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Touchfone (New Standard Telephone)

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TOUCHFONE (New Standard Telephone)

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1. INTRODUCTION

A new range of Touchfones has been developed to replace the existing decadic and dual tone multi frequency (DTMF) Touchfones. The new Touchfones will also eventually replace the 802 rotary dial telephone and then the new Touchfone will become the standard telephone.

The new Touchfone is available in three models, they are a decadic telephone with last number dialled (LND), a decadic telephone with LND, access pause and recall and a D.T.M.F. telephone with recall. All models have an electronic tone ringer with a volume control. The telephone will be available in five colours, Fleece White, Golden Haze, Sage Green, Cinnamon and Musk, all telephones have a matching handset cord and a Cinnamon line cord. The keypad buttons are beige with charcoal grey numbers.

TELEPHONE NUMBER CODES AND FACILITIES

Telephone Number Code	Type	Dialling Mode	Last Number Dialled	Automatic Access Pause	Recall Button
807	Table	Decadic	Yes	No	No
8071	Table	Decadic	Yes	Yes	Yes
8081	Table	DTMF	No	No	Yes

FIG. 1. 807 TELEPHONE

2. FACILITIES

DIALLING

All the new Touchfones use push-button dialling. The 807 Decadic Touchfone sends pulses at the rate of 10 pulses per second. Sending commences as soon as the first digit is entered and continues until all digits are sent. The last number dialled (LND) (upto 22 digits) is stored in the dial circuit memory, this number can be sent to line after restoring dial tone and pressing the hatch # button. The number in the LND memory can be erased by lifting the handset and pressing the star * button otherwise the LND is stored for at least 15 minutes (typically 2 hours).

The 8071 Decadic Touchfone has all the features of the 807 telephone plus access pauses can be inserted into the number train (if required by PABX's etc) by the following procedure:-

i. automatically, when the user pauses during dialling and all previously entered digits have been outpulsed. Two access pauses may be entered in this manner,

ii. manually, after the two automatic pauses have been entered, by operating the star * button when outpulsing of the digits prior to the access pause has ceased.

Both methods place a 3 second pause(s) into the LND.

The DTMF telephone (8081) generates two voice frequency tones when a keypad button is pressed, the tones transmitted by each button are as follows:-

	1209 Hz	1336 Hz	1477 Hz	
697 Hz	1	2	3)	
770 Hz	4	5	6)	KEYPAD
852 Hz	7	8	9)	BUTTONS
941 Hz	*	0	#)	

There is no last number dialled or pause facility provided on the DTMF telephones.

TONE RINGER

The telephones have an electronic tone ringer which has an output level control located on the base. The volume can be adjusted by inserting a coin into the control knob to set the desired output level.

RECALL

An earth recall facility is provided as standard equipment on the 8071. The 8081 telephone, is fitted with earth and timed loop break recall.

FIG 2 8071/8081 TELEPHONE

3. CONSTRUCTION

The new Touchfone has a plastic base and case top. These two plastic mouldings are held together by lugs at the front of the telephone and one captive screw (with Phillips and flat blade head) located near the back edge of the telephone. The case top has a recess below the keypad for the telephone number label. The label is held in place by a clear plastic cover. The case top also has a carrying handle behind the handset resting position. The gravity switch plungers are free to move but held captive in the case top.

When the case securing screw is undone the case top can be pivoted towards the front of the telephone then removed. The keyblock is mounted on two pillars moulded into the telephone base. To remove the keyblock, simply lift it from the pillars and disconnect the ribbon cable.

The recall button assembly fits into a slot at the front of the keyblock pillar. A two wire (make contact) unit is used for recall in 8071 telephones and a three wire (change over contact) unit is used for recall in 8081 telephones.

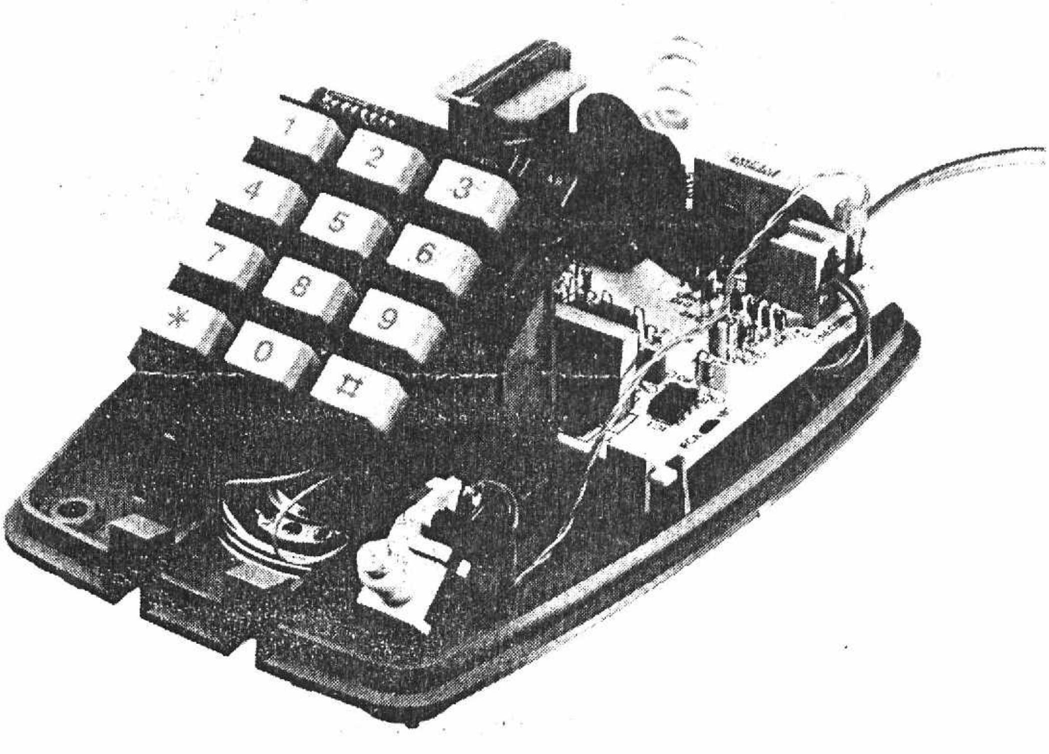


FIG. 3. TELEPHONE WITH CASE TOP REMOVED

When the line and handset cords, speaker and keypad have been disconnected the PBA can be unclipped from the telephone base, this can be done by applying pressure with your thumbs to the two lugs holding the PBA while using your fingers to lift the PBA. See figure 4.

