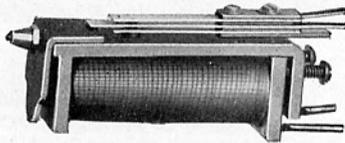
The relays used in the trunk, cord, pilot and night alarm circuits are of the Kellogg angle armature major type mounted in pairs wherever practical or whenever due to the circuit condition two relays can readily be mounted under one steel shell.

The moving parts are on one side of the mounting plate and the terminals on the other side so that it is not necessary when adjusting relays to work on both sides of the relay mounting gate.

The line relays are similar in design and construction but are not equipped with covers.

The heel iron armature and covers of all relays are oxidized and painted with black lacquer to prevent rusting and deterioration.

The springs are of the best grade of German silver and of a length and thickness to insure permanent adjustment, good contact, long life and durability.

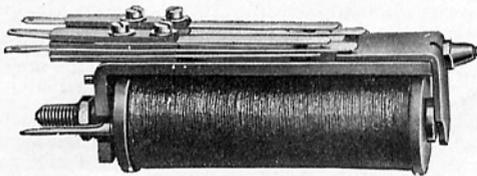


Line Relay

The Kellogg relay, upon being released from operation, returns to normal automatically by the tension of the contact springs and does not depend upon the weight of its armature to restore it to normal.

The armatures carry insulated studs which rest under the lever springs of the relays to insure permanent insulation between the frame of the relay and the springs.

No springs or other metal enter into the magnetic field of the relays except the relay frame, armature and core of the coil, thus eliminating magnetic loss and leakage, and producing a highly efficient relay, with a maximum amount of flux, and a minimum of current consumption and an armature air gap insuring positive make and break contacts.



Cord or Trunk Relay

All relay spools used in the equipment are especially equipped with zinc plated iron cores of material which will at no time retain sufficient permanent magnetism to prevent the armature from returning to its normal position when the current stops flowing through the coil.

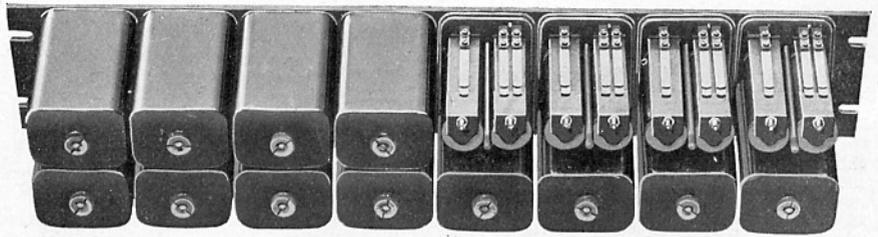
All relay windings are wound with silk or enamel insulated wire.

Keys:

All keys used in the cord, trunk and miscellaneous circuits are of the cam type with T frame construction.

The cam is provided with a wide drill rod, steel bearings through which a drill rod steel pin fastens it securely to the "T" shape brass key frame, preventing side play and insuring long life and positive operation.

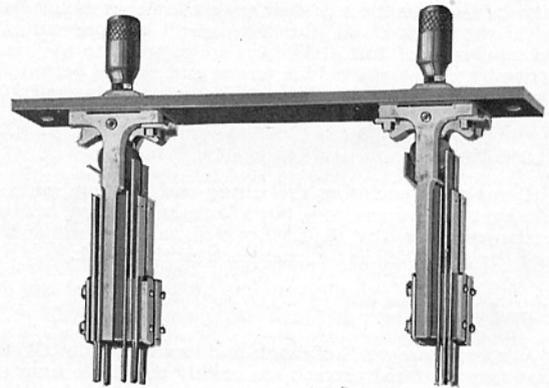
The cam stops are of hard metal securely held in place by small nuts, thus preventing the cam operating too far either



Cord and Trunk Relays

way and eliminating the bending and the possibility of breaking of key springs.

The springs are of the best grade of German silver of a length and thickness to insure long life and a permanent adjustment.



