DIALOG

Technical Description

6/DLG

CONTENTS

1. INTRODUCTION

Ever since its foundation in 1876 L M Ericsson has designed and produced telephone instruments of different versions. One link in the chain of standard telephone instruments is Dialog which incorporates the latest research techniques, new construction materials and the results of our wide experience as designers and manufacturers. Dialog is attractive in appearance and has excellent technical qualities. Furthermore, the technical and design aspects have been matched to the maintenance requirements.

This description refers to the desk version of Dialog but is also valid for the wall version as the mechanical design and technical features follow the same principles. The transmission properties described are given for Dialog with automatic transmission regulation.

2. GENERAL

Dialog, equipped with dial, is intended for connection to automatic main exchanges, private automatic exchanges and private automatic branch exchanges (fig. 1).

Fig. 1
Dialog

In designing this instrument, the aim has been to make telephoning, i.e., the dialling and handling of the instrument, as comfortable as possible, and to enable the instrument to be easily carried (fig. 2).

With this aim in mind, the most attractive design has been created as a result of close cooperation between engineers and industrial designers.

This means among other things that the instrument constitutes a single, compact design, attractive from all angles (fig. 3a-3c).

Fig. 2
Dialog
is easy
to carry

Fig. 3 a
Dialog
front
view

The design of the instrument case and handset, the mechanical build-up, as well as the circuit, are completely new. Two factors have contributed to these alterations. First, the utilization of new materials and high-quality electrical components available, and, secondly, the application of previous experience.

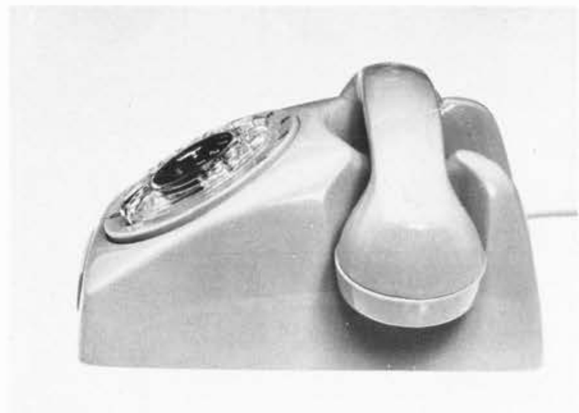


Fig. 3 b
Dialog
side
view

Fig. 3 c
Dialog
rear
view

3. DESIGN

As shown in fig. 4, Dialog has seven main parts, namely

Handset with cord
Instrument cord with wall-terminal box
Instrument case
Base plate
Dial unit
Transmission unit
Ringer unit

Fig. 4
The main parts of Dialog

As the ringer unit, transmission unit and dial unit are keyed into the base plate no screws are required.

The instrument and handset cord conductors are mechanically connected to screw terminals on the transmission unit. The instrument case is fixed to the internal parts by means of only one screw, well located for the repairman and concealed from the subscriber (fig. 5).

Each unit has its own function and can be replaced by an identical unit, regardless of the other units. The assembly method enables a complete telephone instrument to be built up of a few units, each of which comprises several components. From the maintenance point of view this is a most valuable method of design, since

Fig. 5
Only one
screw

Fig. 6
The screw is well located
for the repairman

maintenance in the field can be carried out by semi-skilled staff, with a minimum of tools and instruments. Only a screwdriver is required to replace any unit (fig. 6). When necessary, replaced units can be repaired at a central workshop where qualified staff, tools, and instruments are available.

Case

The DIALOG-case and handset are moulded in acrylate butadiene styrene (ABS), and are manufactured in eight colours. The dyes or pigments used for colouring have been chosen carefully to ensure colour-fastness. The plastic material offers an optimum of high impact- and scratch resistance and can easily withstand the effects of falling from one meter on to a hardwood floor.

The handset cradle is designed so that line disconnection is ensured even when the handset is lightly or carelessly replaced.

Under the cradle and at a convenient distance from the handset, there is a carrying grip to facilitate the moving of the telephone instrument. This execution is far superior to such types where extra arrangements have been added to the case afterwards or where metal handles have been fixed to the case by means of screws.

The frame for the subscriber number is fixed to the front of the case, allowing both subscriber number and routing number, or name of exchange, to be typed.

3.1 Base plate

The base plate, shown in fig. 7 is made of sheet steel, zinc-electroplated with yellow chromate coating and laquered. Unlike L M Ericsson´s earlier telephone instruments, the base plate of this instrument has raised edges to ensure high mechanical stability. The various units can then be keyed into the base plate without affecting its mechanical strength, despite the fact that thin metal is used. The base plate has four non-slip feet of neopren, a durable, migration-free synthetic rubber, which hold the instrument steady during dialling.

The slots in the base plate permit regulation of the ringer and supply locking support for the various units to be mounted. At the cord inlet in the base plate, a hole has been made in the raised edge. The cords, which can thereby be removed one at a time, lock each other and ensure a tight packing.

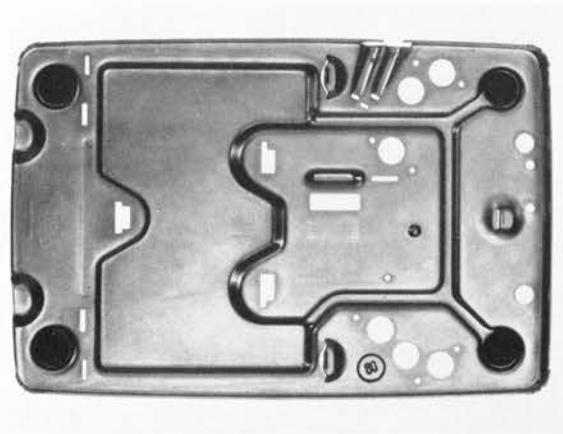


Fig. 7 The base plate from above

3.2 Ringer

The ringer mechanism (fig. 8 and 9) is mounted on a plate (1) provided with three tabs which are inserted in slots in the base plate. In addition there is a hole in the centre of the ringer mechanism plate in which a projecting stud on the base plate fits when the ringer mechanism has been correctly located.

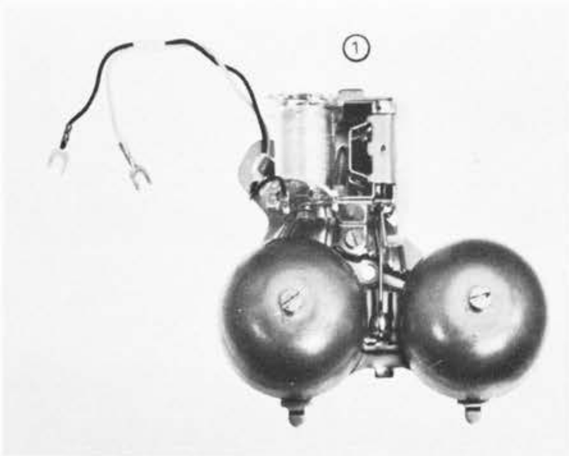


Fig. 8 The bell unit

The ringer is connected to the screw terminals of the transmission unit by means of two PVC insulated conductors, equipped with cable lugs. The ringer is of the polarized type with a single winding (3) and a small AlNiCo permanent magnet (2). The flux generated by the permanent magnet and the flux, originating from the ringing current, is superimposed only in the "air gap", which gives maximum signalling efficiency. The "air gap" is easy to adjust and the coil is replaceable.

The coil former is made of Formaldehyde-plastic and wound with copper wire, insulated by shellac.

All the iron parts are zinc-electroplated with yellow cromate coating and laquered.

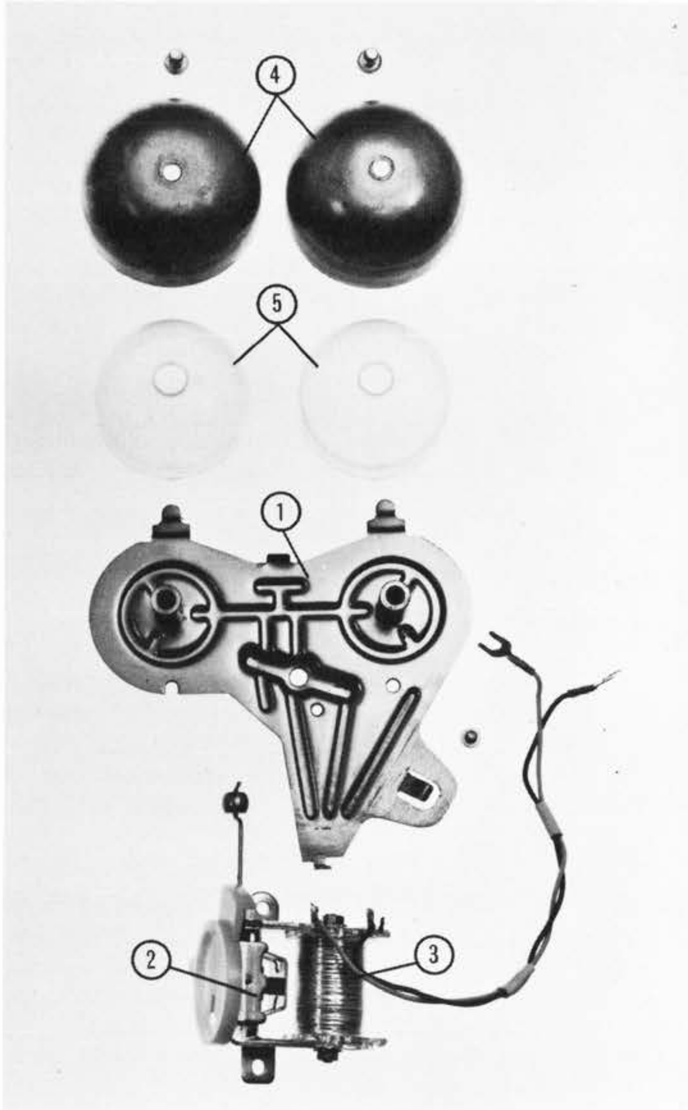


Fig. 9
The bell unit in parts

The gongs (4) are of sheet brass and the fixing holes are eccentric to permit easy adjustment for maximum sound intensity. Two pillars are riveted to the ringer-plate in order to support the gongs and the resonator cups (5).