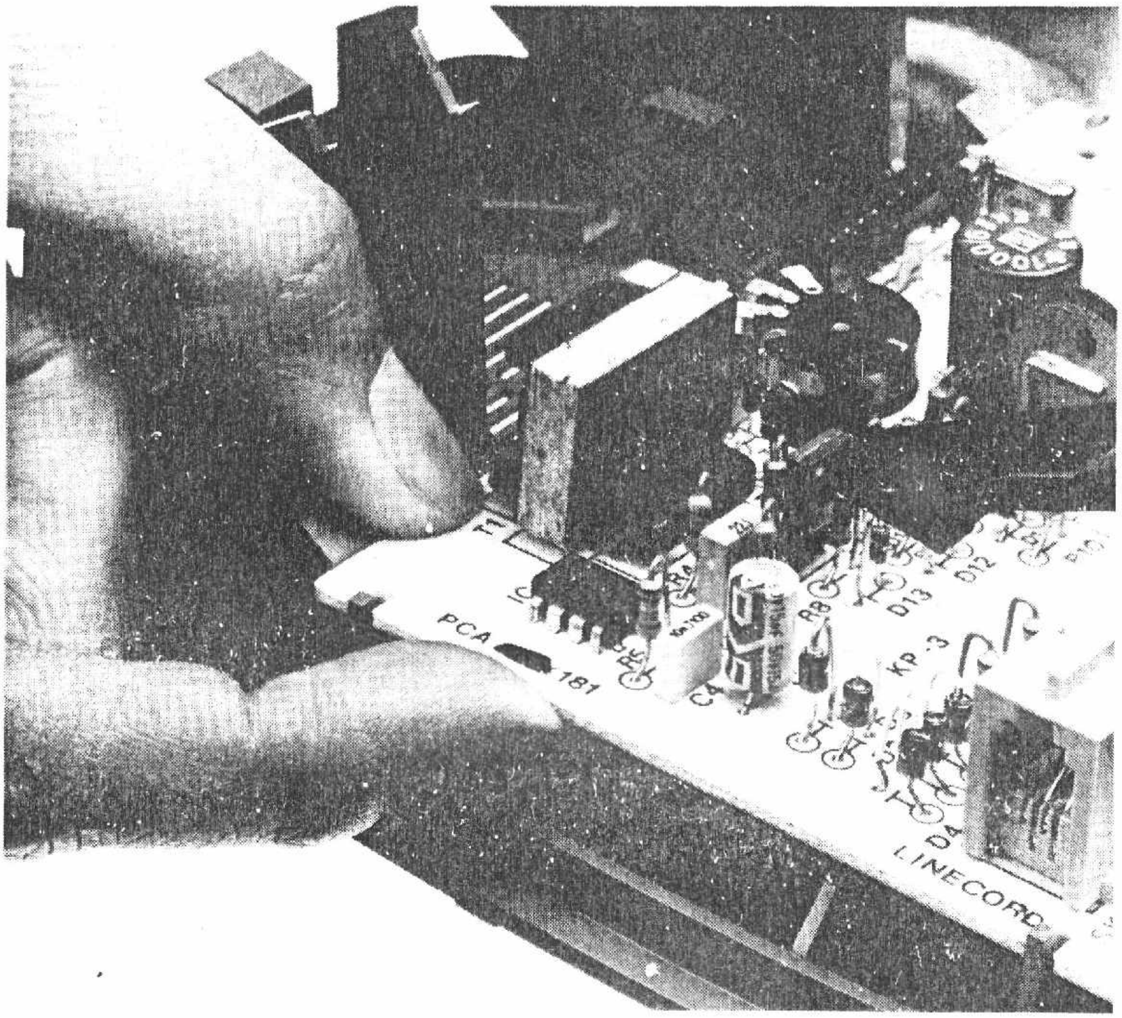


FIG. 4. REMOVING PBA

To replace the PBA first line up the PBA with the rear of the telephone then apply pressure onto the PBA near the two front lugs until the PBA clips into position. See figure 5.

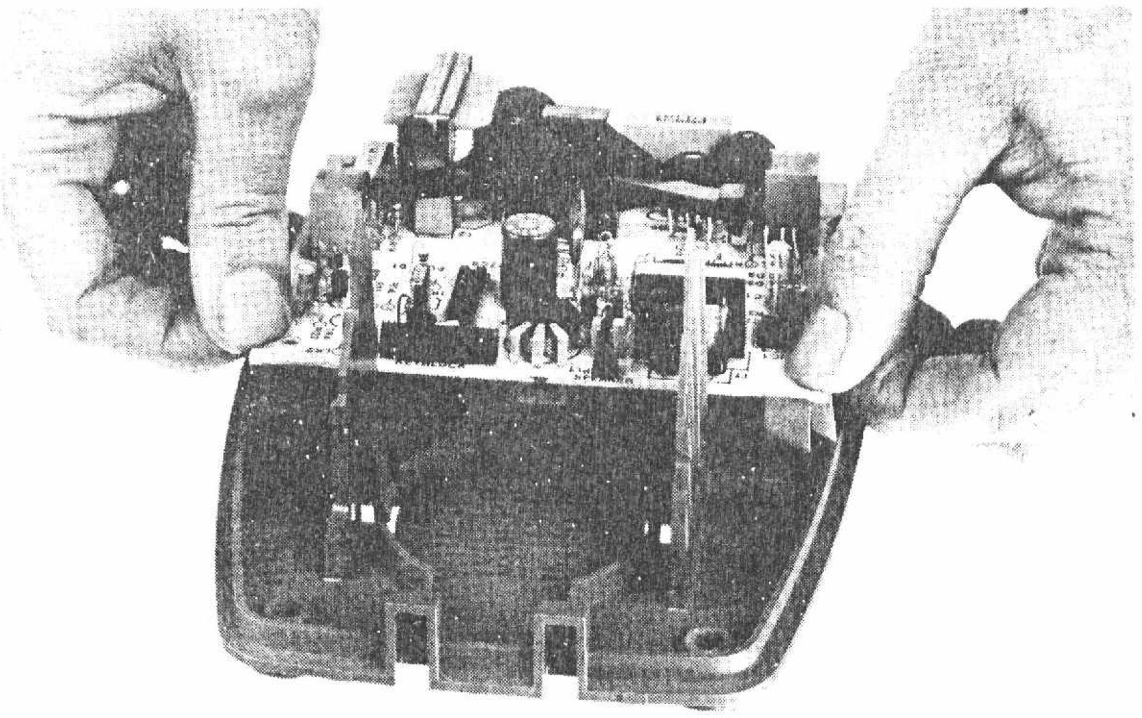


FIG. 5. REPLACING PBA

To remove the speaker, one of the small plastic plugs must be removed using a screwdriver see figure 6. Then the lug holding the speaker is free to move to the side to release the speaker, a screwdriver may be necessary to get enough leverage to move the lug. See figure 7.