All springs and screws used in the key assembly are equipped and insulated from adjacent parts with bakelite bushings and micarta insulators.

The key handles are of hard rubber, correct in size and shape and drilled to provide a firm grip and are screwed on a heavy stud extending from the nickel plated brass cam.

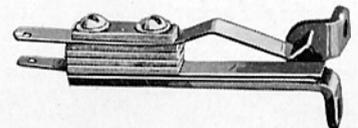
All rollers are of heavy insulated material constructed so as to insure long life and durability.

Key Escutcheons:

The key escutcheons to which the cam keys are fastened are of brass covered with baked black enamel having a durable and attractive finish. The escutcheons are mounted flush with the surface of the key shelf by means of screw clamps and can be readily removed from the top of the key shelf.

Supervisory Lamp Jacks:

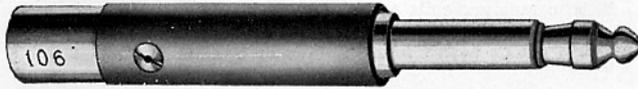
The supervisory lamp jacks associated with the cord circuits or with plug ended trunk circuits are of the individual metal frame type. Heavy gauge German silver springs, separated with bakelite insulation, engage the terminal of each lamp and hold it securely in the correct position. They are so arranged on the lamp shelf that the light from one lighted lamp will not illuminate adjacent lamps.



Plugs:

The plugs are so constructed that they will stand hard usage. The body and contact portion of the plugs shall be of brass. The tip and ring and sleeve contacts are care-

fully insulated with micarta and reinforced with conductors which are carried to the body of the plug for connection to the cord terminals by means of screws. The construction of each conductor is so designed that a positive contact is insured between the plug and the spring jack.

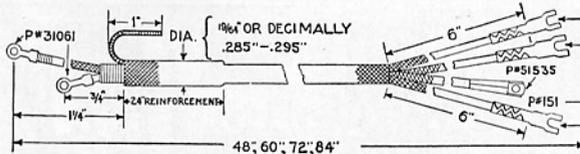


The plugs are so designed that practically no wear will take place on the line jacks. The plugs are of a softer metal as they can be more readily changed than the spring jacks.

The body of the plug is covered with a removable, insulated medium of red fibre treated to prevent absorption of moisture.

Cords:

The cords used in the cord and plug ended trunk circuits are of the 3-conductor most approved type. The conduc-

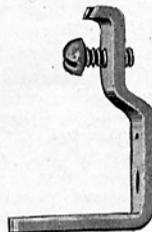


tors are carefully insulated with silk and cotton and covered with a substantial braid. The outer braid is double, reinforced at the plug end at which point most of the wear occurs on a cord. The braid at the terminal end of the cord is extended and provided with a clip so that all strain will be taken by the cover and not by the conductors.

Each conductor is woven with a colored tracer designating tip, ring and sleeve and at the cord rack end spade tips are securely fastened to the conductors so that they can be easily adjusted or removed from the cord fasteners by means of screws.

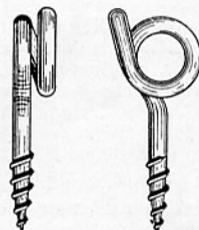
Cord Fasteners:

All cord fasteners are formed so that the cord tips connected through them cannot twist and become short circuited. Each spade tip of cord is fastened to the fasteners by means of screws.

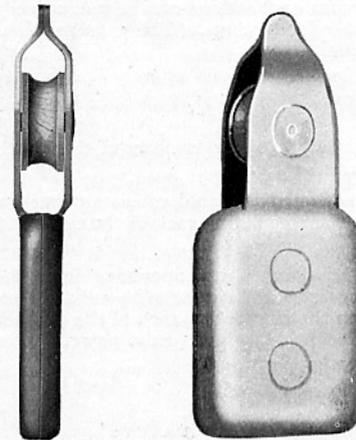


Cord Hooks:

Cord hooks of the "pig tail" type formed to prevent the cord from becoming loose and to prevent the straining of a cord weight from disconnecting the cord tips from the cord fasteners.