The ringer produces a pleasant sound, penetrating even to people with impaired hearing (limitation of hearing generally starts at high frequencies). These important properties are obtained as a result of the gongs having different pitches, and the subharmonics of the signal being amplified by Helmholtz resonators (5).

The Ringer Output Spectrum is shown in fig. 10.

The ringer can be equipped with sound regulation if required. By reducing the movement of the bar by means of a tag under the instrument, the sound intensity of the ringer can easily be altered - continuous regulation from full output (74 dBa) to the soft signal of a buzzer (45 dBa).

The impedance at 25 Hz (c/s), with a 1 μF capacitor in series with the bell, is 4 500 Ohm, and at 800 Hz (c/s) 36 000 Ohm.

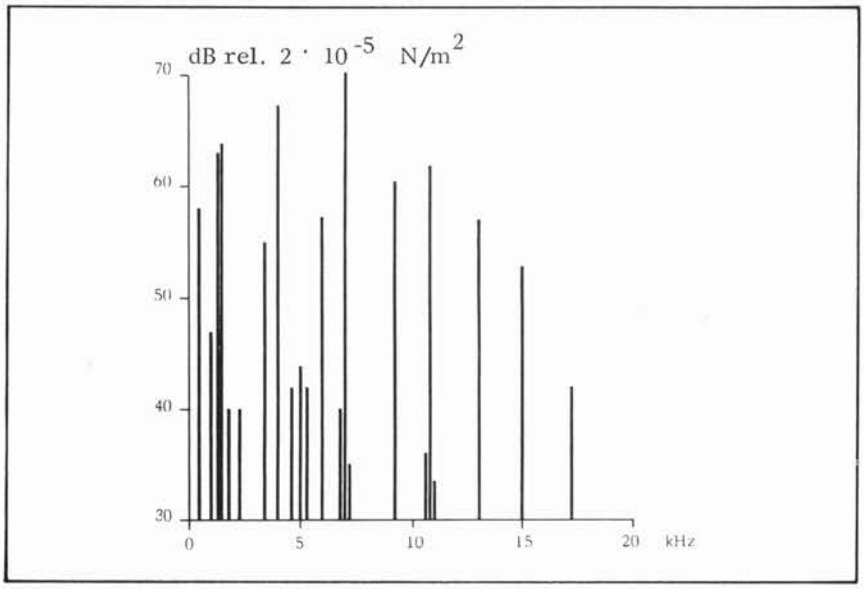


Fig. 10 Ringer output spectrum

3.3 Transmission unit

The printed board is made of insulating material. On the rear side there is a printed wiring, which connects all the components in the transmission unit. The components are grouped on the other side, bell and dial and cords being connected to the board with screw terminals.

The transmission unit (fig. 11) comprises induction coil, resistors, capacitors and varistors as well as cradle-switch springset. Details of these components are given in the following.

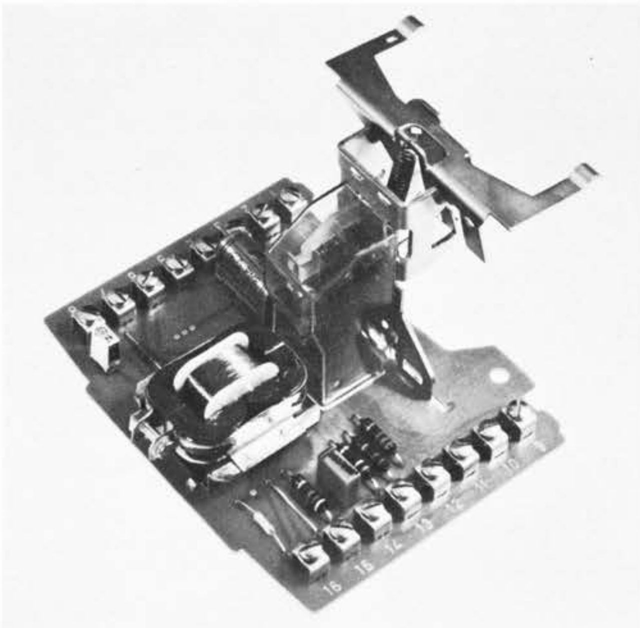


Fig. 11 The transmission unit

3.3.1 Induction coil

The induction coil (fig. 12) is of the antisidetone type with five windings and a C-core of laminated silicon iron, protected against rust by means of varnish. This design has resulted in high permeability and an important saving of material. High inductance values have been obtained with moderate copper losses, and the very good coupling between the winding sections results in a high sidetone attenuation.

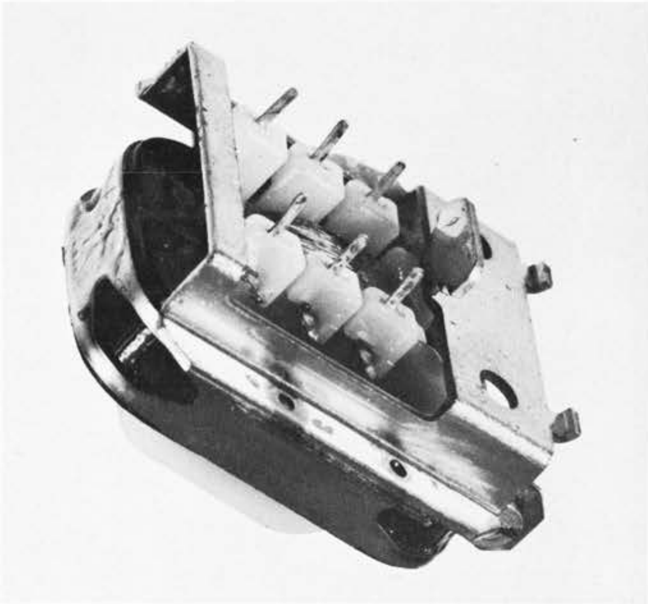


Fig. 12
Induction
coil

3.3.2 Resistors

The resistors (fig. 13 A) used in Dialog are of the modern carbon-film type with colour code or value marking. They are fully tropic-proofed.

3.3.3 Capacitors

Self-healing metallized paper or polyester capacitors (fig. 13B) are used in Dialog. They are protected against moisture by being moulded in epoxy resin.

Each single component comprises one capacitor.

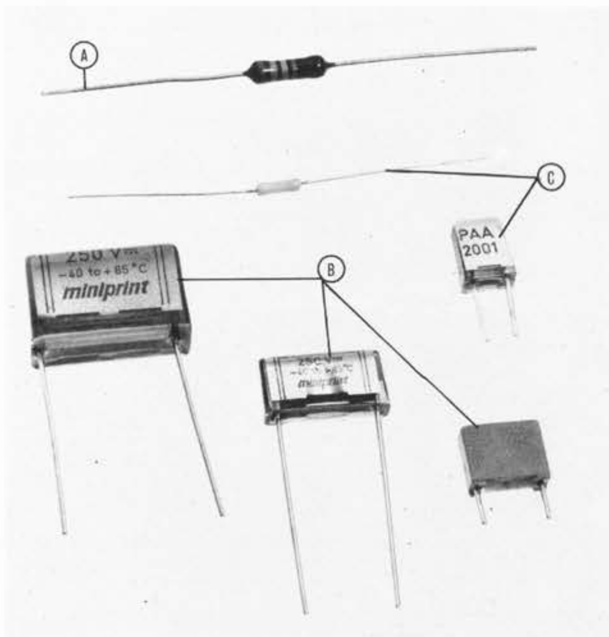


Fig. 13

3.3.4 Varistors

Dialog has a number of varistors (13 C), one working as shock absorber for the receiver and the others as part of the equalizing network. The varistors are voltage dependent, non-linear resistors. With one exception they are made of silicon. The exception is the shock absorber which is made of selenium and moulded in epoxy resin. The silicon-type varistors are enclosed in glass capsules. Each single component comprises one varistor.

