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INTRODUCTION

REX 80E is a modern PABX using reed relay switching together with electronic common control to provide a highly efficient and reliable telephone system.

The skilful design incorporates almost every possible facility for both the extension telephone user and the PABX operator. These include provision for connecting pushbutton telephones which combine with the fast switching capability of the exchange to give almost instantaneous call connection. Alternatively, conventional dial instruments may be connected and mixed in any ratio with the pushbutton telephones without the use of additional equipment. The value of executive time is also recognised and chosen executive extensions may cut-in on busy internal calls. Class of Service options are extremely flexible and enable different extension users to be allocated varying degrees of access to the public network, tie lines and special services.

Not least of the features of REX 80E is the compactness of the exchange. The switching equipment occupies the minimum of floor space, only 25% of that required by certain step by step systems, and is silent in operation. It may be housed in cabinets which blend with an office environment when such an installation is required. The operator's console is also extremely compact and combines graceful appearance with fast, efficient operation such that in most situations fewer operators are needed in comparison with conventional systems. However, the operator is still able to retain that personal contact with the extension user by reference to a digital display on the console which indicates the calling extension number in enquiry, assistance and normal calling situations.

REX 80E offers a quality of manufacture, reliability and a range of facilities capable of meeting the toughest international standards.

PACKAGING ARRANGEMENTS

The REX 80E can be supplied in any size up to 1000 extension lines.

Extension Lines	Junctions (Exchange + Tie Lines)	Traffic Capacity (Erlangs)	Switchboards	Number of Racks *
150	25	20E	1	2
300	40	40E	2	3
450	50	60E	3	4
600	60	80E	3	5
750	75	100E	4	7
900	90	120E	5	8
1000	105	140E	6	10
1000	140	160E	7	12

* Additional racks may be provided at any stage of system growth to cater for special requirements.

Within each package size extension lines may be varied in increments of five and junctions in increments of one. The quantities in the table are maximum figures, and a suitable traffic mix is assumed.

Operator Recall

- Any extension having difficulty with a call to the outside world can obtain assistance from the operator by using a 'recall' button and dialling '0'. The signal to the operator is special to get priority service.

Direct Dialling Out

- Calls to the public network or the private network can be made without operator intervention from dial or keyphones independent of the keyphone capability of the distant network.

Operator Assistance

- Outgoing calls made with operator assistance are made on demand.

Calls from low grade extension to class 1 extensions are made with operator help.

Priority Assistance

- Special calling signals on the manual board attract the operators attention to give priority of answer. These calling signals can be associated with special extensions, executives and operator recall.

Class of Service

- All extensions can be classified or graded according to the number of facilities to which they have access. Classes are numbered 1 to 13, the lower the number the less restricted the extension.

See Table Page 6

FACILITIES PROVIDED	CLASS OF EXTENSION												
	1	2	3	4	5	6	7	8	9	10	11	12	13
DIRECT ACCESS TO PUBLIC EXCHANGE FOR ALL NATIONAL & INTERNATIONAL CALLS & PUBLIC EXCHANGE OPERATOR	•	•											
DIRECT ACCESS TO PUBLIC EXCHANGE FOR :- (i) ALL NATIONAL CALLS AND PUBLIC EXCHANGE OPERATOR (ii) ALL NATIONAL CALLS BUT NOT PUBLIC EXCHANGE OPERATOR (iii) SELECTED NATIONAL CALLS AND PUBLIC EXCHANGE OPERATOR. (iv) SELECTED NATIONAL CALLS BUT NOT PUBLIC EXCHANGE OPERATOR. SEE NOTE 1.													
DIRECT ACCESS TO PUBLIC EXCHANGE FOR LOCAL CALLS	•	•	•	•	•		•						
PABX OPERATOR ASSISTED ACCESS TO PUBLIC EXCHANGE.	•	•	•	•	•	•	•	•	•	•	•		
DIRECT ACCESS TO ALL TIE LINES. (INCL. SELECTED)	•	•	•	•	•			•	•			•	
DIRECT ACCESS TO SELECTED TIE LINES ONLY.						•	•			•	•		•
PABX OPERATOR ASSISTED ACCESS TO ALL TIE LINES	•	•	•	•	•	•	•	•	•	•	•	•	•
DIRECT ACCESS TO ALL SPECIAL SERVICES (INCL. SELECTED) (WHEN PROVIDED).	•	•	•	•		•		•		•			
DIRECT ACCESS TO SELECTED SPECIAL SERVICES ONLY (WHEN PROVIDED).					•		•		•		•	•	•
DIRECT ACCESS TO CLASS 1 EXTENSIONS.	•	•	•	•		•		•		•			
PABX OPERATOR ASSISTED ACCESS TO CLASS 1 EXTENSIONS.	•	•	•	•	•	•	•	•	•	•	•	•	•
DIRECT ACCESS TO PABX EXTENSIONS EXCLUDING CLASS 1	•	•	•	•	•	•	•	•	•	•	•	•	•