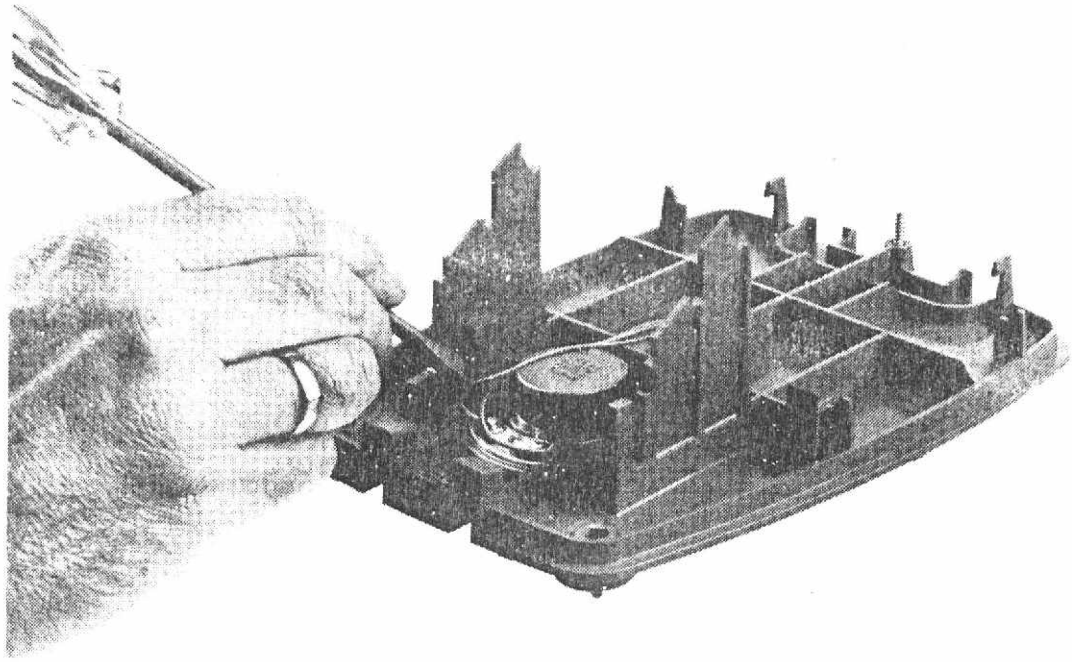


FIG. 6. REMOVING PLASTIC PLUG

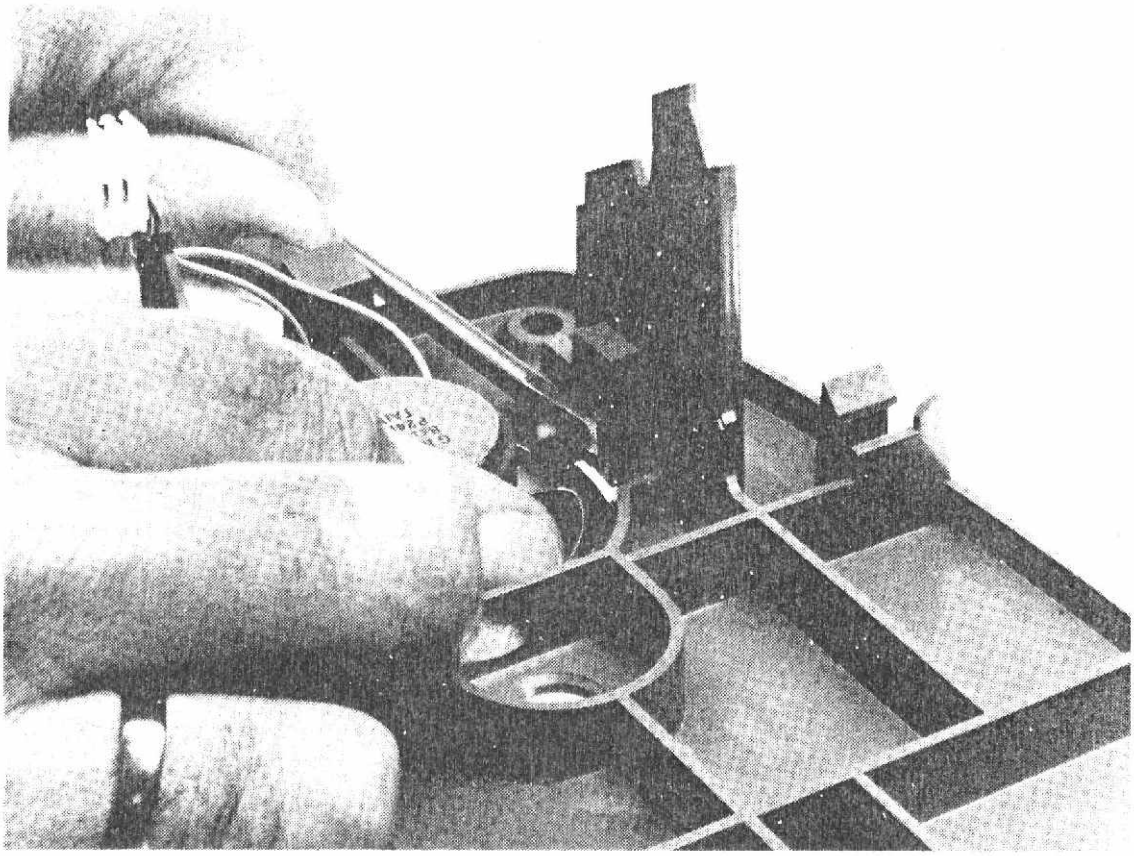


FIG. 7. REMOVING THE LOUDSPEAKER

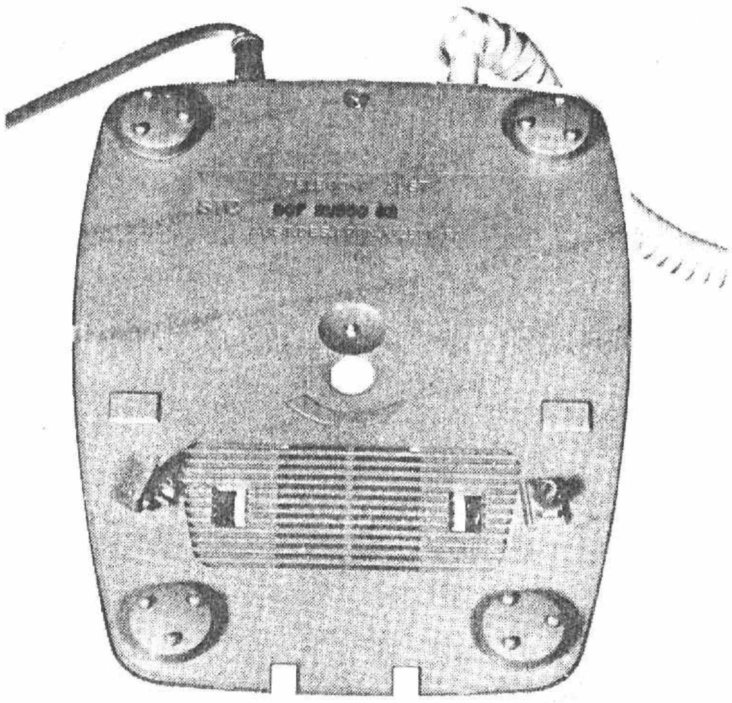


FIG. 8. BASE OF TELEPHONE WITH PLASTIC PLUGS REMOVED

The telephone base has four rubber feet to prevent the telephone slipping on smooth surfaces. A hole in the base is provided for the tone ringer volume control and slots below the speaker allow the ringer sound to emanate from the telephone. See figure 8. The base is heavily ribbed to provide strength and rigidity yet remain lightweight . See figure 9.