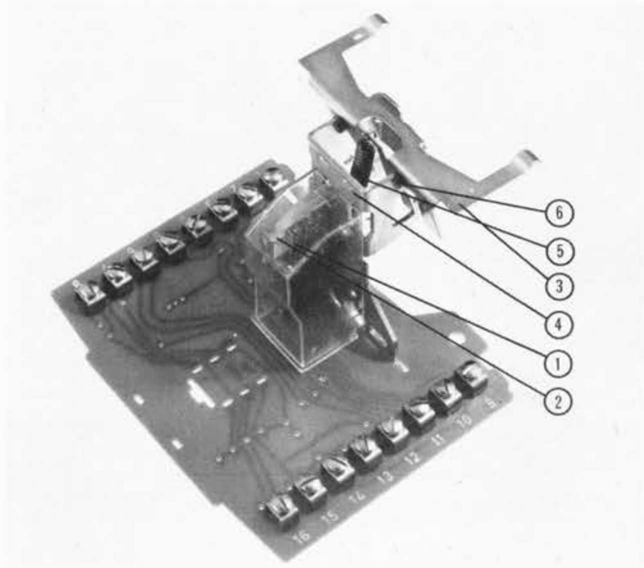


Fig. 14
The cradle switch springset fitted to the insulating sheet

3.3.5 Cradle-switch springset

The cradle-switch springset (fig. 14) consists of 8 springs (1) with twin contacts. Together with insulating spacers, the springs are mounted directly on the springset frame (4) and operated by a cradle-switch (3) with two levers.

When the handset is lifted a tension spring (5) operates the cradle to a fixed position. On replacing the handset, two plungers are depressed, which actuate the levers and the cradle-switch turns over to its first position, allowing a return spring to reset the contact springs via a lifting comb (2). The cradle-switch frame as well as the levers are made of sheet steel. Nylon bearings (6) reduce the amount of friction to a minimum and increase the life-time. The weight of the handset and the load on the tension spring are so adjusted that good function and a wide margin of safety are achieved.

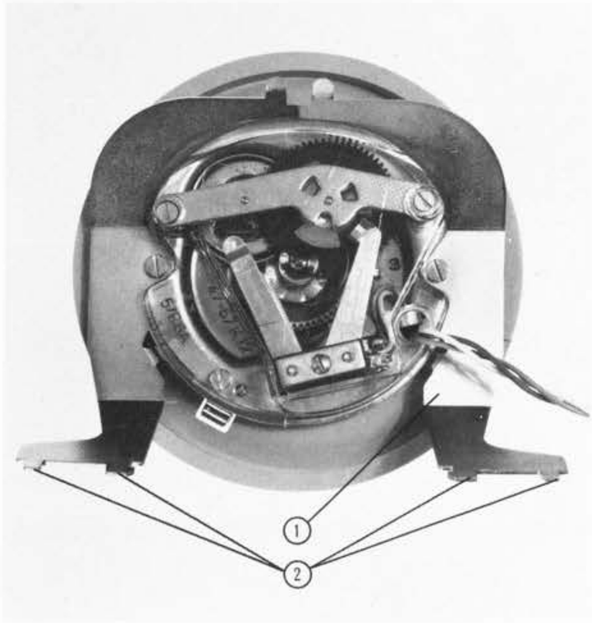
The hook-switch frame contains a threaded hole for the single screw, by means of which the instrument is opened.

3.4 Dial unit

The dial (fig. 15), is mounted on brackets (1) equipped with four tabs (2), which fit into four slots in the base plate. To obtain good locking effect, these four slots are displaced slightly in pairs.

The covering plate (3) of the dial is furnished with figures outside the finger wheel (4). This has been possible since the plate is larger than on earlier conventional types of telephone instruments.

The finger wheel is made of transparent plastic.



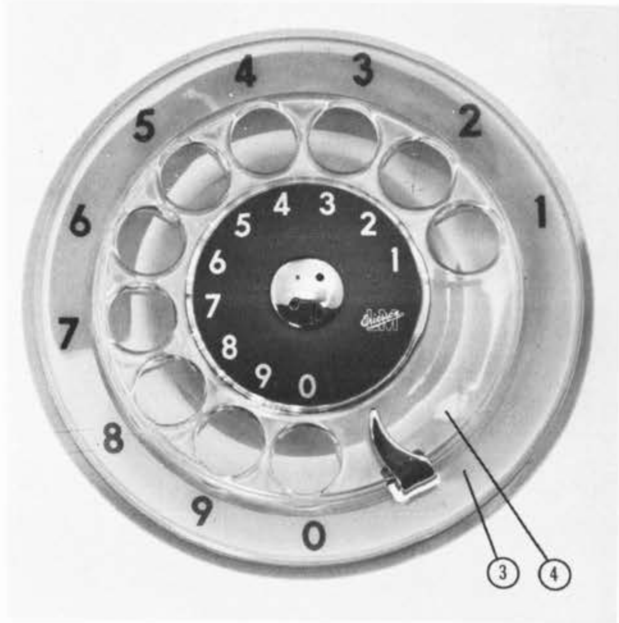


Fig. 15 a The dial unit-rear view

Fig. 15 b The dial unit-front view

The dial mechanism is the same as in L M Ericsson's previous telephone instruments and is guaranteed for an average of one million operations, which, for six-digit numbers, corresponds to 18 dialled calls per day for 25 years.

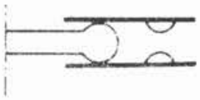


Fig. 16

The dial speed is easy to adjust by means of a screw-driver.

The rim of the impulse cams is domed to provide a perfect sliding surface for the impulse springs. The impulse cams are thus protected against damage from the edges of the springs. The impulse wheel is made of nylon. Owing to the low friction of nylon, no lubrication is necessary.

3.5 Instrument case

The thermoplastic material used in the instrument case (fig. 17) gives a smooth, colour-fast surface, which has good resistance to impact and is not easily scratched. It is not affected by perspiration, skin creams, and lipstick. The material has good ageing properties. Water and soap will remove almost any stain.

The instrument cradle is designed so that the handset, even if carelessly replaced, always falls into the correct rest position.

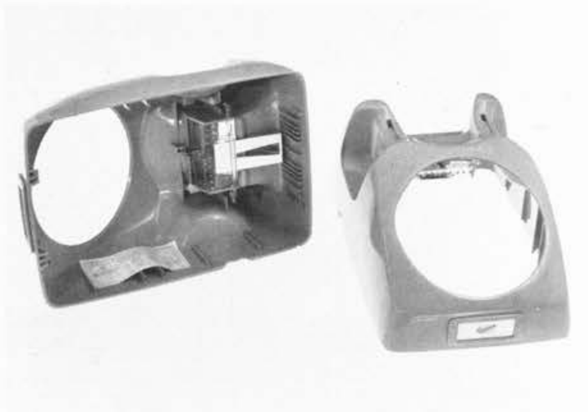


Fig. 17 The instrument case

Fig. 18 The grip at the rear of Dialog

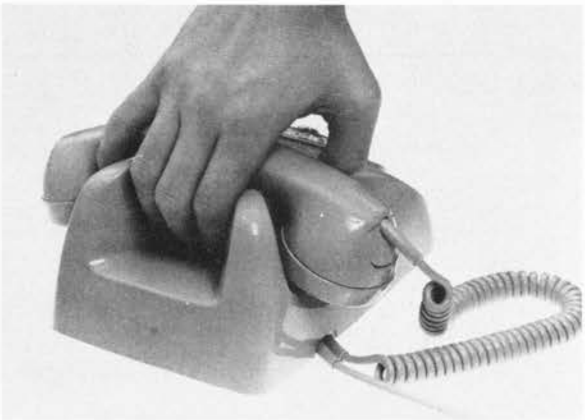


Fig. 19 This is the way to carry Dialog

In this way the switching equipment of the exchange is not unnecessarily occupied, nor the instrument put out of order, by the cradle-switch springset not returning to home position.

Under the handset at the rear of the instrument, there is a grip (fig. 18-19). By inserting the fingers in this pocket and gripping the handset with the thumb at the same time, the instrument can easily be carried. The screw for fastening the instrument case is located inside this grip.

Fig. 20 The subscriber number frame

The front of the instrument is provided with a frame (fig. 20) for fastening the subscriber number card. This frame is held in position by means of a spring inside the case, allowing the subscriber number card to be easily inserted without any removing of the casing.