Cord Weights:



Cord weights for the switchboard cords are of lead and antimony with steel protection jackets and are equipped with free moving hardwood rollers to prevent wear. They are of sufficient weight to hold the cord in the proper position and to return the cord to the proper location upon disconnection from spring jacks.

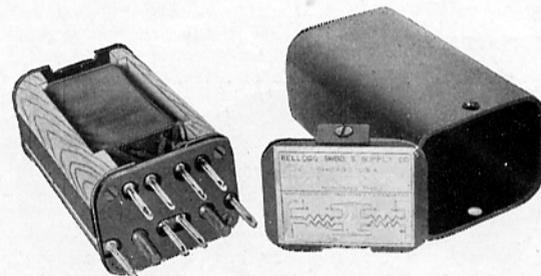
Condensers:



All condensers are of the rolled type. The condenser plates and dielectric are securely sealed with a compound in metal cans, thus excluding moisture and preventing injury due to temperature variations. They are constructed to stand a test of 500 volts direct current between the plates.

The capacity of the condensers does not vary more than 5% from the rated capacity stamped thereon. All condensers are mounted on insulated steel plates and so arranged that the terminals are readily accessible.

Repeating Coils:



Repeating coils used in the circuits requiring same are of the most efficient type for the purpose for which they are used. They are housed in a pressed steel cross talk proof

shell and designed to mount on mounting strips the same as relays are mounted occupying the same space as a pair of cord circuits. The terminals can be brought out in such a manner that connections can be made similar to connections of standard relays. The transmission loss is less than $\frac{1}{2}$ mile.

Night Alarm Signal:

The night alarm signal is either of the direct or the alternating current type.

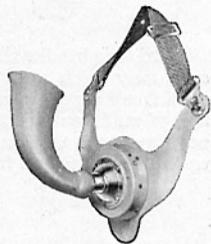
The direct current signal consists of a standard buzzer located on the connecting rack of the cabinet and is readily accessible.

The night alarm signal operating from the alternating current consists of a ringer with vibratorless gongs also mounted on the connecting rack of the cabinet in an accessible position and is wired to the power ringing current.

Transmitters:

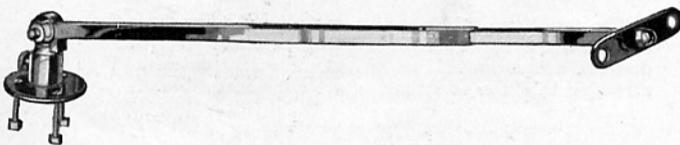


Operators' transmitters are of the breast plate or suspended type as may be desired. The breast plate type is constructed of durable sanitary pyroxylin. The mouth piece is hard rubber, white enameled. The transmitter is light, durable and properly insulated, free from packing and has high transmitting efficiency, low current consumption and permanent adjustment.



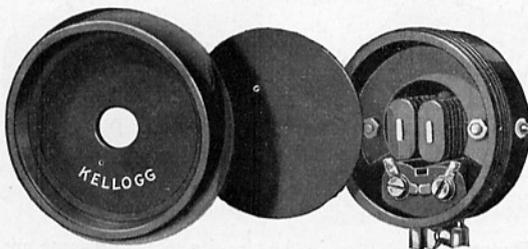
The suspended type transmitter has an attractive black finish and is so constructed and balanced that when suspended from the transmitter arm by means of two single conductor flexible cords it is held in its proper position. The transmitter is properly insulated, free from packing and has the same efficiency as the breast plate type.

Transmitter Arm:



The transmitter arm is constructed of metal given a black enamel finish securely fastened to the top of the cabinet and is adjustable, either vertically or horizontally.