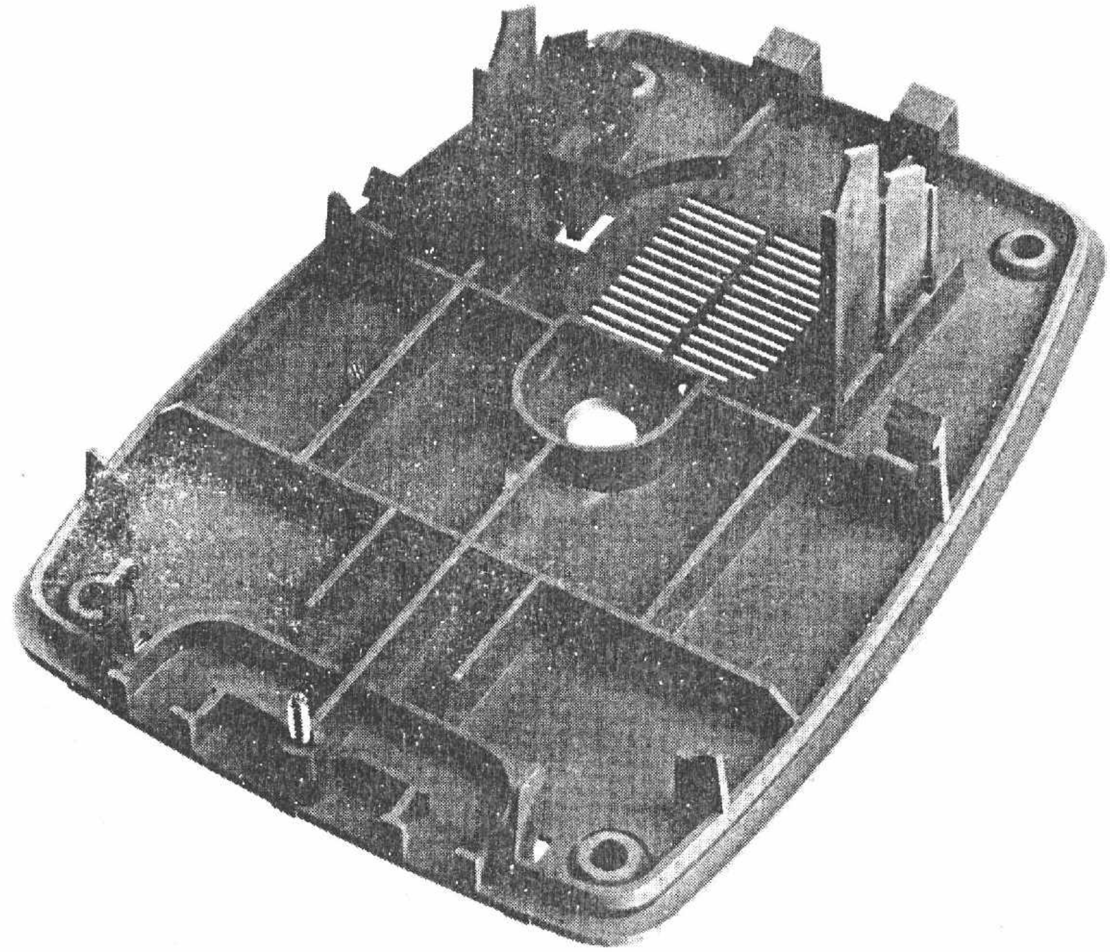


FIG. 9. BASE OF TELEPHONE

The same 12 button keypad is used on all the new touchfones, the plastic buttons are held in by a plastic frame, with a conductive rubber mat being used to make electrical connection to the contact area of back plate of the keyblock. The back plate is also used to hold the keypad together. Connection between the telephone PBA and the keypad is made by ribbon cable connecting into multiway connectors. See figure 10. The ribbon cable must be inserted so that the conductor side of the cable mates with the pins in the multiway connectors.