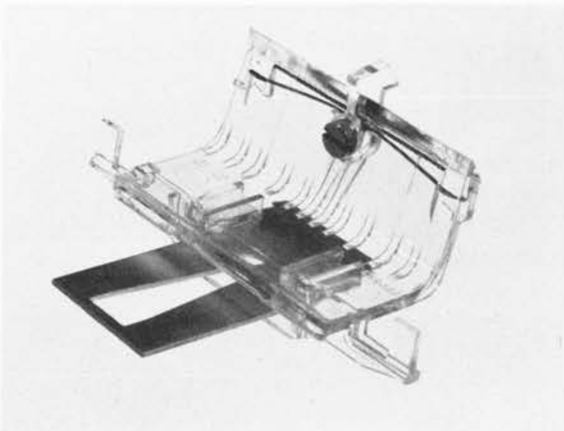


Fig. 21 The transparent inset

At the rear of the instrument there is a transparent plastic inset (fig. 21). The light so admitted into the instrument discourages the entry of insects. The inset also acts as a support for the selfretaining screw and retains the plungers when the case is removed. The inset at the rear edge of the case is kept in place by the flat spring.

The case is on the inside provided with several ribs, which correctly locate the case relative to the base plate.

On the left-hand side of the case (seen from the front) are small inlets for the handset and instrument cords.

3.6 Cords

The cords (fig. 22) consist of three PVC insulated conductors, which are covered by a PVC sheathing. This execution prevents humidity from penetrating which could cause shortcircuiting between the conductors.

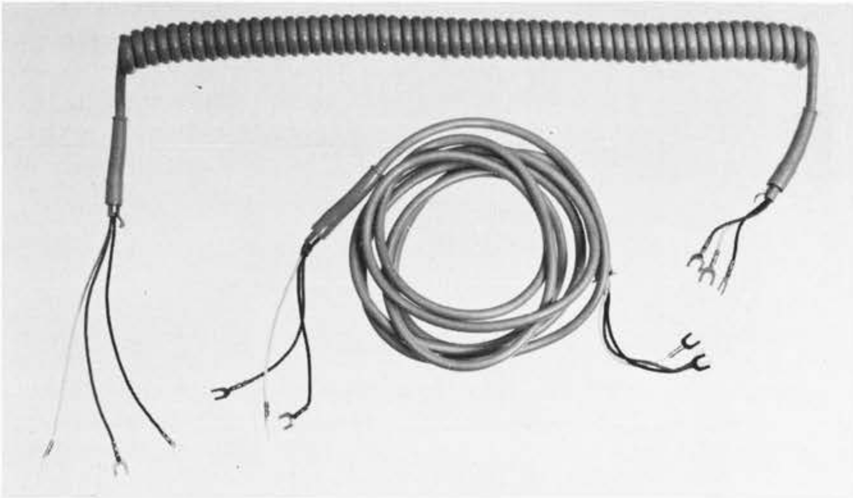


Fig. 22 Handset and instrument cords are made of PVC

All conductors are of standard tinsel threads, each composed of 4 x 2 flexible cadmium copper alloy tapes, lapped around a polyester centre. This design gives maximum flexibility.

The conductors, insulated by PVC of various colours, are laid side by side to form a core, which is covered by PVC. The nominal diameter of each uninsulated conductor is 0.8 mm. The thickness of the PVC insulation is 0.25 mm. Thus the diameter of each insulated conductor is 1.3 mm. The overall diameter of the cord is 4.4 mm. The electrical resistance of each conductor does not exceed 1.0 ohm/m at a temperature of 20 °C.

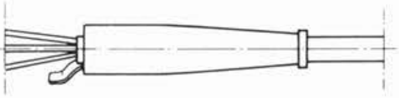


Fig. 23 The mechanical unloading of the cord. The detent is fixed to a hole in the base plate

The length of a normally extended handset cord is 1.3 m and the instrument cord is 1.7 m long.

The conductors are provided with cable lugs for the connection to the terminal screws. The instrument cord has a separate conductor for connection of an extra bell to the wall terminal box.

A continuous study of the maintenance of instruments has shown that the length of life of the cords depends to a high degree on whether or not mechanical strain is allowed to spread to the cable lugs and screw terminals. A cord provided with a good mechanical unloading device to relieve the strain on the cable lugs, has a longer life than a cord with a weak mechanical unloading device.

The handset cord and the instrument cord each have a mechanical unloading device (fig. 23), designed as metal detents, each fastened to a hole in the base plate. The other end of the handset resp. instrument cord has the same unloading device which fits into a slot in the transmitter cup in the lower part of the handset resp. into the wall terminal box.

3.7 Handset

The handset (fig. 24) is made of the same plastic material as the instrument case.

The handset is well balanced for easy and comfortable handling.

The distance and angle between the earpiece and mouthpiece are especially designed to provide the correct speaking position for the average telephone user.

The mouthpiece is of the flat type. Owing to its design and position in relation to the mouth, the voice of the speaker is caught in the most suitable way, regarding efficiency and intelligibility as well as comfort.

The earpiece is shallow, i.e. it provides resonance space for good acoustic matching to the ear volume.

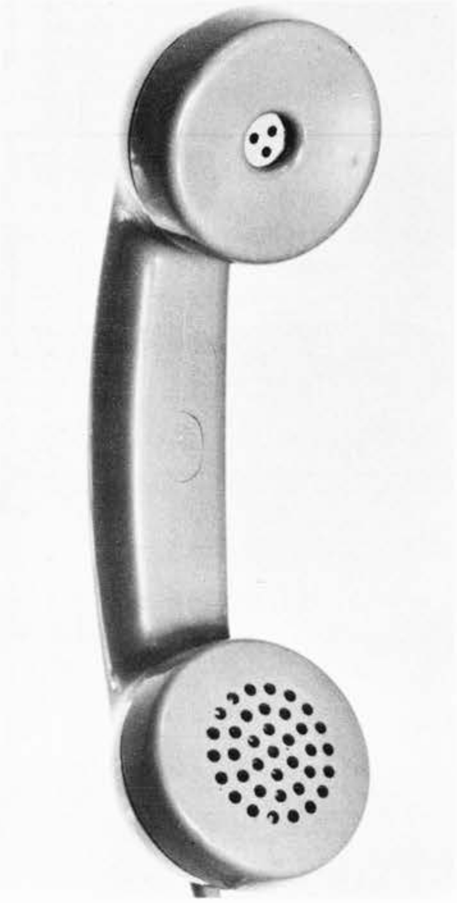


Fig. 24 The handset

Fig. 25 The different parts of the handset (Front view of the transmitter cup)

The transmitter and receiver insets are designed as easily changeable capsules (fig. 25) thus facilitating comfortable and speedy maintenance. Contact springs are silver plated to ensure good contact. The receiver has screw connections.

The connection wires which are laid inside the hollow handset shaft are easily removed.

The transmitter is placed in a removable cup (fig. 25-26) in the lower part of the handset. The rear of the cup is provided with terminals for connecting the handset-cord conductors as well as a slot for the mechanical unloading device.

Fig. 26
The transmitter cup with handset cord and the two conductors to the receiver

3.7.1 Transmitter

The external shape of the transmitter can be seen in fig. 27. The transmitter design is such that the transmitter characteristics are practically independent of the speaking position. The ratio (1.3:1) between the highest and lowest transmitter resistance provides good evidence of this when the transmitter, with constant feeding voltage, is made to assume all possible positions.

The entire surface of the electrodes (6), (14) is in permanent contact with the carbone granules (3). Consequently, the whole electrical current will be conducted through the quantity of carbon affected by speech vibrations.

The stability is further improved by the rough walls of the granule chamber, which prevent the carbon granules from packing during conversation. The electrode surfaces are gold plated to achieve the best possible contact between them and the carbon granules.

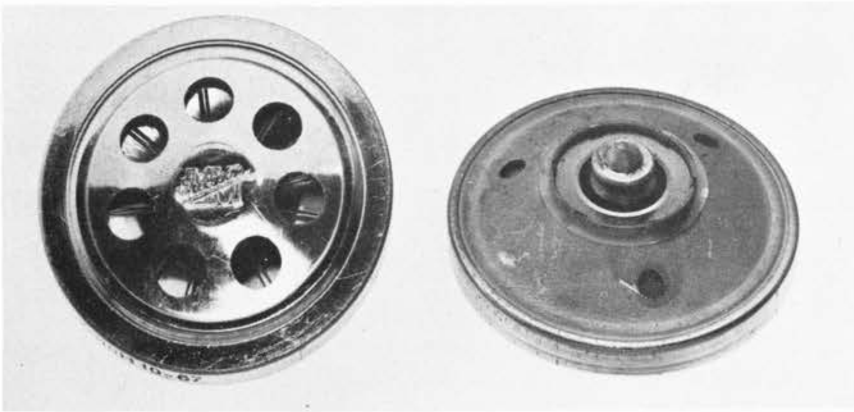


Fig. 27
The transmitter

At high frequencies the transmitter response curve shows an increased degree of sensitivity. This is achieved by the small mass and frequency dependant stiffness of the diaphragm system (15). This stiffness is also a function of the loading on the acoustical volume. The total acoustical volume consists of two chambers separated by the transmitter inset frame. Thus the transmitter cup forms the second chamber. This frame (11) has three holes covered with fabric discs (12), (13) which at low frequencies have virtually negligable acoustical impedance so that the conical diaphragm is loaded by the total air volume in the two chambers. The acoustical stiffness of the system at low frequencies is therefore small and the response curve has a good basic level.