Note 1. One of these four alternatives may be selected and will apply to all Class 3 extensions.

BASIC MANUAL BOARD FACILITIES

- | | |
|-----------------------------|---|
| Cordless Multi Link Working | - Calls are connected without the use of cords and plugs. Normally five calls may be held on the switchboard during the setting up process. Under special circumstances this can be increased to eight calls. |
| Non-locking Keys | - Assists in the rapid processing of calls. Keys do not need to be restored to normal at the end of a sequence of operations. |
| Calling Line Identification | - A numerical display to advise and remind the operator of the source of the call, whether it is an extension, junction or access circuit. In the case of common access type circuits (junctions and access circuits) the displayed information identifies the equipment in use and can be regarded as a maintenance aid. |
| State of Exchange Display | - This is a visual indication of the types of call waiting to be answered, the number of calls waiting, and the number of routes busy. It helps the operator decide what priority should be given to calls, and to advise callers of delays. |
| Selective Answer | - Operator can choose which type of call is given priority using the evidence of the State of Exchange, or to satisfy a pre-arranged instruction. |
| Recall Priority | - The degree of voluntary choice mentioned above is over-ridden for recall. This ensures that extensions requiring operator intervention have priority over other calls seeking operator assistance. |
| Push Button Signalling | - The operator is provided with a keypad for setting up both internal and external calls. |

Call Progress Signals

- The progress of a call is displayed to the operator at various significant times.

The signals displayed are :-

- a) Type of call to be extended
- b) Keysending in progress
- c) Ringing
- d) Monitoring
- e) Extension busy - Trunk offer invited (Extension engaged on local call)
- f) Extension busy - Trunk offer not invited (Extension engaged on exchange line or executive call)
- g) Number Unobtainable - Extension number is unequipped or barred
- h) Equipment Engaged
- i) Inter PBX Call incomplete
- j) Fault (Extension of Alarms)

Intrude

- The operator has facilities for intruding upon engaged extensions with superimposed warn tone. The display received by the operator informs her on what class of call the extension is engaged and normally intrusion would not be attempted into extensions who are connected to exchange lines, unless the operator considers intrusion urgent.

Call Hold

- This facility allows the operator to hold incoming exchange line calls on the board and ensures when the called extension clears the clear signal is not returned to the public exchange and the operator is recalled to the circuit to extend the call to a second extension.

Call Split

- Enables the operator to talk to either the caller or called party without the other hearing.

- Selective Cancel
- Enables the operator to cancel either 'side' of a partially set up call without interfering with the other side.
- Forward Operator Recall
- When working to a distant manual exchange or working over a manual-manual tie line to a distant operator, it allows the originating operator to attract the attention of the distant operator.
- Camp-on
- This 'automatic ring when free', facility allows the operator to extend an incoming exchange line call, to a busy extension and retire from the connection. When the extension eventually becomes free it will be rung.
- Automatic Release
- Any call abandoned by the caller is automatically released from the switchboard without further action by the operator.
- Direct Dialling Out Operator Control
- This facility allows the operator to restrict those extensions permitted direct dialling, when exchange load or emergency conditions dictate.