Receiver:



The operator's receiver is of the light weight head band type. The shell and cap are of the famous Kellite and are

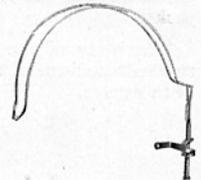
capable of withstanding rough usage without damage to the receiving qualities.

The magnet of this receiver is of a material having high magnetic qualities and so designed that permanent magnetism is insured.

The receiver coils are placed as near the center of the diaphragm as possible so as to obtain the maximum amount of deflection with a minimum amount of current consumption.

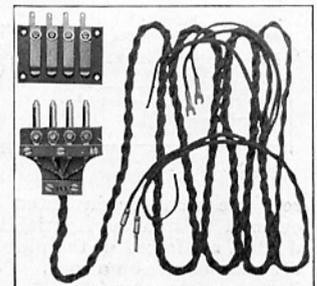
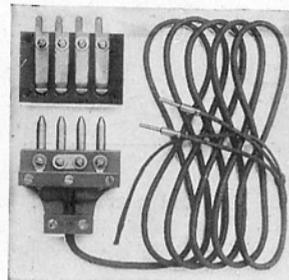
Receiver Head Band:

The head band is of steel wire, fastened to the receiver shell with a nickel plated hinged lug and has sufficient tension to automatically adjust the receiver in the proper relation to the operator's ear.



The total weight of the receiver and head band is only 3.9 ounces.

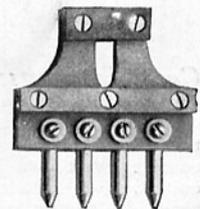
Operator's Instrument Cords:



The operator's cords are of the four conductor type when used for the breast plate transmitter and two conductor when suspended type transmitter is used. The cords are arranged with tips so as to be easily connected to the transmitter, receiver and operator's plugs.

Operator's Instrument Plug:

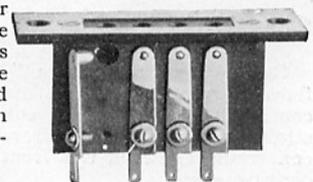
The operator's plug for use in connection with an operator's set is of the four prong type, each conductor being a separate prong to insure positive contact and long life.



Operator's Instrument Jack:

On the key shelf rail position is mounted one four conductor operator's jack. The jack springs are of heavy German silver and of such thickness and length to insure long life, durability and good contact.

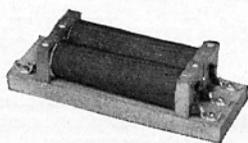
The insulation is of Kellite.



Induction Coil:

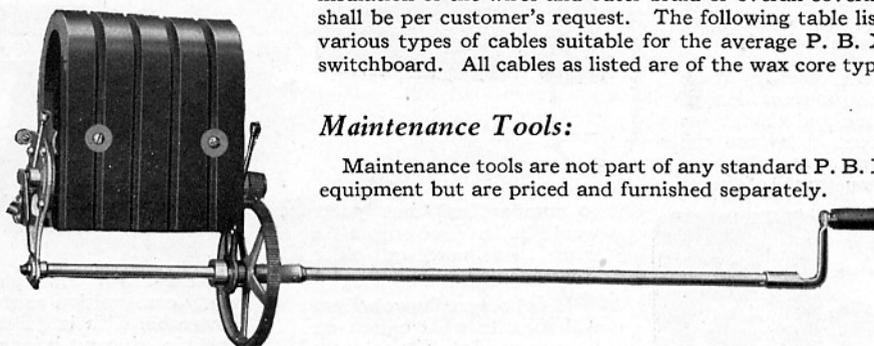
A standard anti-side tone induction coil is provided for each operator's circuit. In the design of this induction coil, the size and material of the core, the ratio of the number of turns in the primary winding to the number of turns in the secondary winding and its mechanical construction, has been carefully determined so that it will fully meet the requirements of both local and long distance work.

The secondary winding is so proportioned to the primary winding that the coil is of high efficiency for both long and short lines and will permit the operator to talk in a moderate tone of voice when handling all calls.