Over the highest range of transmitter frequencies, the holes are closed, since there is not time for full pressure equalization between the two chambers. The diaphragm then works against a smaller volume. As a result, the combined stiffness increases with the frequency and the mechanical resonance curve of the oscillating system is displaced towards the higher frequencies. Covering the holes with fabric discs attenuates sharp resonance peaks and smoothes out the response curve.

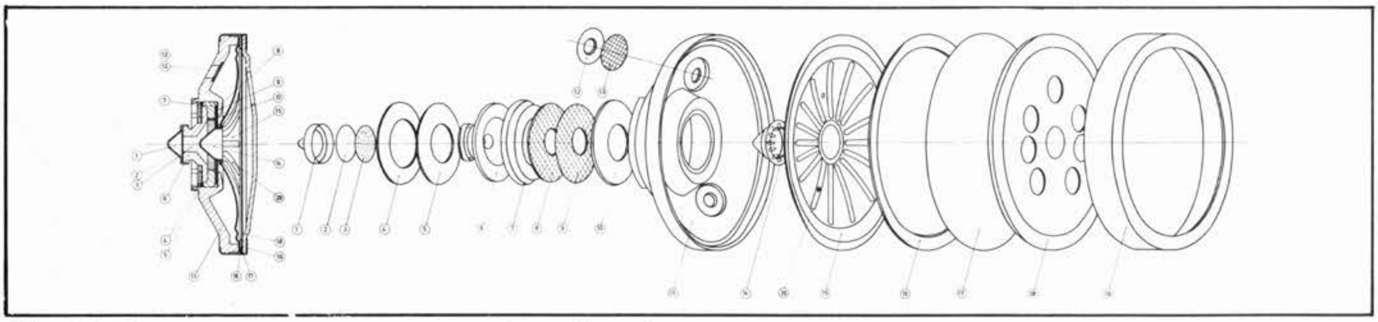


Fig. 28 The transmitter in cross section and parts

A small hole (20) has been made in the diaphragm to counteract adverse static pressure with air pressure variations and to a counteract disturbances from low frequency room noise.

To protect it against mechanical damage, the transmitter is provided with a perforated lid (18). Ingress of humidity is prevented by a polyutheran disc (17) fixed inside the lid. The capsule design and the choice of materials ensures that the transmitter maintains its good characteristics under tropical conditions.

3.7.2 Receiver

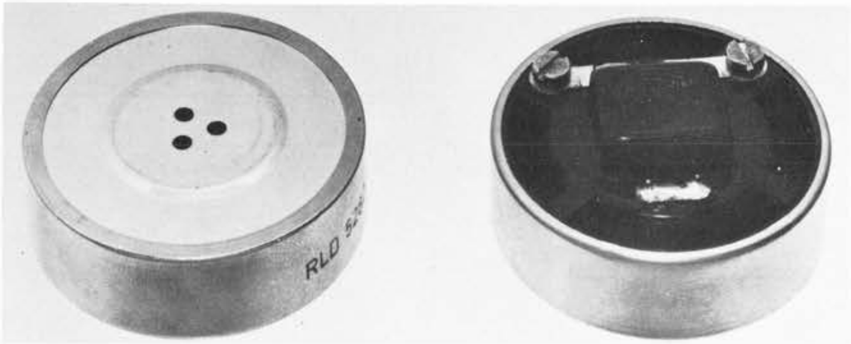


Fig. 29
The receiver

The external shape of the receiver can be seen in fig. 29.

In theory the receiver´s magnetic system is of the conventional type, but by a careful choice of material and accurate optimal magnetizing, a considerable increase in output level has been achieved.

The receiver body is of phenolic plastic. (1)

The diaphragm (8) is made of a special ferro-cobalt vanadium alloy which exhibits high reversal permeability with normal operating flux density. An additional diaphragm (9) of sheet iron is included, and serves as a magnetic shunt, providing a further increase in the transfer factor. A thin aluminium ring (10) separates the magnetic shunt from the protective cap (11). The receiver inset is sealed by a chromium plated brass cover (13).

The short ALNICO steel magnet (3) which has high coercive force is, together with its pole pieces (4), cast into the receiver-well by means of a corrosion-proof metal (2) which expands when cooling. This method provides an extremely stable mechanical anchorage and ensures at the same time that the correct air gap is maintained between the pole pieces and the diaphragm. Grinding of the pole pieces is unnecessary, which makes it possible for us to avoid any risk of altering the magnetic properties.

The thermoplastic coil bobbins (5) have been designed to form a wall in the space behind the diaphragm, creating two acoustical chambers. The response curve is evened out by the same method as applied in the transmitter, i.e. a hole (6) covered by a fabric disc (7). This design is most effective in smoothing the response curve over the high frequencies and thereby ensuring correct reproduction of the weaker sounds.

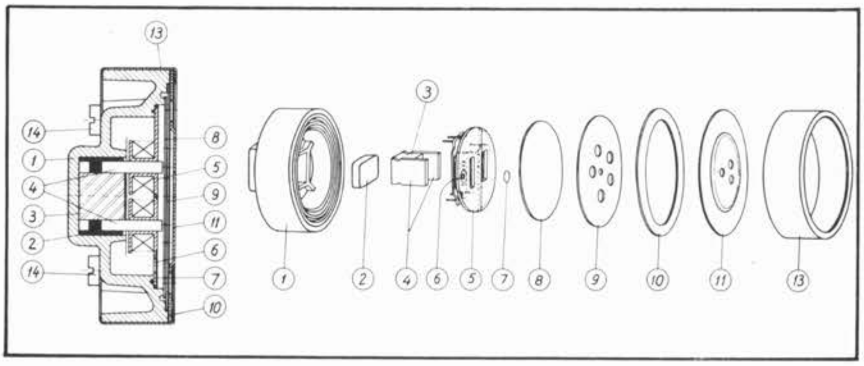


Fig. 30 The receiver in parts and cross section

The receiver side of the telephone instrument has dry contacts, screw terminals (14), as only a.c. flows through the contact positions.

3.8 Wall terminal box

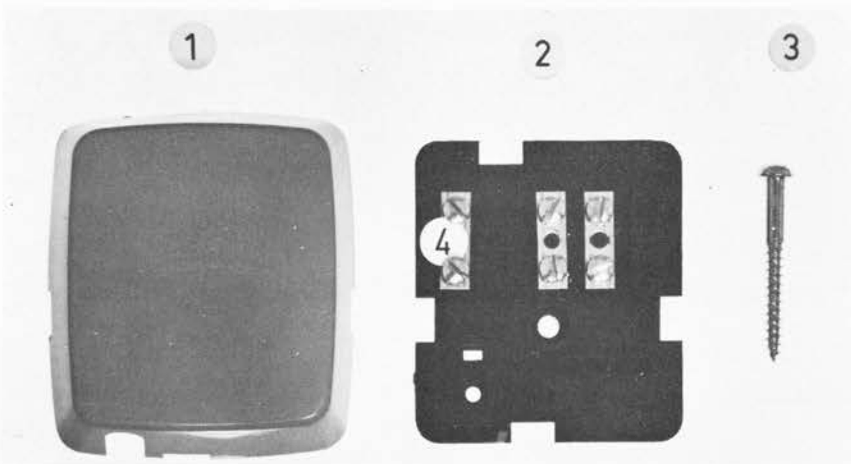


Fig. 31
The wall
terminal
box

The wall terminal box (fig. 31) consists of a small rectangular plastic (carbonate filled with glass-fibre) base-plate (2) with a cover (ABS) (1). The mounting on the wall is done with a single screw (3), and the box is hold in place by means of three points on the back-side of the base. These points are pressed into the wall.

To connect the instrument cord as well as the incoming line and an extension bell, screws, (4) fixed to the base-plate of the wall terminal box, are used. Notice that the incoming line can be put in from all four sides of the box.

4. DESCRIPTION OF THE TRANSMISSION REGULATION DEVICE

DIALOG is provided with an automatic sensitivity control also called automatic transmission regulator. The function of this device is to limit the sending and receiving transmission level when the local line is decreased and improve it when the local line is increased. The result is that the transmission level, within certain limits, will be almost constant and independent of the length of the subscriber´s line.

Receiving regulation is about 4 dB, which means that receiving is attenuated with 4 dB on a 0 Ohm line compared to what it would have been without regulation.

The purpose of regulation is that the signal picked up by the ear shall have the same level independent of the length of the local line up to 1 000 Ohm, line attenuation included. This means that the signal will be heard equally well when the instrument is connected to the exchange on a short line as on a long line. For the subscriber telephoning, this is particularly pleasant and for the total transmission, advantageous.

The reasons for regulating the transmission level at sending are as follows:

Prolonged life of the transmitter

The basic principle here is that the current through the transmitter shall always be constant, independent of the length of the line. This is achieved with a nonlinear element varistor V2, the conductance of which increases with the voltage drop across it, connected in parallel with the transmitter. When the voltage across the transmitter and the non-linear element increases, as a result of reduced length of line, the conductance of the element increases. In this way the unnecessary part of the feeding current for the transmitter is shunted away from the transmitter.