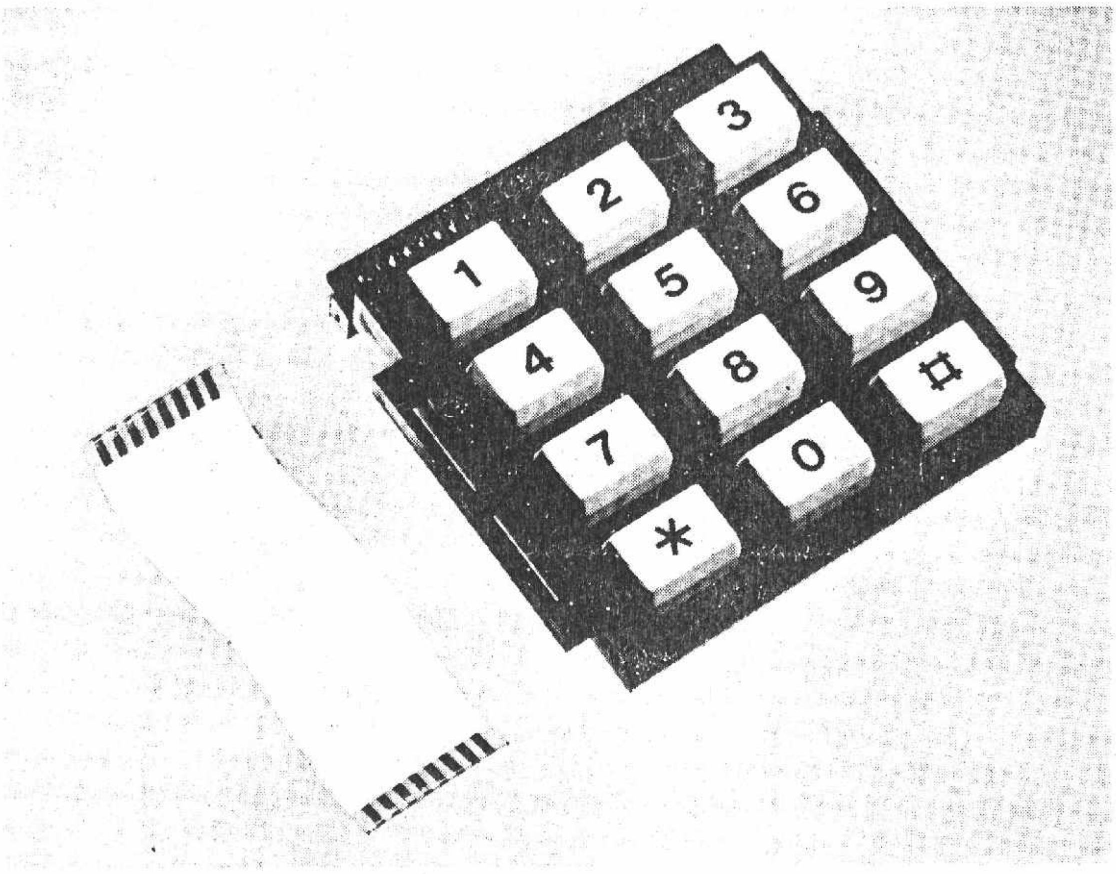


FIG. 10. KEYPAD AND RIBBON CABLE

All the electronics, the gravity switch mechanism, tone ringer volume control potentiometer and the induction coil and line and handset cord modular sockets are soldered direct onto the PBA. See figure 11.

The 8071 and 8081 have plugs mounted on the PBA to connect the recall contact to the cirucit. The 807 PBA is not equipped with a recall plug. The handset and line cords connect to the PBA via. 4 way modular plugs and sockets, the tone ringer loudspeaker is connected to the PBA via flexible leads and a plug and socket.

The PBA's contain C-MOS IC's, therefore correct handling procedures for static sensitive circuit boards must be observed when handling the PBA's (refer TPH 0834).

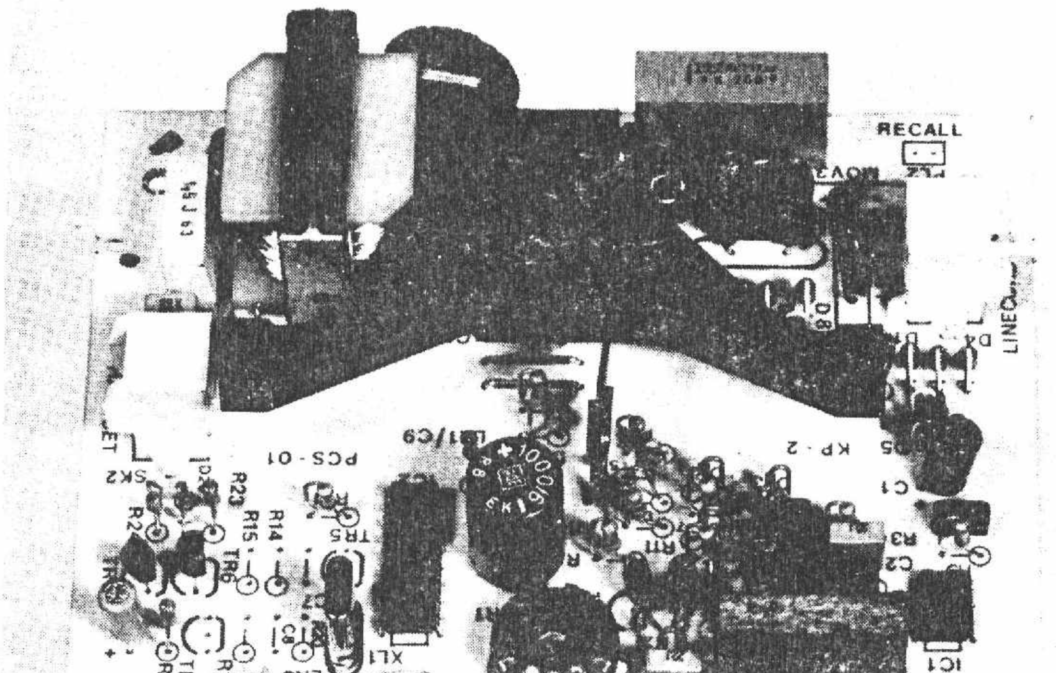


FIG. 11. 807 PBA

The line cord is a 3 conductor flat construction which has a 4 way modular plug which connects to the PBA. A grommet located approximately 120mm from the modular plug is used to provide strain relief for the cord. The standard length cord is 1.8 metres long. A 3.0 metre cord is available as an option. The plug end of the cord also has a grommet to anchor the cord to the plug. The three conductors are terminated on to the plug pins by quick connect tags.

