

# STROWGER

## PRIVATE AUTOMATIC TELEPHONE EXCHANGES



### COMMUNICATION SYSTEMS LTD

*Proprietors:* AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

London Office: **STROWGER HOUSE, ARUNDEL STREET, LONDON, W.C.2**

Registered Office: 7/8 NORFOLK STREET, LONDON, W.C.2

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## PRIVATE AUTOMATIC TELEPHONE EXCHANGES

*Organisations requiring telephone exchanges with capacity for 50, 100, 200 lines or more will find the equipment described and illustrated in the following pages. For particulars of the 10- and 25-line exchanges refer to Publications Nos. 835 and 834 respectively.*

- TYPE 50-7A . . . 50 LINES
- TYPE 100-10A . . . 100 LINES
- TYPE 200-20A . . . 200 LINES

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## INTRODUCTION TO THE STROWGER SYSTEM

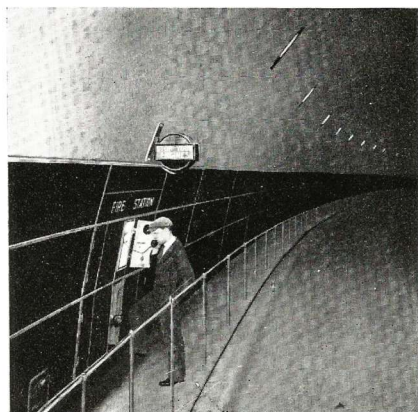
The Strowger System on which STROWGER PRIVATE AUTOMATIC TELEPHONE EXCHANGES operate was developed primarily for public service. The British Post Office, the Governments of Australia, Brazil, Holland, India, New Zealand, Pakistan, Poland, Portugal, South Africa, and telephone operating companies in Barbados, Jamaica, Trinidad and Venezuela are among the important administrations which have standardised Strowger telephone equipment. Strowger public automatic telephone exchanges have been supplied to many countries other than those mentioned above and the number increases year by year—the highest tribute to satisfactory service.

In both public and private service there are many millions of Strowger automatic telephones in daily use in the diverse climatic conditions of seventy different countries.

This world-wide acceptance of the Strowger automatic system for public service has necessitated expansion in the facilities for

manufacturing the basic components of Strowger telephone exchange equipment in large quantities. These components are manufactured to a high degree of accuracy to operate satisfactorily over long periods with the minimum attention.

A Strowger PRIVATE AUTOMATIC TELEPHONE EXCHANGE (P.A.X.) differs from a public exchange only in the number and arrangement of the basic components and every private user therefore benefits from what is the equivalent of a Government endorsement of satisfactory service, and at a price rendered economic by virtue of the large contracts which have brought into being a vast and important industry. Moreover, users of Strowger private and public automatic telephone exchanges have the assurance that behind them is the largest automatic telephone engineering and manufacturing organisation in the British Commonwealth, on which they may rely for any service that may subsequently be required.



*Strowger Telephones and A.T.M. Fire Alarm Boxes safeguard Queensway (Mersey Tunnel) England.*



*Strowgerphone installation aboard a luxury liner.*

**STROWGER PRIVATE AUTOMATIC TELEPHONE EXCHANGES**

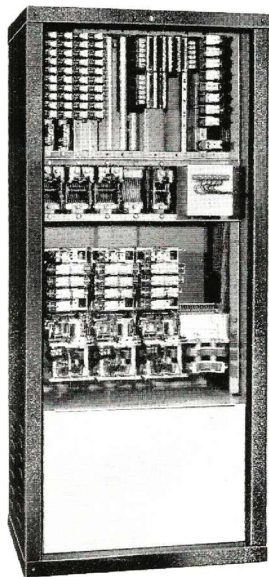
Private Telephone service is now generally recognised as an essential aid to modern business. Strowger private automatic telephone exchanges are designed specifically to provide such service for the staffs of large or small organisations.

The exchanges range from the smallest, which has capacity for ten lines, up to any size that may be required for service in the largest commercial organisation or industrial plant.

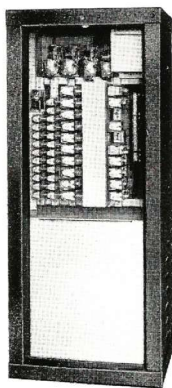
A standard range of P.A.X.'s is manufactured in the most popular sizes which are 10 lines, 25 lines, 50 lines, 100 lines and 200 lines.

Both the 10-line and 25-line exchanges are the subject of separate publications, numbers 835 and 834, copies of which will be forwarded on request.