Long-line efficiency

The instrument is designed as to give its optimal efficiency on the long-line - just where it is most needed. It has high transmitter effect for line resistances of 1 500 Ohm.

The receiving regulation device operates as follows. The symbols used refer to fig. 32.

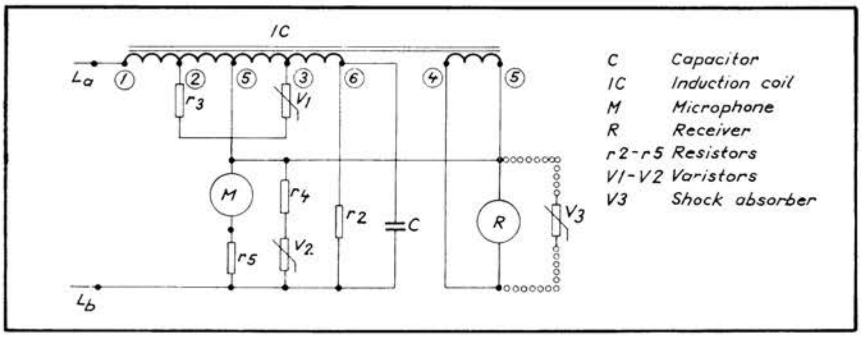


Fig. 32 The circuit diagram of Dialog

Two component´s resistor r3 and varistor V1 are connected in parallel with the 2 - 5 - 3 branch of the IC winding. The varistor V1 is a non-linear element whose impedance is high with low voltages across it but decreases (becomes low-ohmic) with increasing voltage.

The transmission circuit is designed to provide a constant transmission level from 0 Ohm up to about 1 000 Ohm line resistance. In order to achieve this the shunting circuit (V1-r3) is dimensioned to give an attenuation of about 4 dB at 0 Ohm line resistance with a continuous fall - off to 0 dB at approx. 1 000 Ohm line reisistance. The 2 - 5 - 3 branch is in the primary winding and 4 - 5 in the secondary of a transformer circuit. Considering the above, when the primary winding is almost short-circuited at 0 Ohm line resistance the transformer efficiency is reduced by about 4 dB and consequently the receiver is fed with a lower voltage.

The instrument´ s balancing impedance (c-r2) is designed to give as good as possible sidetone attenuation over lines of greatest possible length. In fig. 33 the side tone reference equivalent is shown as a function of various cable lengths.

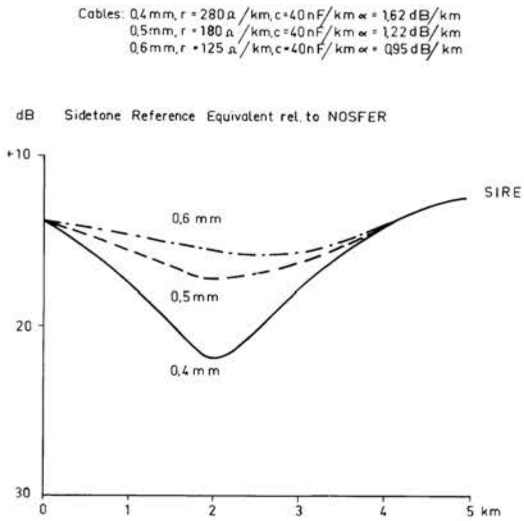


Fig. 33

Instrument impedance

The instrument impedance must be variable so that, seen from the line, it coincides with the line impedance and causes minimum reflection losses.

In fig. 34 an RX diagram shows the instrument impedance and phase angle´s variation at a number of different line resistances.

Another function is a requirement which has become stronger during the last few years, namely the instrument to line adaptation. Attempts have always been made to achieve the best results in this respect, but it is only with the coming of long-distance international connections that a real need has arisen. If we consider the case of a call from one point of the earth to another point, no appreciable transmission losses take place since amplification is applied over the entire length of the connection. However, noise, added and amplified at every point of amplification, does enter, as do reflections at every poor matching point. One point where reflections can arise occurs where the instrument is connected to the line. In this way a poor connection is established right from the start. From this it will be understood how important good adaptation between an instrument and the local cable is for setting up good long-distance connections, which are becoming more and more common.

The function of shock absorber is to protect the speaker´s ear from incoming shock voltages caused by such exchanges where sparking and clicking occur when the selector is set out. Such shock voltages can also result from impulsing and line faults. Shock protection is of course not necessary for the function of the instrument and can be omitted if desired.

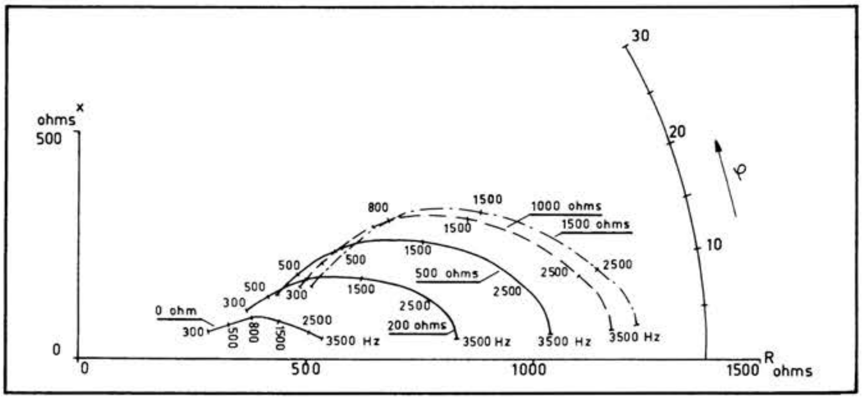


Fig. 34

5. TRANSMISSION PROPERTIES

After studying that part of the instrument diagram directly concerned with transmission regulation, we must turn to the remaining transmission properties of the instrument. These properties are of course to a great extent dependent on the transmission regulation.

The curves referred to relate to the instrument connected to a feeding system of 48 V with 2 x 250 Ohm feeding coils.

Fig. 35 shows the response curve during sending with 600 Ohm termination. The shape of the curve applies independently of the line resistance up to 1 000 Ohm. As can be seen the level is good and the curve even, without resonances. The curve rises with frequency for compensation of the cable attenuation, which increases with the frequency.

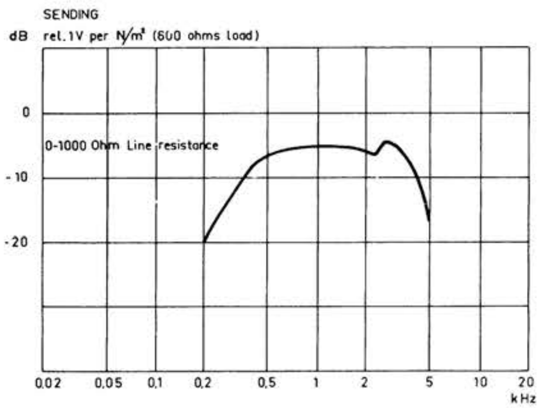


Fig. 35

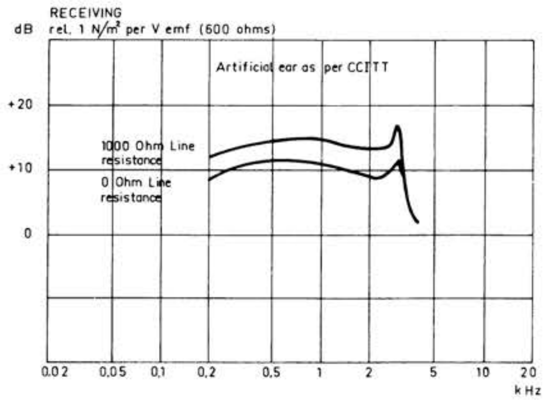


Fig. 36

Fig. 36 shows response curves during receiving with two different line resistances and the instrument loaded with 600 Ohm. The curve has a good level and a flat response. The highest level in this diagram shows the curve for 1 000 Ohm line resistance.

This agrees with what has already been said about the design of the instrument. With a reduction in the line resistance the level falls owing to the automatic transmission level regulation, and its lowest value is at 0 Ohm line.

The results of the curves already discussed are confirmed by the reference equivalent curves, which will now be dealt with. First, however, a few conditions applying in general for these curves will be mentioned. The representative frequency for which the cable attenuation is added, varies with the cable diameter.