Hand Generator:

The hand generator is of the four bar type equipped with a shaft, the end of this shaft being equipped with crank handle. It is practically noiseless in operation. It is thoroughly insulated and finished to prevent rust and deterioration.



Cable:

The positional hand made cable is made of commercial copper wire not smaller than No. 22 B. & S. gauge. The wire is of the tinned type having a standard insulation of two silk and one cotton. The wires are sewed into a compact cable, using twisted pairs for all talking conductors, the color code corresponding to the colors specified on the circuit prints.

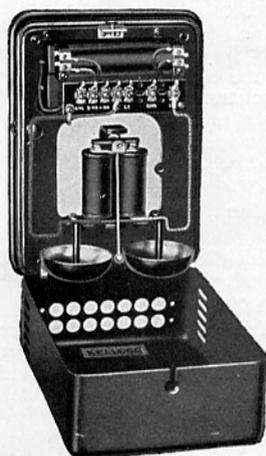
Note: When machine made cable is required to extend between the P. B. X. switchboard and various distributing points, this cable to be made up of wires not smaller than No. 22 B. & S. gauge formed into twisted pairs. The insulation of the wires and outer braid or overall covering shall be per customer's request. The following table lists various types of cables suitable for the average P. B. X. switchboard. All cables as listed are of the wax core type.

Maintenance Tools:

Maintenance tools are not part of any standard P. B. X. equipment but are priced and furnished separately.

TELEPHONES

Common Battery Enclosed Gong Desk Type



No. 600 SA Bell Box
Open View

Enclosed gong desk sets are made up in two types, common battery and automatic. The construction of the desk set box is practically the same as that used in the wall sets and parts are interchangeable. The desk set box contains the ringer, induction coil, No. 146-1Mf condenser and connecting rack. The same desk set boxes are used on both straight common battery and automatic, the only difference being in the desk stands.

The Kellogg desk stand has been carefully designed to reduce maintenance to a minimum. It is graceful in appearance and light enough in weight to handle with ease, is sufficiently rugged to withstand ordinary knocks and continuous service. It is the only one on the market that is provided with a perfect transmitter adjustment which never requires attention. The transmitter back does not become loose on its mounting, as it is part of the lug.

The capital is non-breakable and holds the transmitter securely in any position. Instead of using an ordinary japan finish over the upright which always chips or wears off, a heavy Kellite protection tube is used, insuring a lasting finish that does not discolor, crack or chip.

The base is of steel, treated to prevent rusting after which it is given a heavy coat of dull, black enamel. It is equipped with a heavy felt ring which is firmly held in a groove, encircling the outer edge of the base. This felt is securely held in position by prongs and protects the furni-



F118

600SA

ture as well as absorbing the shock of the impact when the stand is slammed down on the table.

The springs are of German silver equipped with No. 1 contacts, and with the connecting rack are located in an accessible manner in the base. The hookswitch has a very short action, yet a free movement of the contact springs is effected. All corners and sharp edges are rounded off, and the hook fork so formed that the receiver does not fall off should the stand be tilted. The standard finish is in a permanent black enamel.

No rattle to hookswitch. Weight is in the right place. Accessibility and practicability in arrangement of the apparatus in base of stand. Absolute, unequalled transmission for either short or long distances.

The superiority of this stand has caused the leading telephone companies to adopt it as standard for long distance, as well as local work.

Kellogg

TELEPHONES

Common Battery Enclosed Gong Wall Type

Kellogg enclosed gong type wall telephones are made in three styles or circuit arrangements; straight common battery, straight common battery for 8 or 10 party harmonic rural common battery lines, and common battery arranged for automatic dials.

In planning these sets, a great deal of time and study was spent to secure the most accessible arrangement of parts



No. F-801

ing iron or without disturbing the wiring in the set. For low maintenance, excellent transmission and long life, we believe the telephone manager can find nothing better than these fine instruments.