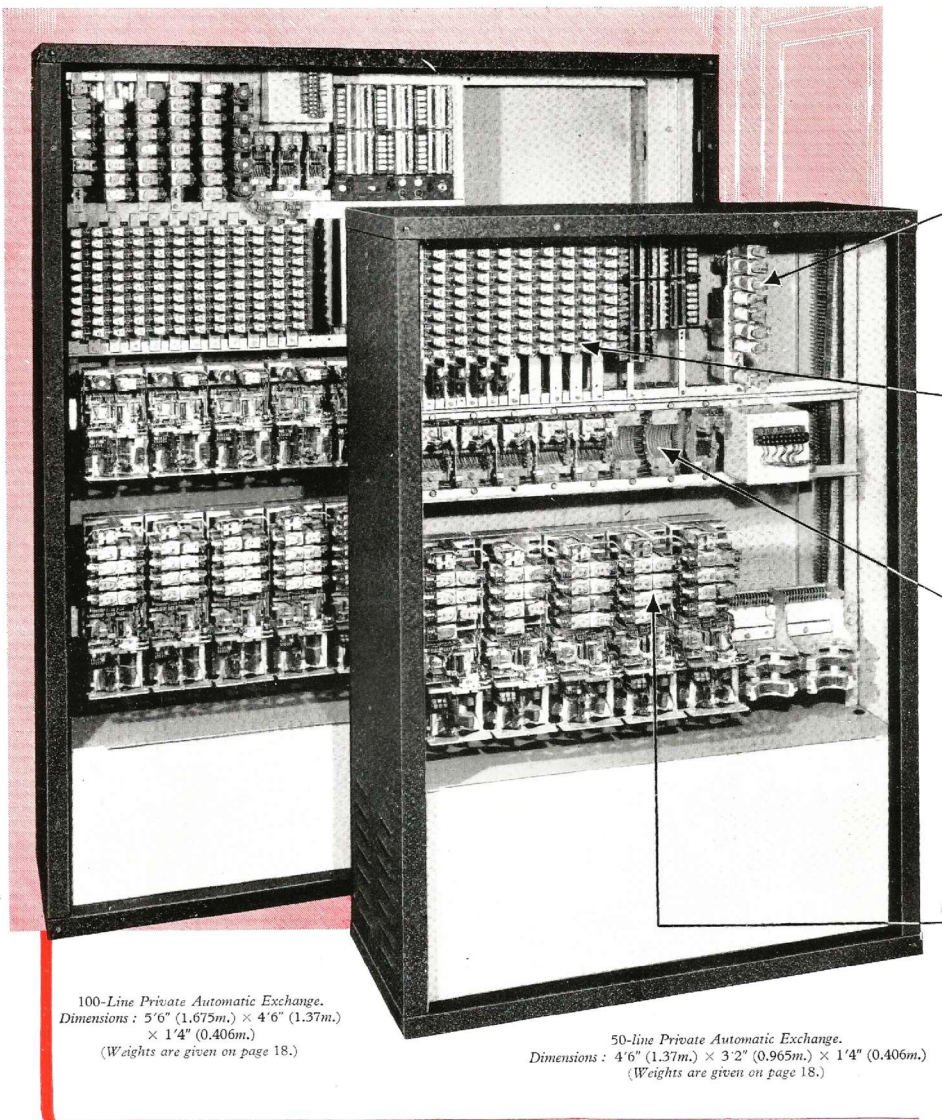
The three largest standard sizes—50-line, 100-line and 200-line exchanges—are fully described and illustrated in the following pages.



*25-line Private Automatic Exchange*  
 Dimensions: 4'6" (1.37m.) × 2' (0.61m.)  
 × 1'4" (0.41m.)  
 Weight 287 lbs. (130 kg.)

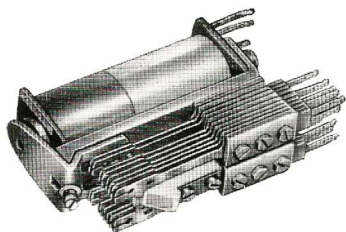


*10-line Private Automatic Exchange*  
 Dimensions: 3' (0.91m.) × 1'3" (0.38m.)  
 × 1'4" (0.41m.)  
 Weight 96 lbs. (43.5 kg.)



100-Line Private Automatic Exchange.  
Dimensions : 5'6" (1.675m.) × 4'6" (1.37m.)  
× 1'4" (0.406m.)  
(Weights are given on page 18.)

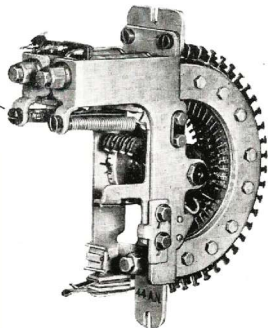
50-line Private Automatic Exchange.  
Dimensions : 4'6" (1.37m.) × 3'2" (0.965m.) × 1'4" (0.406m.)  
(Weights are given on page 18.)



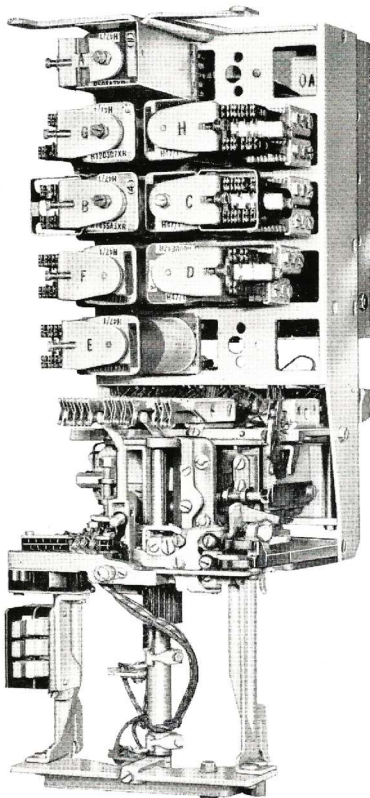
● The British Post Office type 3000 relay.