The 4 conductor coiled, flat construction handset cord also has a 4 way modular plug and a grommet at the telephone end. At the handset end of the cord, the grommet fits through the cord entry hole then clips into a slot moulded into the handset body and is held in place by the transmitter. Quick connect tags are provided on the transmitter conductors and spade terminals are provided on the receiver conductors.

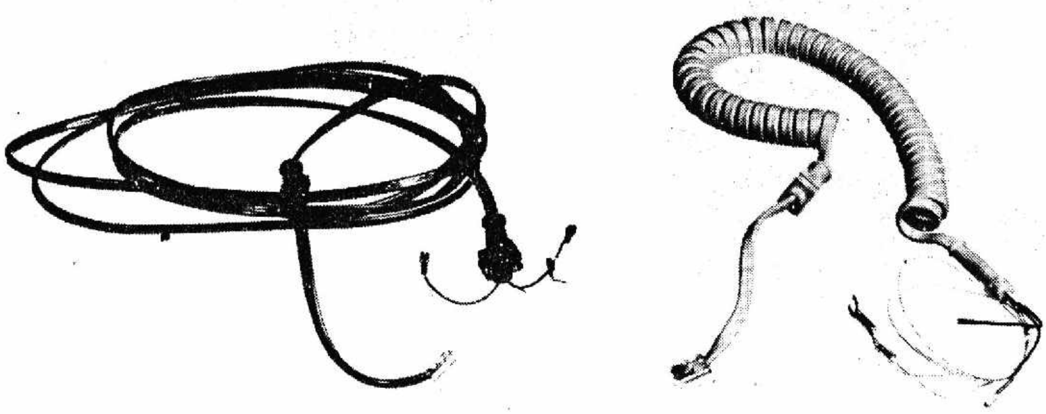


FIG. 12. CORDS

The new Touchfone circuit is designed to use the 20E electronic transmitter and the 4T rocking armature receiver. The transmitter fits directly into the handset body but the receiver is held in position by the receiver adaptor. Gaskets in the receiver and transmitter caps hold the insets firm when the caps are screwed up tight onto the handset body.

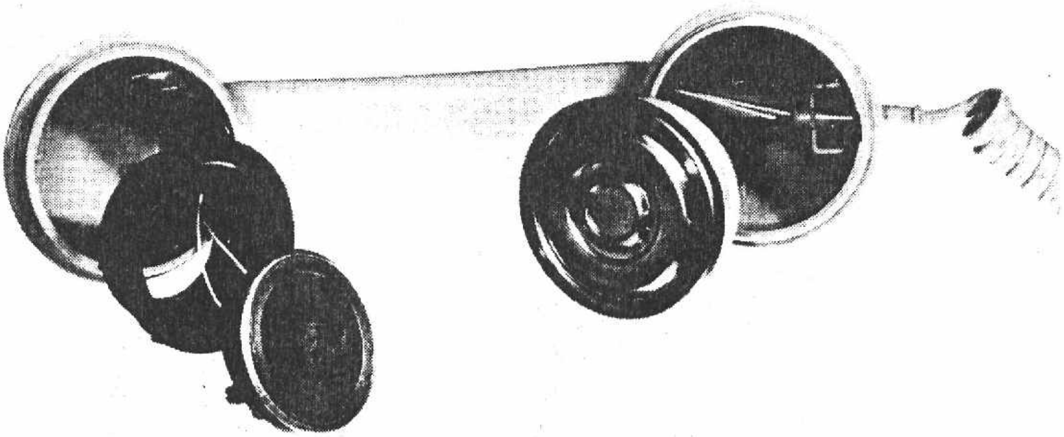


FIG. 13. EXPLODED VIEW OF HANDSET

4 CIRCUIT OPERATION

Reference Documents

Telephone 807, see figure 14

Telephone 8071, see figure 15

Telephone 8081, see figure 16

ON-HOOK STATE (807, 8071, 8081)

The tone ringer consists of R1, 2, 3, 4, 5, D1, 2, 3, 4, 5, 6, C1, 2, 3, 4, 5, ICI, T1, SPK1, VR1 and is connected to the line via gravity switch contacts 1 and 3.

C5 is a dc blocking capacitor and couples the ring signal which is rectified by the diode bridge D1 - D4 and filtered by C1.

The voltage across ICI is limited by zener diode D5.

Potentiometer VR1 allows manual control of the output level from loudspeaker, SPK1, which is fed through the impedance - matching transformer, T1.

Integrated circuit IC1 generates two tones f_L and $f_H = 1.24\ f_L$ with f_L determined by R5 and C4. The output alternates between f_L and f_H at a shift frequency determined by R4 and C2. Resistor R3 sets the triggering threshold of IC1 (ie. the voltage across IC1 at which an output first appears).

Varistor MOV1 provides high voltage transient protection in the on-hook state while allowing the ring signal to pass.

Gravity switch contact 7-8 isolates the receiver while on-hook (8081 only)

OFF-HOOK STATE (807, 8071)

The gravity switch disconnects the tone-ringer and connects the line to diode bridge D7 to D10. In the speech (non-dialling) mode, the main dc line current path is as follows:- cathodes of D7, 8, R7, TR1 D11, transmitter, coil 1-2 of T2 to the anodes of D9, 10. Varistor MOV2 provides protection against high voltage line surges

Transmission Circuit

This circuit is very similar to the standard 800-type with anti-sidetone coil T2, and balance network consisting of C10, C11, R18, R19, AR2.

Click suppressor D19 limits the voltages across the receiver. Transistor TR7 is normally saturated via R23 and the ON transistor TR1 and connects the receiver to the common line. Transistors TR3 are 6 cut-off in the speech mode. R24 gives "confidence" click while dialling.