Cable attenuation for the different cable dimensions according to the latest proposal by CCITT are:

0.4 mm cable:	1.62 dB/km
0.5 mm cable:	1.22 dB/km
0.6 mm cable:	0.95 dB/km

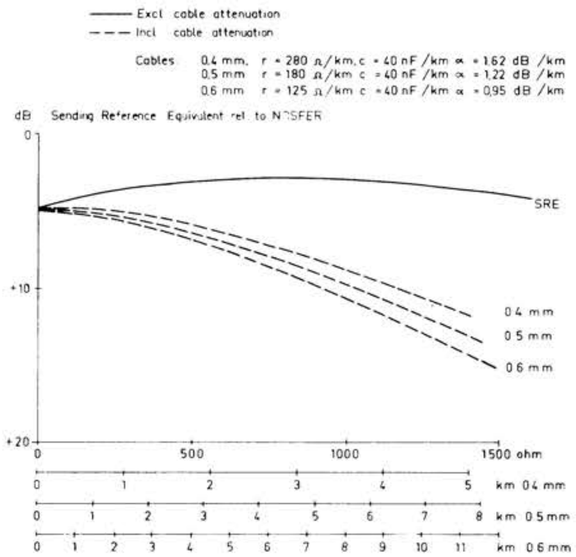


Fig. 37

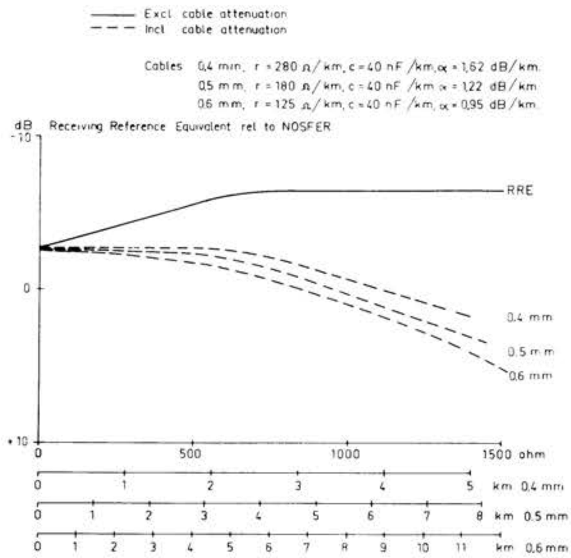


Fig. 38

In fig. 37 - 38 sending and receiving reference equivalents for the instrument as a function of the line resistance, and cable attenuation, are given. The sending reference equivalent, SRE, is practically independent of the line resistance, while the receiving reference equivalent, RRE is improved in the increased line resistance up to about 1 000 Ohm. At 1 000 Ohm the effect is about 4 dB higher than at 0 Ohm.

Since SRE, without cable attenuation, is practically constant, a curve with SRE as a function of the line length, inclusive cable attenuation, will naturally vary with the latter. This point is also illustrated in fig. 37, which represents the function produced for three different cable dimensions. In an instrument without regulation the slope of the curve would naturally be steeper, since attenuation has to be added owing to the reduced transmitter feeding.

The receiving level as function of increased line resistance, shown in fig. 38, is reduced, when cable attenuation is included. The result is a flattened curve, which means almost constant receiving level within the range 0 - 1 000 Ohm line resistance. The difference shown by cables with small cable diameter is of course dependent on the high resistance per km. The ideal is a regulation which completely compensates cable attenuation. Since cable types vary, the design of Dialog is a compromise, with the best possible values for common types of cables.

6. DISMANTLING AND REASSEMBLY DURING MAINTENANCE

Since the telephone instruments consist of separate parts the work of dismantling and reassembly, in case of fault, is very easy.

A brief account of this follows.

Desk type

The screw inside the handgrip is first loosened while the transparent inset is DEPRESSED in the way shown in fig. 39.

The case can then be lifted off, all the parts being visible for inspection.

Fig. 39 Depress the transparent inset and loosen the screw

To dismantle the instrument further, one of the dial supports is pressed outwards and eased slightly upwards (fig. 40). Once this support is free of the two slots in the base plate, the other support can be removed in the same way.

The dial now remains fastened just to the cradle springset frame. If the dial supports are lifted so that the dial is parallel with the base plate (fig. 41), the dial can easily be detached from its slots in the cradle springset frame.

Fig. 40 Press one of the dial support legs outwards and upwards

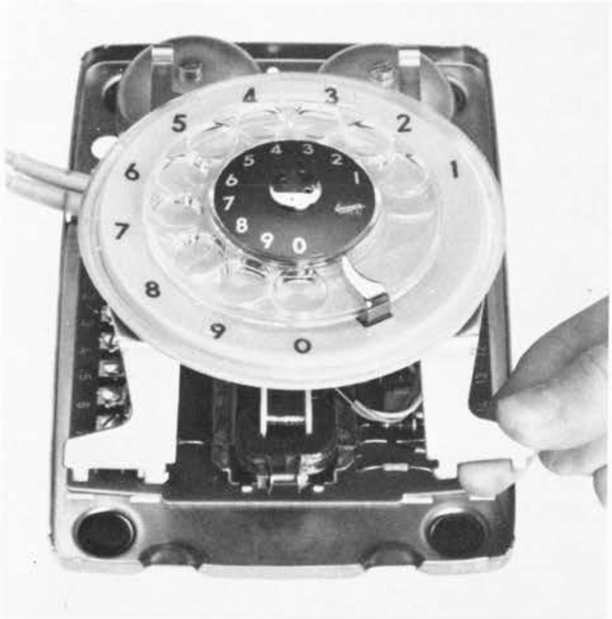


Fig. 41
The dial support is lifted until the dial is parallel with the base plate

By loosening the three conductors of the dial from the terminal screws, the dial can be completely removed.

The transmission unit is best removed by first loosening the instrument and handset cords in such a way (fig. 42) that the cords are taken out one at a time.

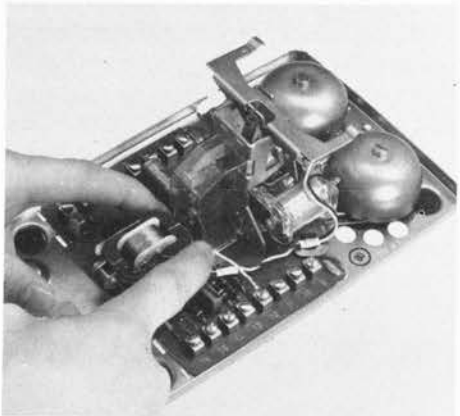


Fig. 43 Press the fingers against the thumb

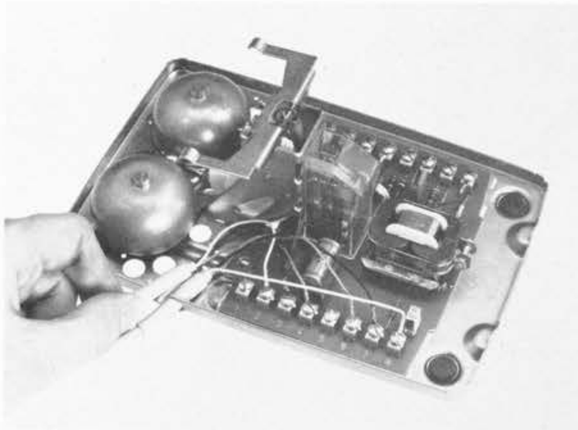


Fig. 42
Loosen the cords

The first step in the dismantling of the transmission unit consists of placing two fingers on the transformer and the thumb on the front edge of the base plate in the way which can be seen in fig. 43. If pressure is then applied, the transmission unit slides out. A click is heard when the ringer is released from the transmission unit. Once the transmission unit is free, the ringer is lifted sufficiently (fig. 44) so that the part of the cradle-switch spring-set that is slotted to the base plate is released. The transmission unit is then removed from the ringer and all remaining terminals are loosened.

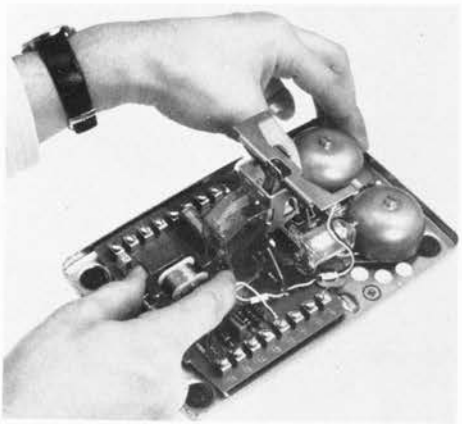


Fig. 44
Lift the ringer and take away the transmission unit

Only the bell unit is now left on the base plate and can be lifted away.

It only remains to dismantle the handset. This should not require any instruction. However, after the transmitter cap has been

Fig. 45
All parts are now disman-tled

unscrewed and the transmitter taken out, it should be mentioned that the entire cup in which the transmitter lies, is to be removed from the handset. The inset in which the handset cord is fastened is pressed lightly into the handset. This inset is part of the cup and the whole assembly can be removed through the handsets' transmitter opening.