● The British Post Office type 600 relay.

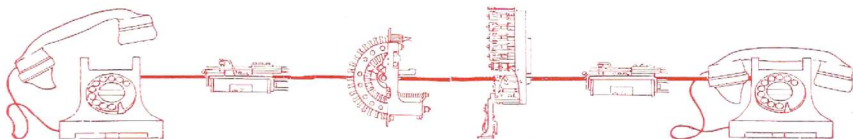


● A Strowger Uniselect—electro-mechanical selector.  
British Post Office type.



● Strowger Selector—Type 32a (British Post Office type 2000)

The respective positions occupied by the apparatus in the various stages of an automatic telephone call.



## AUTOMATIC SWITCHING APPARATUS

The complete switching apparatus for 50 and 100 lines, illustrated on page 4, is self-contained and enclosed in dust-excluding metal cabinets which have removable panels at front and rear. Locks are provided to prevent unauthorised access to the apparatus. The cabinets are finished in crystalline black and have chromium-plated fittings.

The complete apparatus for 50 or 100 lines is enclosed in a single cabinet. Two cabinets accommodate the equipment for 200 lines. Special service apparatus when required for 100 and 200 line exchanges is accommodated within the cabinet, but for a 50-line exchange the cabinet is extended upwards to provide the space required for additional apparatus if necessary. If more space for special services is required, auxiliary cabinets are provided.

### STROWGER RELAYS

The relays (B.P.O. type 600 and 3000) are of the latest pattern standardised by the British Post Office for public exchange service.

These relays incorporate novel features which are the result of many years' operating experience and laboratory research. Reliability of action and ease of adjustment have been achieved to a remarkable degree by accurate winding, efficient magnetic circuit and the use of twin contacts.

### THE STROWGER SELECTOR Type 32a (B.P.O. Type 2000).

The Strowger selector is the latest pattern of the well-known 2-motion type first introduced in Strowger exchanges more than 60 years ago.

It is the result of the many years' operating experience of its prototype in all parts of the world supplemented by particular study, research and many experiments in Strowger laboratories.

Development of the Type 32A selector occupied a period of 6 years during which it was subjected to the most searching tests that the laboratory experts could devise.

It is precision manufactured from specially chosen materials.

It is more robust yet smaller than its predecessors and it is quicker in operation yet has a longer "life."

Before general adoption, type 32A selectors were subjected to rigorous trials in public exchange service for a period of two years. These tests demonstrated the reliability and speed of the Strowger Type 32A Selector beyond all doubt.

In addition to the British Post Office, the Union of South Africa and other important Government and public telephone operating administrations have adopted the 32A selector as standard for present and future use.

### RINGING AND TONE APPARATUS

The ringing and tone set provides, in addition to ringing current, the following tones :—

- (a) "Dial Tone"—to indicate that the dialling may commence ;
- (b) "Ring-back Tone," which is received whilst the bell of the called telephone is ringing ;
- (c) "Busy Tone," which indicates that the called telephone is in use.

## POWER SUPPLY

The direct current operating voltage limits of the equipment are : maximum 55 volts ; minimum 45 volts. For 100 and 200 line installations in Great Britain on which A.C. supply mains are available, a "battery eliminator" is incorporated in the cabinet to provide direct current for the whole of the apparatus. For the 50 lines and all sizes of foreign installations the "battery eliminators" are mounted externally.

Alternatively, a single battery "floated" on a compensated charging rectifier can be used. This method has the advantage that most of the energy used is taken direct from the mains through the rectifier which automatically maintains the battery in a charged condition and ready to take up the full lead in the event of mains failure.

Where the electricity supply is direct current, duplicate batteries are employed, together with a suitable charging panel, the eliminator being omitted.

## AUDIBLE AND VISUAL "TELL-TALES"

For convenience in supervision of the apparatus, audible and visual "tell-tales" or signals are normally provided on standard 100-line and larger switchboards. Signals can be fitted on 50-line switchboards if desired.

## CLIMATIC PROTECTION

All the component parts of standard equipment are protected by special finishes and the entire equipment is suitable for use under sub-tropical conditions.

If equipment is required for operation under full tropical conditions or where it may be subjected to severe sandstorms or attacks by insects, full particulars should be given so that modifications to various components and the general assembly can be made to ensure the most satisfactory operation.

# AUTOMATIC DIAL TELEPHONES

Several models of the well-known Strowgerphone—the world's most up-to-date and efficient dial telephone—are available for use with this type of private automatic telephone equipment. All these models employ the Astic circuit principle that has been standardised by the British Post Office and ensures the highest transmission efficiency combined with

minimum sidetone. Both desk and wall type telephones are available. All the models incorporate the British Post Office standard hand-set which is light, comfortable and convenient. It leaves one hand disengaged when the hand-set is in use, and permits greater freedom of movement. The quality and volume of speech transmission and reception are excellent.