Decadic Dial Circuit

High Voltage Protection

Varistor MOV2 provides the primary high - voltage surge protection. Current and voltage protection for the line current switch during surges is provided by R7, D12, D13 and R11, D15, D16 respectively. TR1 is normally saturated but when its emitter current exceeds 150 milliamps (nominally) TR1 comes out of saturation due to the current limiting action of R7 and D12. When the voltage across the telephone is in excess of 150V, D15 and D16 conduct thereby turning on TR3 which turns off TR2 and TR1 leaving MOV2 to absorb the surge power.

Line Current Switch

R7, R8, R9, R10, R12, D11, D12, D13, D17, TR1, TR2, TR3 are the components of the line current switch

For line currents less than 100 milliamps, TR1 is held saturated via R9, TR2 TR3 is normally cut-off by IC2. R10 permits a small current to flow in TR2 when line voltage is applied thereby turning on TR1. R12 and D17 hold TR2 saturated after initial line current in-rush. D11 limits the circuit voltage.

R7, D12 and D13 limit the line current in TR1 to about 150 milliamps during high voltage line surges but have no effect at normal line currents.

During the line current break period IC2 supplies current via R13 to saturate TR3 which is turn cuts off TR2 and TR1. The resistance of the dial during this period is set by R10. Diode D18 isolates C6 from the line current switch during line current breaks thereby preventing the discharge of C6 by the line current switch.

Dialling Control

IC2 and the associated keyblock control the dialling functions.

The keyblock is of the conductive rubber contact type with contacts arranged in a 3 x 4 matrix connection.

IC2 provides the following facilities:-

- keyblock input debouncing
- timing control for dial pulses
- off-normal (mask) output to mute receiver while dialling
- random access memory to store digits during dialling and for redialling.
- automatic insertion of up to two access pauses and also manual programming of access pauses.

The timing tolerance of the outputs of IC2 is directly related to the clock oscillator tolerance which is controlled by XL1.

C6 is charged by the line current and retains power to IC2 during line current breaks in the off-hook mode and for redial memory retention in the on-hook mode.

When on-hook, gravity switch contact 6-4 holds the chip enable (CE, pin 7) input low, keyblock entries cannot be recognised and data previously stored is retained. When the telephone is taken off-hook, the CE input is taken high via gravity switch contact 4-5 and R17. This initialises IC2 to accept keyblock data.

Capacitors C12, 13, 14 decouple RF interference from the keyblock inputs.

Receiver Muting Circuit

In the speech mode, pin 3 (M1) of IC2 is low and TR6 is cut-off. Transistor TR7 is saturated via R23 and D20 thereby connecting the receiver to the "common point" of the transmission circuit. When a keyblock button is depressed, M1 goes high, this saturates TR6 which in turn cuts off TR7 and thus mutes the receiver.

At the end of dialling, M1 goes low and so turns off TR6. Capacitor C15 now begins to charge via R23 and R22. The saturation of TR7 is thus delayed until C15 has charged to VBE of TR7 plus the forward voltage of D20. The "click" produced by the dialling-to-speech current transition in the transmission circuit is therefore inaudible.

OFF-HOOK STATE (8081)

The gravity switch disconnects the tone-ringer and connects the line to diode bridge D7-D10. In the speech (non-dialling) mode, the main dc line current path is as follows:- cathodes of D7, D8, through R6 coil 1-2 of T2, transmitter, D13, D12, to the anodes of D9, D10. Varistor MOV2 provides protection against high voltage line surges to around 90V and diode D11 limits the voltage across the cirucit to around 27V. Resistor R6 limits the current through D11.

Transmission Circuit

This circuit is very similar to the standard 800-type with anti-sidetone coil T2, and balance network consisting of C10, C11, R16 R20.

Click suppressor D15 limits the voltages across the receiver. Transistor TR6 is normally saturated via R19 and the ON transistor at pin 2 of IC2 and connects the receiver to the common line. Transistors TR1, 2, 3, 4, 5 are cut-off in the speech mode. R22 gives "confidence" tone while dialling.

D.T.M.F. Dial Circuit

A two-tone voice frequency signal is generated by IC2 whenever a row input (pins 14,13,12,11) is connected to a column input (pins 3,4,5) by depressing a button on the keyblock. The internal clock of IC2 is controlled by crystal XL1.

The output amplifier TR1, R8, R9 couples the IC2 output signal to the line. R7 and C6 prevent high frequency instability.

C7, R10 and the output amplifier input impedance form a low pass filter and attenuate the high frequency components of the digitally-synthesised output waveform. Diode D12 provides a stable power supply voltage for IC2 which is bypassed by C8.

In the speech (non-dialling) mode, the MUTE (pin 10) is low and the internal transistor between pins 1 (collector) and 2 (emitter) of IC2 conducting. This latter component controls the operation of the receiver muting cirucit and holds TR6 saturated via R19, D14. When a keyblock button is depressed, the above transistor within IC2 is turned off which cuts off TR6 and thus mutes the receiver.

When pin 10 of IC2 is low (speech mode), TR5 is held cut-off. But in the dialling mode TR5 is saturated via R17, R18 and pin 10 being high. When the circuit reverts to the speech mode pin 10 goes low but the charge on C12 holds TR5 conducting for a short while longer which in turn delays the conduction of TR6. The component values have been chosen so that the delay is just longer than the duration of the otherwise audible transients resulting from the current changes in T2 during the dialling-to-speech mode changeover.

Transients resulting from the speech-to-dialling mode changeover occur after TR6 has turned off (and the receiver has thus been muted) and so are inaudible.

In the dialling mode, with pin 10 high TR3 and TR4 are conducting which causes TR2 to conduct via R14 and sets the telephone impedance at 600 ohms (nominal) via C9 and R15. With TR2 conducting, the line current is diverted from the transmitter to the dialling circuit thereby greatly reducing the transmitter sensitivity and so maintaining a high signal to noise ratio of the tone dialling signal. Since the voltage drop across TR2 is less than that across the transmitter, the telephone voltage drop is lower during dialling than during speech thereby ensuring reliable dialling operation on long lines.

The main dc current path during dialling is: cathodes of D7 and D8, R6, coils 1 -2 and 3 - 4 of TR2 emitter-collector, D12, recall button contact T-BN anodes of D9 and D10.