FACILITIES Cont

BASIC MAINTENANCE AND SERVICE FACILITIES

- Alternative Set Ups
(Second Attempts)
- Failure of Initial or Final Set-up will result in a second attempt being made by the control to obtain the required connection using, as far as possible, a different path through the exchange.
- 'P.G.' Lockout
- Line faults and incorrect replacing of the telephone handset result in the release of held common equipment. An alarm is given.
- Busying Out
- A service panel accessible to the operator can be used to remove from service items of faulty equipment.
- Traffic Recording
- Access points are included in the design of the exchange to enable traffic meters and other recording devices to be added. The arrangements are such that separate analysis can be made of system and control areas.
- Fault Recording
- Access points are also included in the design to allow the addition of fault recording devices to assist in the speedy and accurate location of faults.
- Alarms
- A comprehensive system of alarms gives an immediate warning of common power, tone and system lockout failures.
- Subsystem Isolation
- Isolating links are provided to disconnect common supply feeds.
- Mains Fail Switching
- Under public supply failure external lines are directly connected to selected extensions.
- On high security installations alternative power sources can be supplied.
- Night Service
- Night service retaining full PABX facilities by common answering using recall button.
- Where desirable it can be arranged for the classes of service given to extensions to be altered automatically on switch over to night service.

Changed Number Interception

- A call is automatically connected to the operator when a call to a changed number is dialled.

OPTIONAL FACILITIES

Inter PBX Tie Lines

- Provides communications with other exchanges. The use of keyphones on the REX 80E is not affected by the keyphone capability of the distant exchange.

Executive Right of Way (E.R.O.W)

- Selected extensions nominated as executives can intrude upon established connections, except where such connections are involved with a public exchange or operator call. A special busy tone is returned to executive when intrusion is possible, in all other circumstances normal busy tone is returned. Upon receipt of special busy tone an executive may either:-

- i) remain camped on to the wanted connection until clear-down.
- ii) or by pressing his recall button inject a tone into the established condition so indicating that an executive is awaiting attention.

In both cases, 'ring when free' conditions apply.

PBX Group Hunting

- Hunting over groups of extensions of seven numbers using a special group calling code. Ten such groups can be provided, which need not be consecutive numbers.

Short Code Dialling

- Long, frequently used public exchange numbers can be translated into much shorter codes which are dialled by extensions having access.

Staff Location Access

- Access to the various forms of staff location including radio pocket paging systems.

Fire Alarm Access

- Various arrangements of giving fire alarms.

Watchmans Service

- A system whereby a patrolling security officer can originate calls from any telephone and have the action recorded with telephone identity and time.

Emergency Number

- Various arrangements.

FACILITIES Cont

- Step Conference
- Enables one external line and up to six extensions to combine together in conference. The setting up of the conference is under the control of the extension.
- Direct Dialling in (D.D.I)
- Permits the dialling of extension numbers by Public Exchange subscribers.
- Ring Back When Free
- Having dialled an extension that is busy, a caller may dial a further digit and replace his handset. Both the called and calling extensions will be automatically rung when the required extension becomes free.
- Call Diversion
(Absent Extension Transfer)
- Enables a call to be diverted from one extension to another.
- Dictation Access
- Access to various forms of dictation equipment.
- "Meet-me" Conference
- At a pre-arranged time a number of extensions may access a circuit which then enables them to hold a conference.
- Direct Extension Night Service
- Selected extensions are each connected to an exchange line whilst retaining full PABX facilities.
- Three Party Conference
(Add-on 3 way)
- An extension is able to make an enquiry call and include the original caller on a "three party conference".
- Public Address Coupling
- The operators headset microphone may be connected to the P.A.system by operating a key on the switchboard.
- Manual Extensions
- Extensions who rely upon the manual board operator for all calls.
- Call Information Logging
- The association of proprietary recording equipment to print out details of external calls.