Common Battery Enclosed Gong Desk Grabaphone Sets



The F-115-A Grabaphone Desk Stand is of the same sturdy construction as the regular F-118 stand and interchangeable with it. Because of the convenience of this type of equipment it is preferred by many subscribers. It is used with the F-600 type Desk Box described on page 37.



Open View No. 801 Wall Set

so standardized that parts would be interchangeable with those used on older Kellogg telephones.

The photographs we believe will show to what extent we have succeeded. The cabinets used in these sets are made from heavy drawn steel, finished in durable black enamel. All parts are most accessible for inspection and adjustment. Connecting racks are stamped with white lead so that all markings can be easily distinguished.

The booster induction coil circuit has been designed in connection with the Kellogg transmitter and receiver for maximum transmission.

For common battery rural lines, having divided ringing, we recommend the No. 802 set which is arranged with an extra condenser in the ringer circuit. The standard 801 set has a provision for adding the second condenser to convert it for rural use without any change in the cabling.

Ringer wires on all sets are separate from the cable, so that the ringer can be removed without the use of a solder-

Common Battery Desk Grabaphone Stands

Kellogg Grabaphone stands are of the same sturdy construction as our standard desk telephones. The cradle is of pressed steel heavily black enameled, and operates the hook switch springs with the same reliability as in our desk stand.

This F115A Grabaphone stand takes the No. F11C Grabaphone.

Kellogg Grabaphones are unequalled in every way. They combine ease of talking, practicability and handsome appearance.

They are especially desirable in offices, as only one hand is required to carry on a conversation. The right or left hand is always free for writing, for instance, and requires minimum amount of effort.



ARRANGED FOR AUTOMATIC DIAL

For those switchboards connecting with an automatic exchange and where through night service is desired, it is necessary to provide facilities that will permit the P. B. X. subscriber to establish his own connections. The telephone in such installations, located in the office or room of the parties to be connected through the switchboard for night service, should be equipped with an automatic dial.

In this case the Kellogg F-803 HB wall set on the F-301 desk stand should be used. These instruments are very similar to our code No. 801-SA wall sets or the F-118 desk stand except that they are arranged for an automatic dial.

The dial is not furnished unless specified on order and the type of dial desired is stated.



Kellogg

OTHER ITEMS

The Kellogg Company is prepared to furnish all apparatus and supplies necessary to completing P.B.X. installations, including cable, terminals, wire, nails, cleats, etc.

For main leads and other cable requirements we offer the following table for your reference. These cables are formed of No. 22 B. & S. gauge copper conductors well insulated with silk and cotton wrappings. (For moist or damp climates the enamel, silk, and cotton insulation

should be used.) After forming the conductors into a cable reverse paper wrappings are drawn over it and the entire cable treated with a hot wax preparation which is followed by knitting a heavy braid covering, or drawing the lead covering over this wax core cable. (See Table.)



Cotton Outer Braid



Cable With Lead Sheath

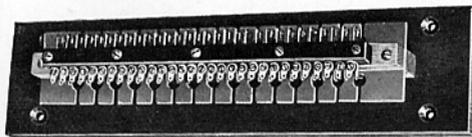
CABLE

Red and White Tinned Wire 2 Silk, 1 Cotton Ins.		Outer Braid Saturated With Lead Colored Flameproof Paint Enamel Wire 1 Silk, 1 Cotton Ins.		No. of Pairs	Diameter
Outer Braid Waxed Enamel Wire 1 Silk, 1 Cotton Ins.		Tinned Wire 2 Silk, 1 Cotton Ins.			
65	114-X	65-A	114-AX	11	$\frac{25}{64}$ "
127		127-A		16	$\frac{13}{32}$ "
24	107-X	42-A	107-AX	21	$\frac{15}{32}$ "
112		112-A		26	$\frac{15}{32}$ "
97	109-X	125-A	109-AX	41	$\frac{5}{8}$ "
63	29-X	63-A	29-AX	51	$\frac{5}{8}$ "
62	53-X	62-A	53-AX	102	$\frac{15}{16}$ "