Fig. 1. T.A078. Desk type Strowgerphone.  
Red moulded case.



Fig. 2. T.A078. Desk type Strowgerphone.  
Jade-Green moulded case.



Fig. 3. T.A078. Desk type Strowgerphone.  
Ivory moulded case.

The desk model is illustrated in Figs. 1 to 4. It is available either in red, green or ivory with silver-grey cords, and the design of the instrument is such that the accumulation of dust on any part is avoided.

The terminal block is of improved design having four or six terminals according to circuit requirements ; the instrument as a whole has been designed to facilitate maintenance and ease of inspection.

A wall type Strowgerphone is shown in Fig. 6. Fig. 5 is a robustly constructed ironclad weatherproof automatic telephone. Sealing glands are provided for the receiver cord and line cable and a bell is incorporated. It is designed to withstand usage in exposed situations.



Fig. 6. T.A127. Wall type Strowgerphone with  
incorporated Bell Set. Black moulded case.



Fig. 4. T.A078. Desk type Strowgerphone with  
incorporated Bell Set and Tray in base.  
Black moulded case.

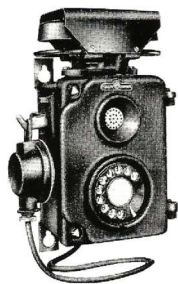


Fig. 5.  
Weatherproof Telephone.

## SPECIAL SERVICES

In addition to full automatic intercommunication between the telephones, Strowger private automatic switchboards are designed to facilitate the addition at any time of the following special services and refinements:—

- Key-Calling for Executives • Conference Key-Calling for Executives • Secretarial Service
- Priority for Executives • Tie-Lines to interconnect two or more Private Exchanges • Code
- Call Service • Loud Speaking Service • Fire Alarm Service • Party Lines
- Discriminatory Ringing • Watchman's Service • Visual Call Indicator • Extension Bells

### KEY-CALLING FOR EXECUTIVES

Key-Calling service is a particularly convenient facility for an executive who, by merely operating a key and without dialling, can gain immediate access to the line of any one of ten or twenty principal officers regardless of whether the required line is engaged or not.

The keys required for this service are compactly assembled in a polished wood cabinet (shown in Fig. 7) of the following dimensions: Height,  $3\frac{3}{8}$ " (8.6 centimetres), Width, 11" (28 centimetres), Depth,  $10\frac{1}{4}$ " (26 centimetres).



Fig. 7. Key-Calling Cabinet.



In addition to the key-calling keys, the cabinet is equipped with a lamp which indicates the progress of calls, a "hold" lamp and a "hold" key.

Actuation of the "hold" key enables the executive to withdraw his telephone to dial and communicate with any other line whilst the key-called party is holding on. In this case the lamp associated with the "hold" key is illuminated as a reminder. Upon the restoration of the "hold" key the lamp goes out and conversation with the key-called party can be resumed. If conference facilities are desired the conference key-calling service described on page 10 should be specified.

The cabinet is so shaped as to permit the desk telephone or a loud speaking telephone instrument to be placed conveniently on top of the cabinet, thus effecting a neat assembly and a saving in desk space.

## CONFERENCE KEY-CALLING FOR EXECUTIVES

This special service provides the key-calling facility as described on page 9, and, in addition, enables a conference to be established by merely actuating the appropriate keys in the cabinet. If any of the parties called to the conference happen to be engaged on telephone calls at the time, the convener requests them to replace their receivers and join the conference. Such parties **are rung automatically** when the existing calls are cleared and the lamp associated with the "hold" key glows dimly until all called parties have joined the conference.

A useful feature of this facility is that, by actuating the "hold" key, the convener of the

conference can withdraw his telephone to dial and communicate with any non-conference line, whilst still leaving the other parties to the conference connected together. Restoration of the "hold" key gives immediate access again to the conference.

The executive or convener of the conference can also disconnect the line of any member from the conference, by merely restoring the appropriate key. Up to a maximum of ten persons can be connected at one time. Simple pre-arrangement of the key selection combinations is all that is required to ensure the "attendance" of the right officials when the various conferences are convened.



## SECRETARIAL SERVICE

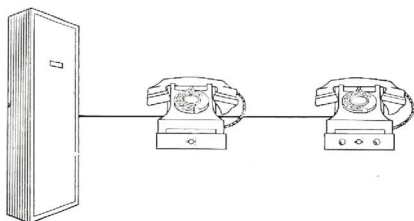


Fig. 8



Fig. 9

This service will protect the executive from comparatively unimportant internal telephone calls when he is in conference or engaged upon work requiring the utmost concentration, and entails no loss of secrecy for his internal telephone conversations.

The service utilises a Control Unit (Figure 8) which consists of a dial telephone fitted with a push-button, mounted on a plinth containing indicating lamps and a key for diverting calls. This is used in association with a sub-instrument which consists of a push-button telephone similar to Figure 8 but without the plinth. The Control Unit may be situated in the secretary's office to enable her to filter all calls incoming to the executive, using her discretion as to which calls should be switched through. Alternatively, the executive may prefer to have it in his office to receive all calls direct and switch through to his secretary those calls with which she can deal.