EXCHANGE NUMBERING SCHEME

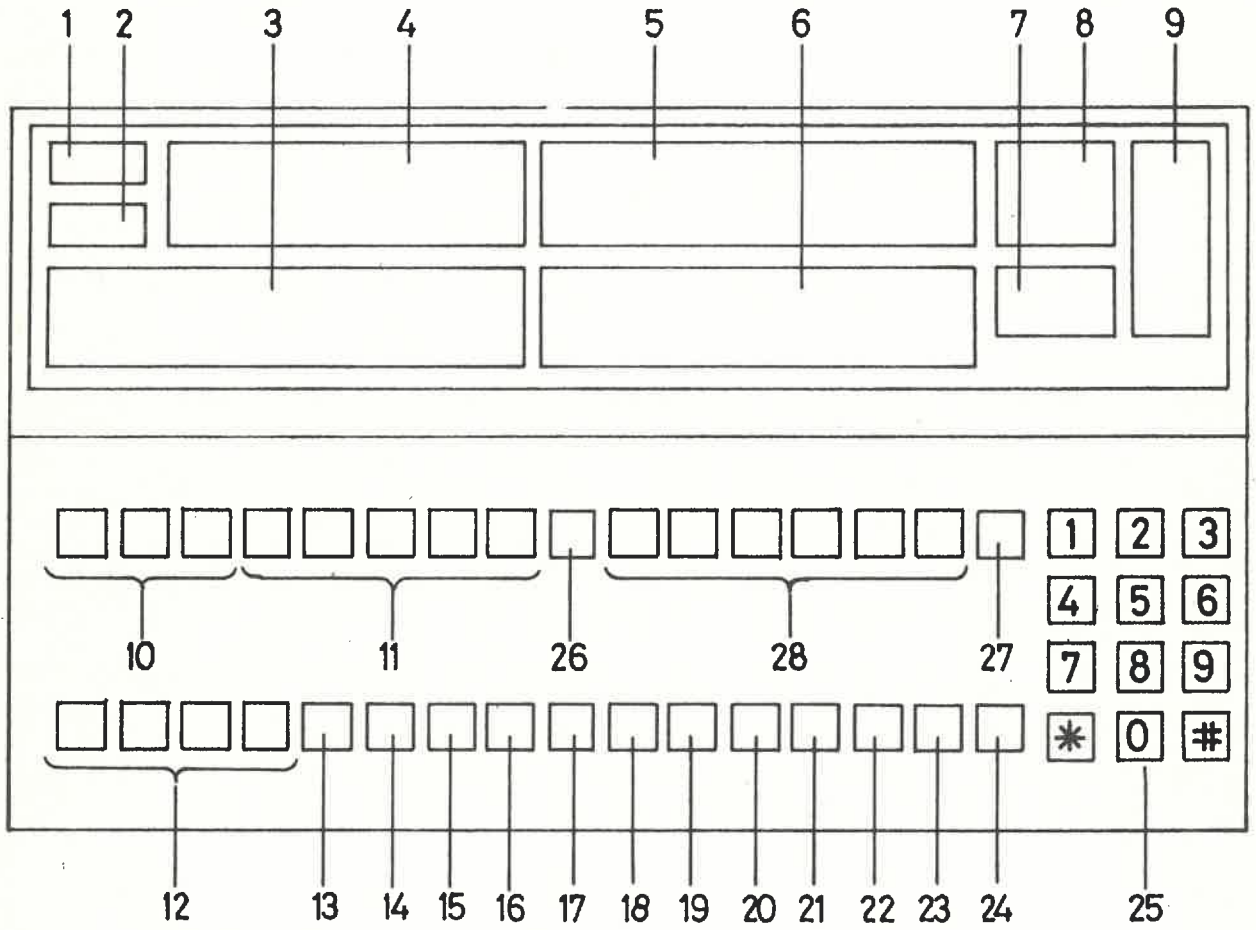
A three or four digit numbering scheme is employed depending upon exchange size. The basis of a three digit numbering scheme is shown below:-