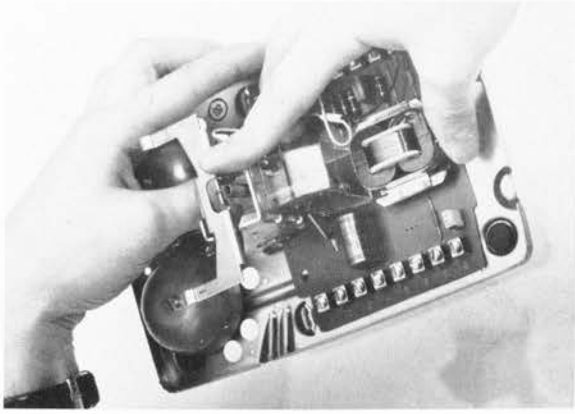
Screws for connecting the conductors in the handset cord are found at the back of the cup. There is also a slot for the mechanical unloading of the cord (fig. 46). By first loosening the easily accessible screws, the handset cord can be removed and replaced.

Fig. 46
Loosen the screws and remove the handset cord

Reassembly of the units after inspection or service should not cause anyone, aware of the method of dismantling, any difficulty. However, it should be pointed out that the ringer must be slightly depressed at the ringer coil end (fig. 47), when the transmission unit is to be inserted in its slots in the base plate. The reason for this is that a lip on the ringer is to be fitted into a slot in the transmission unit.

Depress the ringer slightly before the transmission unit is inserted in its slots in the base plate.

Fig. 47
Depress the ringer slightly before the transmission unit is inserted in its slots in the base plate



When mounting the case, put a screw-driver on the screw and DEPRESS the transparent inset until the screw fits into the threaded hole. Then tighten the screw.

This brief account shows how simply the Dialog can be dismantled and reassembled.

Fig. 48

Fig. 49

Wall type

Insert a pointed object, such as a paper clip in the small hole at the side of the cord inlet (fig. 49).

The case can now be lifted off. (fig. 50).

To dismantle the instrument further one of the dial supports is pressed outwards and eased slightly upwards (fig. 51).

Once this support is free of the base plate the other support can be removed in the same way.

(The dial can be released by being pulled upwards and by removing the connections with a screw-driver).

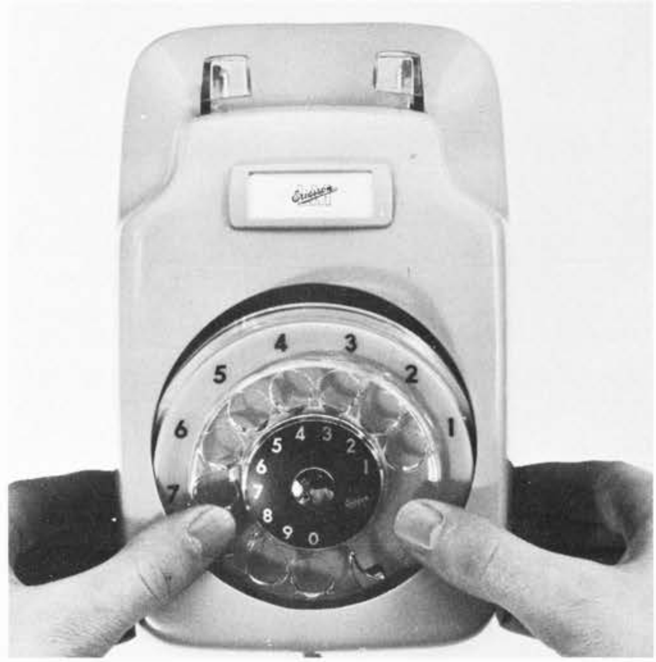


Fig. 50

The dial supports now remain fastened to the cradle springset frame. Lift the dial so that it can easily be detached from the slots in the cradle springset frame. (fig. 52).

Further dismantling is carried out as for the desk type DIALOG.

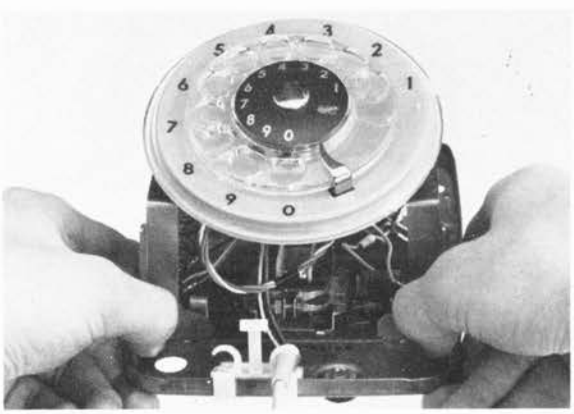


Fig. 51

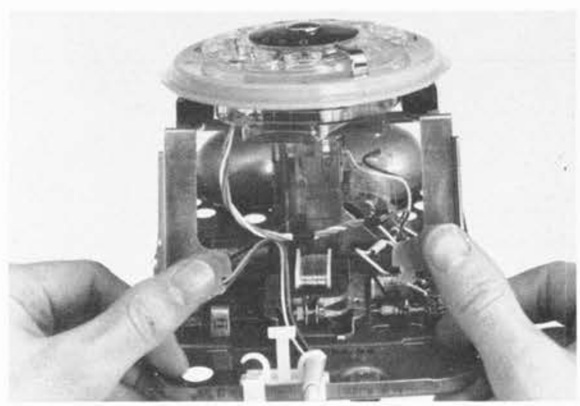


Fig. 52

7. MAINTENANCE

For most telephone administrations, the maintenance costs of a complete network, make up a large share of the operating costs. Since these costs affect the financial result, it is obvious that maintenance costs should be reduced wherever possible. It is equally obvious that a telephone administration, making attempts to lower the maintenance costs of plants in operation, should request the manufacturer of the plants, to take measures for facilitating these attempts.

Since the telephone instruments are an important and integral part of the network, it is natural that special attention is paid to their maintenance.

So, with the design of the DIALOG telephone instrument, great consideration should be paid to those factors that affect the maintenance financially. Before it was possible to solve the relevant problems successfully and systematically, each part of the telephone instrument had to be improved. For several years our engineers were occupied with this task. This work continued until a point was reached, when it was decided that the time had come to proceed along new and more radical lines. Our aim was to produce a telephone instrument based on reliable, tested, high quality components, either already available or available later during the process of construction. The properties and design of this telephone were to have the prerequisites for reducing the main expense items of maintenance.

A close study of the maintenance costs for telephone instruments, based on our own experience of maintenance and that of our customers, shows that the main expense items are: staff, travelling, tools and instruments.

The most obvious way to lower staff costs is by decreasing the number of staff, by utilizing the qualified men better and allocating routine work to less qualified people. But is this way in line with the desire to keep, or improve the present maintenance standard? Our answer to this is Yes, provided that the maintenance of the telephones concerned can be simplified and that the telephones have such properties that the need for fault-correcting measures is reduced.

If the travelling expenses for each fault correction can be lowered, the whole travelling expenses account can be reduced. This can be achieved by careful planning of the routes, effective fault correction to avoid repeated visits, and telephone instruments requiring a minimum of attention so that, except for obvious faults, complaints may not arise.

The expense item for tools and instruments can be reduced if the design of the telephones is simple and if repair work in the field can be limited to replacing a few easily exchangeable parts. More complicated repairs can be carried out in a central workshop.

What are the properties of L M Ericsson's DIALOG that enable maintenance costs to be reduced?

The carefully planned grouping of the parts makes it possible to determine in which part the fault lies, on receipt of a complaint. Since replacement of faulty parts is the rule, the maintenance man can, before leaving, be advised of the probable measures to be taken. Such a possibility enables more repairs to be carried out per day than if the real cause is not discovered until the man arrives.

Lengthy jobs such as soldering and replacement will be dispensed with. The supply of spare parts required for fault correction is so limited that it can always be easily checked. The great advantage of the replacement system is that on-the-spot determination of the real cause of a fault is almost unnecessary - a prerequisite for employing less qualified maintenance staff.

Thus, a less qualified repairman can correct more faults than a trained man previously could, and there is greater guarantee of better work done, which implies a reduction in staff costs for each fault correction. By always replacing faulty units with reliable, tested units produced from tested components and high-quality material, the risk of repeated visits is considerably reduced.

The simplified maintenance work permits careful planning of the routes and calculating the time for replacement of faulty parts. Today, the possibilities of correcting more faults, the reduced risk of repeated calls owing to unsatisfactory repairs, the ease of planning routes, and the saving in time, mean a large reduction in travelling expenses.

By simply using a screwdriver, any unit of the telephone can be replaced. The faulty unit is then sent to the central workshop. Here, a small team of qualified repairers with tools and testing equipment can work in proper conditions and the work will be done more accurately.

In order to systematically utilize the advantages which the telephone instruments provide from the maintenance point of view, it is vital that repairs in a central workshop are carried out rationally.

L M Ericsson has investigated the vital problem of overhaul and maintenance work, and are prepared to give advice on rational planning and running of a central workshop, and supply the necessary equipment.

The aim of the suggested methods is to make each operation simple, timesaving and easy to learn so as to enable relative inexperienced people to produce uniform quality of work.

L M Ericsson can also supply forms for recording the measures taken. These forms may then be used as a basis for keeping statistical records of repair work and also for pricing.

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G 1551 - 918 Ue (Rev. A 17.4.68)

Printed in Sweden