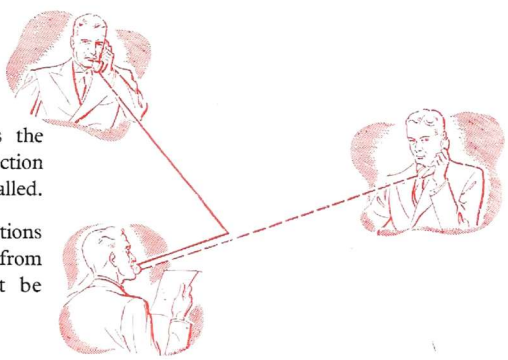
A secondary but useful feature of this service is that the executive and his secretary can call each other by buzzer and converse without using the automatic exchange. The speech facility may also be used whilst holding an incoming call, and the buzzer may be used alone for pre-arranged code signalling.

An additional facility is the provision of an ex directory line for the executive so that he can institute calls if his directory line is busy, and receive calls from other executives. This is achieved by the executive having a Terminal Unit (Figure 9) when his secretary has the Control Unit. Similarly the secretary may have an additional line to allow her to make and receive calls which would otherwise occupy the executive's line, and this can be incorporated in the Control Unit.

## PRIORITY SERVICE FOR EXECUTIVES

This service gives to selected lines the privilege of securing immediate connection with any line even if it is engaged when dialled.

The facility is designed for organisations where delay in establishing connections from certain executives' telephones cannot be tolerated.

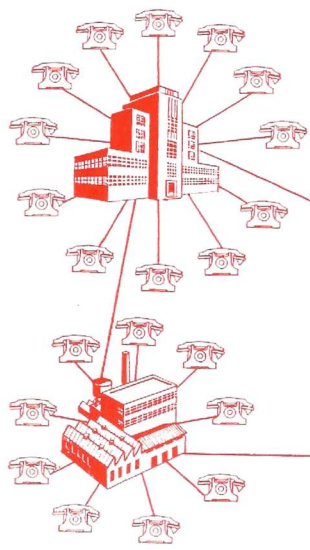


## TIE-LINE SERVICE

Tie-lines are the links which provide full automatic intercommunication between all the telephones connected to two or more private automatic exchanges.

Tie-line service is particularly useful where the business or expansion of an organisation entails the occupation of separate premises, not necessarily adjacent, perhaps some miles apart. If the telephones in one building were to be connected to an exchange in another, a separate pair of wires would be required for each telephone. The expense and difficulties of such an arrangement are avoided by installing a Strowger automatic exchange in each building and linking the exchanges together by one or more tie-lines according to the number of calls between them.

The service enables close contact to be maintained between the several departments of an organisation without the expenditure which would otherwise be necessary for calls through the public exchange system if the private exchanges were not linked together.



## CODE CALL SERVICE

This service is variously named "staff call," "round call," "general call," "page call," "person finder," etc. It provides means whereby audible and/or visual coded signals or coloured lamp signals may be given automatically and simultaneously at various selected positions throughout a building or works.

Code Call is particularly useful in large works, etc., where it may also be used to signal to a particular official or to give a general alarm in case of fire or other emergency.

The apparatus provides for a total of 22 different code signals, each composed of dots and dashes similar to the well known Morse system, given on bells, buzzers or lamps.

With colour signals the code is set upon groups of coloured lamps in selected positions. Lamps are arranged to be illuminated, and an audible signal (not coded) may be added to call attention to the lamps. Any of the code signals may be given simply by dialling the associated number.

When communication with a particular official is desired and no reply is received from his telephone, the calling party dials the code number assigned to that official and the code signal is given in all departments. On hearing or seeing his code signal, the official goes to the nearest telephone and dials the answering number. This stops the code call and places him in communication with the calling party.

## LOUD-SPEAKING SERVICE

This service enables an executive to communicate with members of his staff over the private telephone system without using a telephone handset. This is effected by means of a loudspeaker and transmitter, valve amplifier, volume control, dial, operating key and lamp—the whole assembled in a handsome desk cabinet (Fig. 10) : Height 7" (17.7 centimetres), Width 11" (28 centimetres), Depth 9 $\frac{5}{8}$ " (24.4 centimetres).

The loudspeaker is located in the body of the instrument and the watch-type transmitter is suspended from a switch hook on the side of the instrument. This is its normal working position but if it is desired to keep incoming conversation secret from other persons in the room, the lifting of the transmitter automatically transforms it into a receiver and the loudspeaker into a transmitter.

The instrument is ready for use on depression of the operating key which also illuminates the lamp to remind the user that the instrument is "alive" Depression of this key



Fig. 10. Loud-Speaking Cabinet.



Fig. 11. Loud-Speaking Cabinet with Key-Calling facilities.

## FIRE ALARM SERVICE

For Fire Alarm service, a compact cabinet is supplied and located at a selected central indicating station. This cabinet contains either a lamp or an indicator for each line. Fig. 12 shows a cabinet fitted with lamps. To give a fire alarm, a predetermined number is dialled from any telephone to gain access to the fire alarm equipment and another digit is then dialled to start the alarm signal. Sirens and/or bells are then sounded automatically and the lamp is illuminated corresponding to the telephone from which the call originated.