1	Future Short Code Access or first digit of extra extension numbers
2)	
3)	
4)	
5)	First digit of extension numbers
6)	
7)	
8	First digit of junction codes, group hunting numbers etc.
9	Public Exchange code
0	Access to Operator

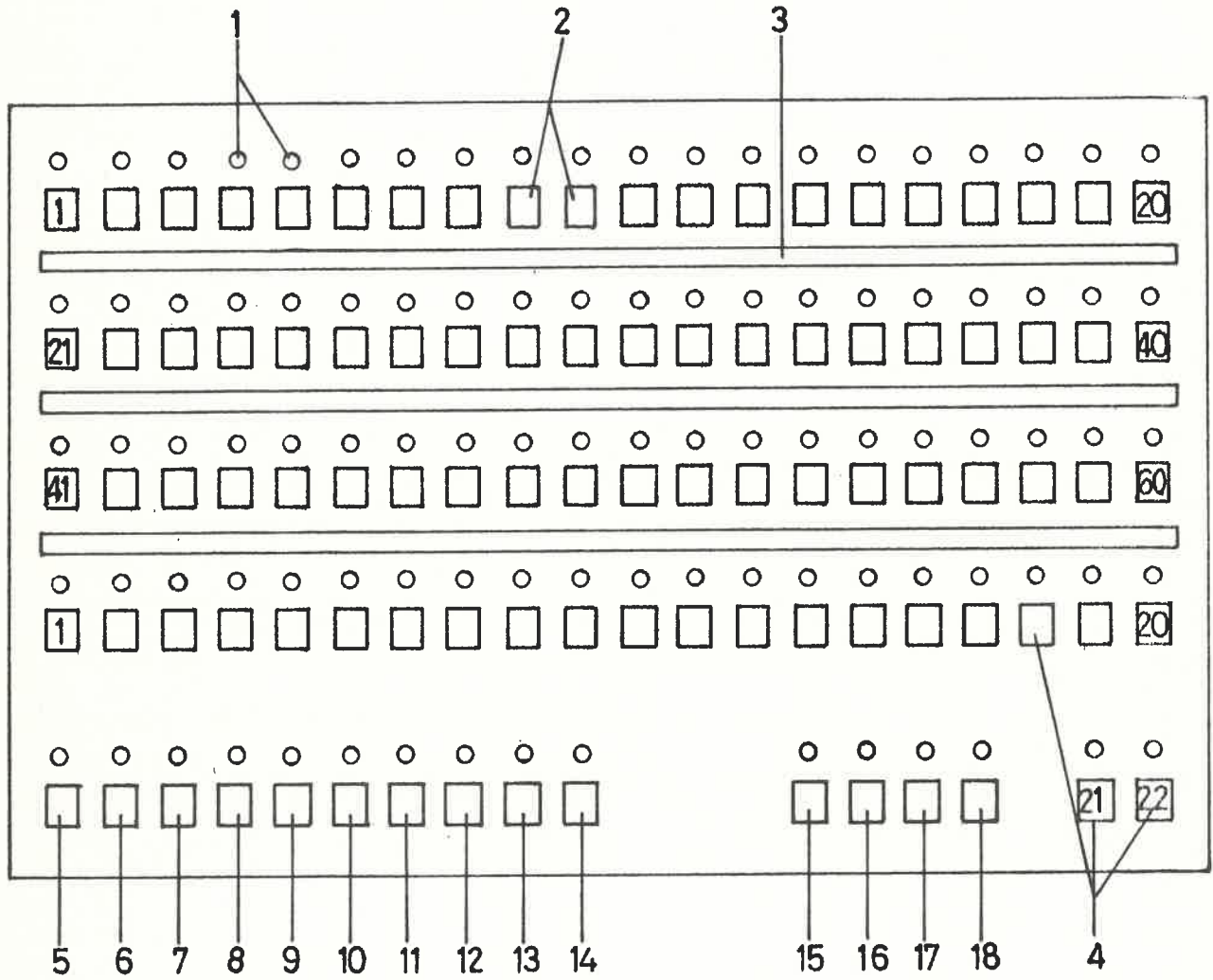
The 'Recall' button is used for Enquiry and Night Service Answer.