LEAD COVERED CABLE

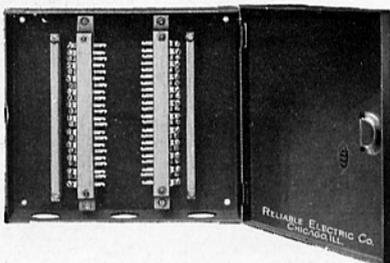
Code No.	No. of Pairs	Diameter	Thickness of Sheath	Code No.	No. of Pairs	Diameter	Thickness of Sheath
120-L	11	$\frac{29}{64}$ "	$\frac{1}{16}$ "	147-L	26	$\frac{19}{32}$ "	$\frac{1}{16}$ "
144-L	16	$\frac{17}{32}$ "	$\frac{1}{16}$ "	146-L	51	$\frac{3}{4}$ "	$\frac{5}{64}$ "
121-L	21	$\frac{33}{64}$ "	$\frac{1}{16}$ "	145-L	102	$\frac{1}{2}$ "	$\frac{3}{32}$ "

JUNCTION BOXES



No. 2500 Type

For distribution purposes in forming out the cable pairs for attaching the station leads, as on the floors of a hotel we recommended the Kellogg No. 2500 type. This junction box, is made up in six capacities ranging from five pair to twenty-five pair size. It consists of a suitable base drilled for mounting, to which is securely mounted a terminal strip with the required number of terminal clips. Each clip is provided with one screw and two soldered connections. A fibre fanning strip is so arranged that it is not necessary to lace the cables, which may enter the box from either end.



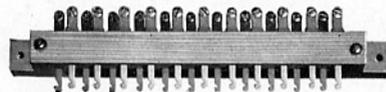
Type E

Both solder and screw connections make it easy to connect and disconnect line wiring. A heavy enamel finished metal cover protects the terminals from dirt and foreign

particles which might interrupt service.

Where more than twenty-five pair of terminals are wanted we can furnish the Reliable Electric Type E in capacities of thirty, fifty-two and one hundred pairs. These boxes are formed of sheet steel with side swinging doors and are furnished in a heavy black. Maple connecting racks with screw binding posts having soldering tips on the opposite end facilitates working conditions. The terminal strips are held securely to the back of the box with ample working room. Knock outs in both the top and bottom permit cabling or wiring to run from either bottom or top. These boxes can also be furnished for flush mounting if desired.

Terminal Strips



Where open or unprotected terminals are preferred, we offer the E type terminal strip which is composed of a continuous maple strip, drilled for mounting and provided with soldering terminals for the cable end and screw binding posts for the line side. This is the most satisfactory terminal strip for general use to be had. It can be furnished in six capacities ranging from eleven to fifty-two pairs measuring from ten to thirty-seven and three-quarter inches in length.

Interior or House Wire



For general use in connecting up the telephone to the terminals and connecting racks use Kelloggs Rubber insulated dry braid covered copper interior wire. This wire consists of No. 17 B. & S. gauge copper conductors having a heavy line rubber insulation with a dry glazed olive green braid covering. This wire can be furnished in single, double and triple conductors. When the duplex and triple sizes are furnished a colored tracer thread woven into the braid facilitates insulation.

Kellogg

BULLETIN NO. 8X for PRIVATE BRANCH EXCHANGE SWITCHBOARDS - 1928

Catalog of Kellogg Private Branch Exchange Switchboards from 1928 for 10 to 200 lines, including accessories for the operator and the power plant and batteries. Includes several switchboard component diagrams and dimensional drawings.

Printed using the letterpress method, 11 X 17 inches, black ink on 20# coated stock with an embossed two color red and black cover on 60# leather embossed tan stock. Folded in half to 8 ½ X 11 inches and saddle stitched bound. Thirty nine pages.

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