As a telephone is invariably located at the selected central indicating station, a key is provided on the cabinet and upon this key being operated, telephone communication is immediately established with the telephone from which the fire alarm originated. Because of the fire it might be impossible for the originator of the signal to speak, therefore the display of the signal is arranged to be dependent upon the dialling operation only, and when once an alarm is displayed it cannot be cancelled except by the attendant at the central indicating station.

is all that is required to reply to an incoming call. An outgoing call is initiated by first depressing the operating key and then dialling a number in the ordinary way.

The loudspeaking cabinet may be supplied with the addition of key-calling facilities as illustrated in Fig. 11. In this case the depression of the operating key is followed by the depression of a further key to gain access to any one of 10 or 20 predetermined lines according to the number for which the facility is provided. Conference facilities, which enable an executive to hold a conference between himself and any number of selected parties up to a total of ten, may be added to the key-calling facilities if required.

In addition to the number or location of the initiating telephone being indicated, the system can also be arranged to give a "group" indication, i.e., the particular building, floor or area from which the fire alarm is given.

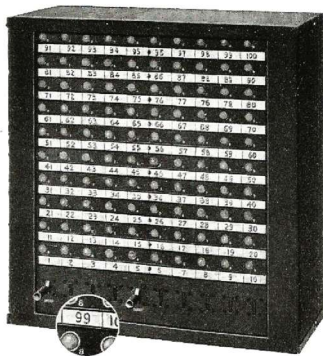


Fig. 12. Fire Alarm Signal Lamp Cabinet.

## PARTY LINES

This facility enables two or more persons, each with his own telephone instrument, to use the same line.

The facility is particularly useful in a case where several employees occupy adjacent desks and where none of them requires an individual line. Each is enabled to send or receive calls without moving from his desk or disturbing others. Another advantage of the arrangement is that calls are answered promptly even if the required party is absent.

If only two share the same line, each can

have his own number and be rung individually ; otherwise the same number and bell will serve for all. Where there are more than two parties on one line special arrangements can be made to provide the individual ringing feature up to a maximum of ten parties.

Another equally useful application is where two or three telephones are located in a remote situation to which the provision of individual lines would be expensive or where, on account of infrequent use of the telephones, the installation of a small exchange with a tie-line is not justified.

## DISCRIMINATORY RINGING

This is a special feature which can be provided for executive officers and others who,

when they are making a call, desire their signal to be distinct from the normal ringing.

## WATCHMAN'S SERVICE

This important facility can be specially provided in conjunction with A.T.M. Strowger private automatic exchange equipment. It enables the telephone instruments situated in the various parts of the offices or factory to be used for recording the time at which the

watchman visits those points. It is only necessary for the watchman to lift the receiver of the telephone and dial a predetermined number. This causes a permanent record to be made on the "tell-tale" clock which is controlled from the exchange equipment.



Fig. 13. T.2857.  
Visual Call Indicator.

## VISUAL CALL INDICATOR

When a Visual Call Indicator, Fig. 13, is substituted for the customary telephone bell, attention is attracted to incoming calls without

ringing being heard. It comprises a neon lamp mounted in a weighted rubber moulding  $4\frac{1}{2}$ " (11.4 cms.) high, also a length of connecting cord. Placed on the desk within view, repeated brilliant flashes announce the incoming call.



**EXTENSION BELLS AND CODE CALL INDICATORS**

Fig. 14 shows a weather-proof extension bell for use in exposed situations. It is arranged to be connected in series with the ordinary bell of a telephone instrument.

Where greater sound output is required a contactor (Fig. 15) can be used in conjunction with either a mains-operated bell (Fig. 16) or a horn (Fig. 18.) The contactor is connected to the bell of the telephone instrument and when actuated by ringing current connects full mains voltage to the extension bell or horn.

Either the horn or the bell mentioned above can be used as an audible code call indicator.

If a visual indicator is required the coloured lamps type (Fig. 17) is suitable.

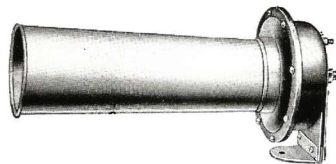


Fig. 18 T.2523. Horn for direct or alternating current.

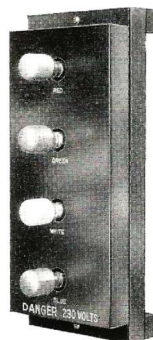


Fig. 17 Visual Code Call Indicator.

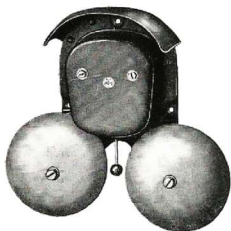


Fig. 14. T.2025. Double gong, weatherproof extension bell.



Fig. 15. T.375. Contactor for use with mains-operated bell.

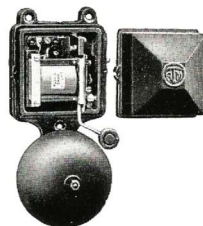


Fig. 16. T.343. Loud-ringing weatherproof mains-operated bell.