Variations to the above scheme may be possible and should this be required it should be stated when requesting a quotation.

MANUAL BOARD LAYOUT



OPERATORS SERVICE PANEL LAYOUT



AIDS TO MAINTENANCE AND TESTING

Maintenance of the system will normally be the responsibility of the Telephone and Telecommunications Authority or local distributor.

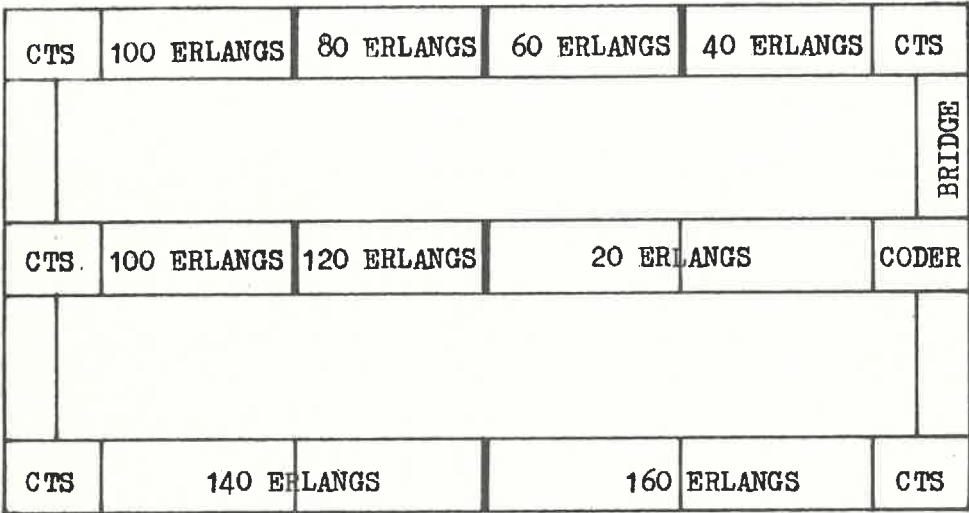
REX 80E is provided with special diagnostic features such that, should a malfunction occur the inconvenience to the user is reduced to a minimum. These features include:-

- 1) Modular construction allowing simple replacement of plug-in units.
- 2) A comprehensive system of alarms with displays on the equipment racks, console and operators service panel and together with an audible signal.
- 3) A Rack Isolation Board allowing certain routes to each rack to be isolated without disturbing established calls.
- 4) A range of meters which in general terms records any reduction in the grades of service provided by the system. These meters monitor, for example
 - Register performance
 - The occupancy of various call routes
 - and First and second set-up attempt failures by the Control and Supervisory Allotter.A periodic check of the meter readings by the maintenance engineer will highlight any abnormal conditions (REX 80E users will normally be unaware that such a condition exists). The maintenance engineer may then attach a diagnostic printer for a more detailed examination of the circumstances. Provision is made for remote siting of the print out device.
- 5) The printer, when connected, will print out any combination of various conditions as selected by the engineer. For instance successful call information or fault information may be selected independently or together. In general the printer output shows the source and equipment used, for each call on which the selected condition occurs, enabling the engineer to locate the area of malfunction in the exchange.
- 6) To test specific equipment 'forced' calls may be made from a particular extension through a pre-selected supervisory and chosen register. A 60KHz transmitter and receiver can be connected to Test Points in order to trace a call.
- & 7) A Test Trolley with outriggers is used when individual units are required to be tested out of the racks but still connected to the system.

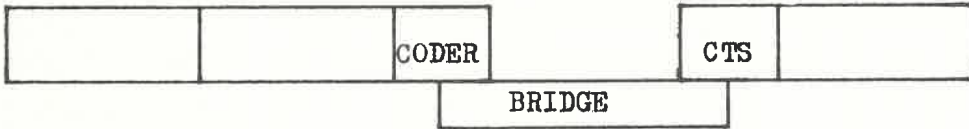
Features 1 to 4 are built into the system, whereas 5 to 7 are ancillary test equipment which would normally be held by the maintenance authority.

EQUIPMENT ROOM LAYOUT

The use of pre-formed, plug-ended cables to interconnect the equipment cabinets aids rapid installation whilst still allowing a variety of different equipment layouts.



OR 40 ERLANGS IN LINE



Other alternative layouts by negotiation.

POWER SUPPLIES

Power for the exchange is normally derived directly from the Public Supply mains and converted into D.C. supplies by power packs mounted within each cabinet.

This method of providing power, means that equipment is installed with the correct power capacity without needing to consider the ultimate expansion requirements.

The power packs have been designed to suit the exchange equipment exactly and quotations will include prices for power.

A mains fail switching facility is provided as a basic feature but standby power facilities are available using either secondary cells or generating sets as a basic power source.

Input for the power packs is 110 or 200/240 volts at 50 or 60 Hz. Current requirements depend upon traffic.

Typically an exchange carrying 60 erlangs in the busy hour will consume an average 20 amps.

PHYSICAL DIMENSIONS

The dimensions of the cabinets including doors are:-

Height	2483 mm
Depth	748.5 mm

The widths vary as below:-

Standard Cabinets	914.4 mm
Coder and CTS cabinets	458 mm
Cabinet doors	15 mm

A covered Main Distribution Frame is enclosed in a standard width cabinet when required.

The dimensions of the Manual Board are:-

Height	144 mm
Width	463 mm
Depth	334 mm

The dimensions of the Operators Service Panel are:-

Height	325 mm
Width	484 mm
Depth	77 mm

Minimum access space around cabinets is suggested at 762 mm with 910 mm between suites with doors fitted.

ELECTRICAL PERFORMANCE

Loop Resistance (including instrument) (Dial)	1600 ohms max.
Pushbutton (DC leg Code C)	1000 ohms max.
Loop Resistance	
Inter-exchange (Loop disconnect signalling)	1000 ohms max
Leak Resistance	
Leg-to-Leg	33000 ohms min.
Leg-to-earth	36000 ohms min.
Signalling	
Dial speed	7 - 12 pps
Dial break ratio	63 - 72%
Pushbutton	International Code 'C'

Ring & Tones

	Frequency ($\pm 5\%$)	Level	Cadence ($\pm 10\%$)
Dial Tone	1.5 cycles of 400 Hz every 20 m/secs	-9 \pm 1.5 dBm	Continuous
Busy Tone	400 Hz	do	0.375 Secs. on 0.375 Secs. off
N.U. Tone	400 Hz	do	Continuous
Special Busy Tone	400 Hz	do	0.1 Secs. on 0.9 Secs. off
Ring Tone	400 + 450 Hz	do	0.4 Secs. on 0.2 Secs. off 0.4 Secs. on 2.0 Secs. off
Operator Intrusion Tone	Pulses	-	Pulse every 500 m/secs
Executive Intrusion Tone	Pulses	-	Pulse every 500 m/secs
Ringling Current (i)	20 - 27 Hz	70 - 100V rms	0.4 Secs. on 0.2 Secs. off 0.4 Secs. off 2.0 Secs. off
(ii)	20 - 27 Hz	70 - 100V rms	1.0 Secs. on 2.0 Secs. off

ELECTRICAL PERFORMANCE Cont

Transmission Characteristics

Speech bandwidth	300 - 3400 Hz
Transmission Loss	less than 1.0dB at 800 Hz less than 1.5dB over range 300 - 3400 Hz
Crosstalk Attenuation	not less than 75dB
Balance to Earth	greater than 40dB
Return Loss	not less than 20dB 500 - 3400 Hz not less than 15dB 300 - 499 Hz against 600 ohms
Psophometric noise unweighted at extension	-40 dB into 600 ohms
D.C. loop resistance of exchange line	200 ohms
Impulsive noise peaks (in busy hour)	less than or equal to 15 counts in 15 minutes at -40 dBm
Group Delay	less than 100 micro-seconds.