When ordering a Private Automatic Exchange, the D.C. mains voltage, or in the case of A.C. mains, the single phase voltage and frequency which is available should be stated.

**Table I. Maximum Combinations of Special Services.**

No.	Special Service	Space Units required for each Circuit.	10-Line	25-Line	50-Line	100-Line	200-Line
1	Key Calling to 10 or 20 lines ... ..	$\left\{ \begin{array}{l} 3 \text{ (for 10 lines)} \\ 4 \text{ (for 20 lines)} \\ 6 \text{ (for 10 lines)} \\ 10 \text{ (for 20 lines)} \end{array} \right.$	2	4	6	8	10
2	Conference Key Calling to 10 or 20 lines (see Note i)		1	1	1	1	1
3	Secretarial ... ..		Nil	Yes	Yes	Yes	Yes
4	Priority (see Note ii) ... ..	Nil	Yes	Yes	Yes	Yes	Yes
5	Tie Lines ... ..	Nil	1	2	4	5	10
6	Code Call, Audible ... ..	5	—	1	1	1	1
6a	Code Call, Visual Colour Code (see Note iii)	8	—	1	1	1	1
7	Fire Alarm ... ..	4	—	1	1	1	1
8	Party Line Working (see Note iv)	Nil	Yes	Yes	Yes	Yes	Yes
9	Discriminatory Ringing ... ..	—	Yes	Yes	Yes	Yes	Yes
10	Fuse Alarm ... ..	Nil	Yes	Yes	Yes	Standard	Standard
11	Release Alarm ... ..	—	—	Yes	Yes	Standard	Standard
12	Watchman's (see Note v)	—	—	—	—	—	—

**NOTES**

- (i) A conference is limited to 10 participants who may be any predetermined 10 of those connected to the conference key calling cabinet.
- (ii) Standard priority service can interrupt key calling priority and vice versa.
- (iii) Code Call (Audible) and Code Call (Visual Colour Code) are alternatives.
- (iv) The following variations of party line service are available:—
- 2-Party selective ringing (standard); each party requires a separate number on the P.A.X.
  - Omnibus circuits with selective ringing; a maximum 10 instruments; special consideration required.
  - Reverberate calling may be applied to (a) or (b); special consideration required.
- (v) Watchman's Service is available for each P.A.X. except Type 10-2, but as individual requirements vary, special consideration must be given to each case before a quotation can be made.

**TIE-LINE SERVICE.**

Between 2 or more private automatic exchanges; maximum loop resistance 750 ohms.

Special "long line" equipment consisting of a relay group inserted in front of the relevant line circuit is available for long tie lines.

When the amount of special service apparatus exceeds the capacity of a cabinet extension, auxiliary cabinets can be employed which, externally are replicas of switchboard cabinets used with types 10-2 and 25-4A, and to which top extensions can be added. The "space units" capacities of the several cabinets and extensions are given, together with the number of "space units" occupied by each circuit of a special service, so that the cabinet capacity required for any particular equipment can be calculated. If auxiliary eliminators are required they can be fitted in auxiliary cabinets where they occupy respectively 7 space units in a type 10-2, or 12 space units in a 25-4A cabinet.

**Table II. P.A.X. Switchboards Standard Capacities and Equipment.**

Wired for ultimate capacity			Equipped initially with		
Local Telephone Circuits	Tie Lines	Connecting Links	Local Telephone Circuits	Connecting Links	Battery Eliminator
10-2 P.A.X. switchboard. 10	1	2	10	2	2 amp.
25-4a P.A.X. switchboard. 25	2	4	15	3	2 amp.
50-7a P.A.X. switchboard. 50	4	7	30	5	6 amp.
100-10a P.A.X. switchboard. 100	5	10	60	7	8 amp.
200-20a P.A.X. switchboard. 200	10	20	120	14	(2 sects) 16 amp.

**BATTERY CHARGERS.**

Battery chargers can be supplied with the following output ratings: 2, 3, 4, 5, 6, 8, 10 amperes.

**CHARGING PANELS.**

Three sizes are available for charging batteries from D.C. mains.

- For 10A.H. and 20A.H. capacity batteries.
- For 30A.H. batteries and incorporating half-charge facilities.
- For 60A.H. batteries and incorporating half-charge facilities.

These can be supplied for use on 110—120 or 200—250 volt mains.

## APPROXIMATE WEIGHTS &amp; DIMENSIONS OF EQUIPMENT

	50 LINES.	100 LINES.	200 LINES.
Height ... ..	*4' 6" (1.37 metres)	5' 6" (1.675 metres)	5' 6" (1.675 metres)
Width ... ..	3' 2" (.965 metres)	4' 6" (1.37 metres)	9' 3" (2.82 metres)
Depth ... ..	1' 4" (.406 metres)	1' 4" (.406 metres)	1' 4" (.406 metres)
Floor space required including clearance for access ... ..	4' 8" (1.42 metres)	6' 0" (1.83 metres)	10' 9" (3.28 metres)
†Weight unpacked ... ..	×5' 10" (285 lbs. (.129 kg.))	511 lbs. (.232 kg.)	×5' 10" (1022 lbs. (.464 kg.))
†Weight packed for shipment ... ..	362 lbs. (.164 kg.)	732 lbs. (.332 kg.)	†732 lbs. (.332 kg.)
Packing Case ... ..	4' 8" (1.42 metres)	5' 11" (1.8 metres)	†5' 11" (1.8 metres)
	×3' 5" (1.04 metres)	×4' 11" (1.5 metres)	×4' 11" (1.5 metres)
	×1' 8" (.508 metres)	×1' 10" (.559 metres)	×1' 10" (.559 metres)

## SELECTORS &amp; FINDERS

	7 SELECTORS.	10 SELECTORS AND 10 FINDERS.	20 SELECTORS AND 20 FINDERS.
Unpacked ... ..	78 lbs. (.354 kg.)	185 lbs. (.84 kg.)	390 lbs. (.177 kg.)
Packed for shipment ... ..	215 lbs. (.975 kg.)	302 lbs. (140 kg.)	‡312 lbs. (145 kg.)
Packing Case ... ..	3' 2" (.965 metres)	4' 2" (1.27 metres)	‡4' 2" (1.27 metres)
	×2' 8" (.813 metres)	×2' 2" (.66 metres)	×2' 2" (.66 metres)
	×1' 2" (.356 metres)	×1' 2" (.356 metres)	×1' 2" (.356 metres)

## ELIMINATORS

	50 LINES.	100 LINES.	200 LINES.
Unpacked ... ..	119 lbs. (.54 kg.)	161 lbs. (.73 kg.)	322 lbs. (146 kg.)
Packed for Shipment ... ..	144 lbs. (.654 kg.)	213 lbs. (96.5 kg.)	‡213 lbs. (96.5 kg.)
Packing Case ... ..	2' 4" (.75 metres)	4' 3" (1.295 metres)	†4' 3" (1.295 metres)
	×1' 3" (.381 metres)	×1' 5" (.432 metres)	×1' 5" (.432 metres)
	×1' 4" (.406 metres)	×1' 3" (.381 metres)	×1' 3" (.381 metres)

## SPECIAL SERVICE APPARATUS

Approximate Average Weight Packed	55 lbs. (.25 kg.)
Packing Case ... ..	11" (.28 metres)
	×2' 3" (.685 metres)
	×1' 5" (.432 metres)

Special Service Apparatus for 100- and 200-Line Switchboards does not require a top extension but average equipment will add about 16 lbs. (7.25 kg.) to total weight of a switchboard.

## TELEPHONES &amp; BELL SETS

<i>Equipment not packed.</i>	<i>Equipment packed for shipment.</i>	<i>Equipment not packed.</i>	<i>Equipment packed for shipment.</i>
10 TELEPHONES T.4085		10 TELEPHONES T.4085 AND 10 BELL SETS T.4119	
Length ... ..	3' 4" (1.016 metres)	Length ... ..	3' 4" (1.016 metres)
Width ... ..	2' 4" (0.711 metres)	Width ... ..	3' 4" (1.016 metres)
Depth ... ..	1' 4" (0.406 metres)	Depth ... ..	1' 4" (0.406 metres)
Weight, 50 lbs. (22.7 kg.)	155 lbs. (70.4 kg.)	Weight, 84 lbs. (38.2 kg.)	203 lbs. (92.2 kg.)
10 BELL SETS T.4119		10 TELEPHONES T.4072	
Length ... ..	1' 10" (0.559 metres)	Length ... ..	3' 2" (0.97 metres)
Width ... ..	1' 4" (0.406 metres)	Width ... ..	2' 2" (0.66 metres)
Depth ... ..	1' 4" (0.406 metres)	Depth ... ..	1' 2" (0.36 metres)
Weight, 35 lbs. (15.9 kg.)	84 lbs. (38.2 kg.)	Weight, 73½ lbs. (33.5 kg.)	127 lbs. (57.6 kg.)

\*Top Extension, if necessary, for Special Services increases height to 5' 8" (1.725 metres). (An extension is not required for 100- or 200-line switchboards.)

†Switchboards fully equipped but less selectors and eliminators.

‡200 Line Equipment is packed in two units each of weight and dimensions given.

The above approximate weights and dimensions apply where standard eliminator operated exchanges are employed and are not applicable where additional special service cabinets are required.

## COMMUNICATION SYSTEMS LIMITED

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*Registered Office:*

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*Tel.:* TEMple Bar 4506

*Telegrams:* "Commsys Estrand, London."

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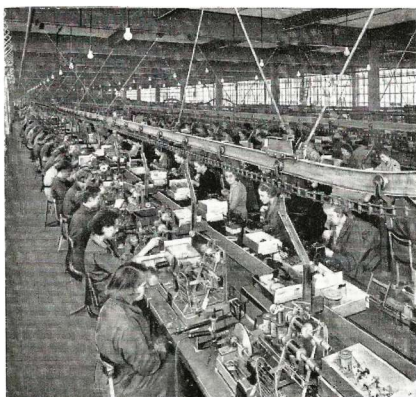
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