RECALL BUTTON FUNCTIONS (8081)

The recall button is shown in the unoperated state.

Varistor MOV3 limits the voltage between the earth connection and the telephone line during high-voltage line surges.

Earth Recall

Pin 1 of the telephone line socket must be earthed to obtain this facility.

When the recall button is depressed the anodes of D9 and D10 are connected to earth via the G-BN contact of the button. As the earth conductor has a positive potential, one of the diodes will be forward biased such that a current path will be completed to the exchange battery via one telephone line conductor. The normal (speech mode) telephone line current is thus diverted from the transmission circuit and the timed loop break circuit is prevented from energising.

Timed Loop Break

Terminal 1 of the telephone-line socket must be unconnected to obtain this facility.

The recall button places a short circuit across the timed loop break circuit via closed contact T-BN in its unoperated state. When the button is depressed the timed loop break circuit is exposed to the line. Transistors TR7, 8 and 9 are initially off and C13 begins to charge via R23. The telephone loop resistance is now determined primarily by R23 and TR8, 9 leakage.

When the voltage across C13 is approximately 20V (i.e. D17 knee voltage plus VBE and TR7) TR7 begins to conduct which causes TR9 to conduct which in turns causes TR8 to conduct and cause TR9 to conduct further. This regenerative switching configuration of TR8 and 9 gives a very high switching speed and also latched TR8 and 9 into conduction with a low voltage drop. TR8 and 9 will remain in conduction unitil the current through them is reduced by the release of the recall button. Thus the loop current "break" is determined by R23, C13 and D17. Any residual charge on C13 is discharged via R23 when the recall button is released. Capacitors C14, 15 prevent TR8, 9 from being triggered by transient voltages, eg during operation of the recall button. Diode D16 limits the voltage across the circuit due to the back emf when the recall button is operated. Resistors R24 and R25 provide the necessary leakage current paths for TR8, 9.

RECALL BUTTON FUNCTIONS (8071)

Terminal 1 of the telephone-line socket must be earthed to obtain this facility

The recall button is shown in the unoperated state.

Varistor MOV3 limits the voltage between the earth connection and the telephone line during high-voltage line surges.

When the recall button is depressed earth is connected to one of the telephone line conductors.

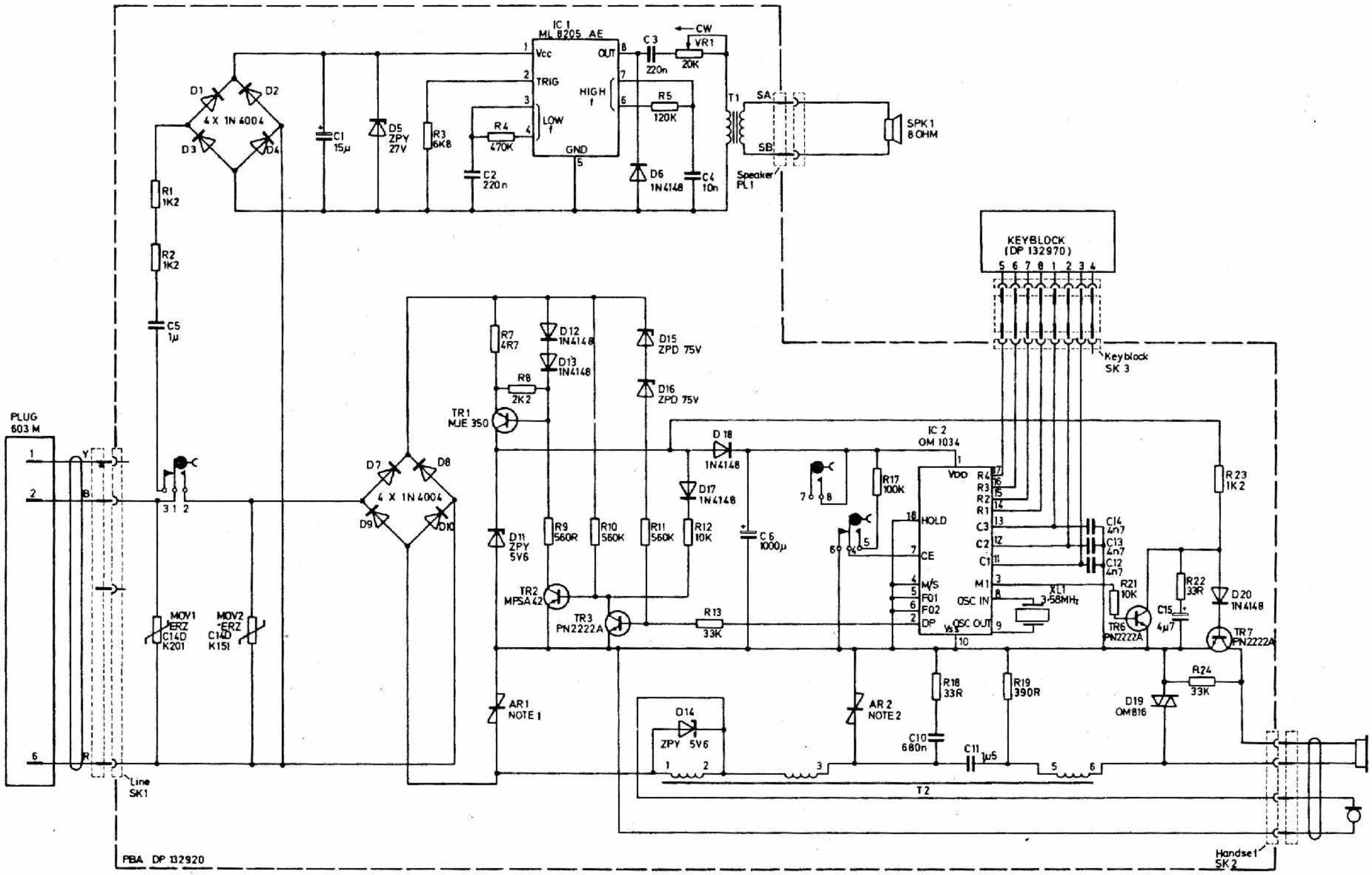


FIG 14 CIRCUIT SCHEMATIC 807

NOTE 1) LINE VARISTOR (BLACK DOT)
2) BALANCE VARISTOR (RED DOT)

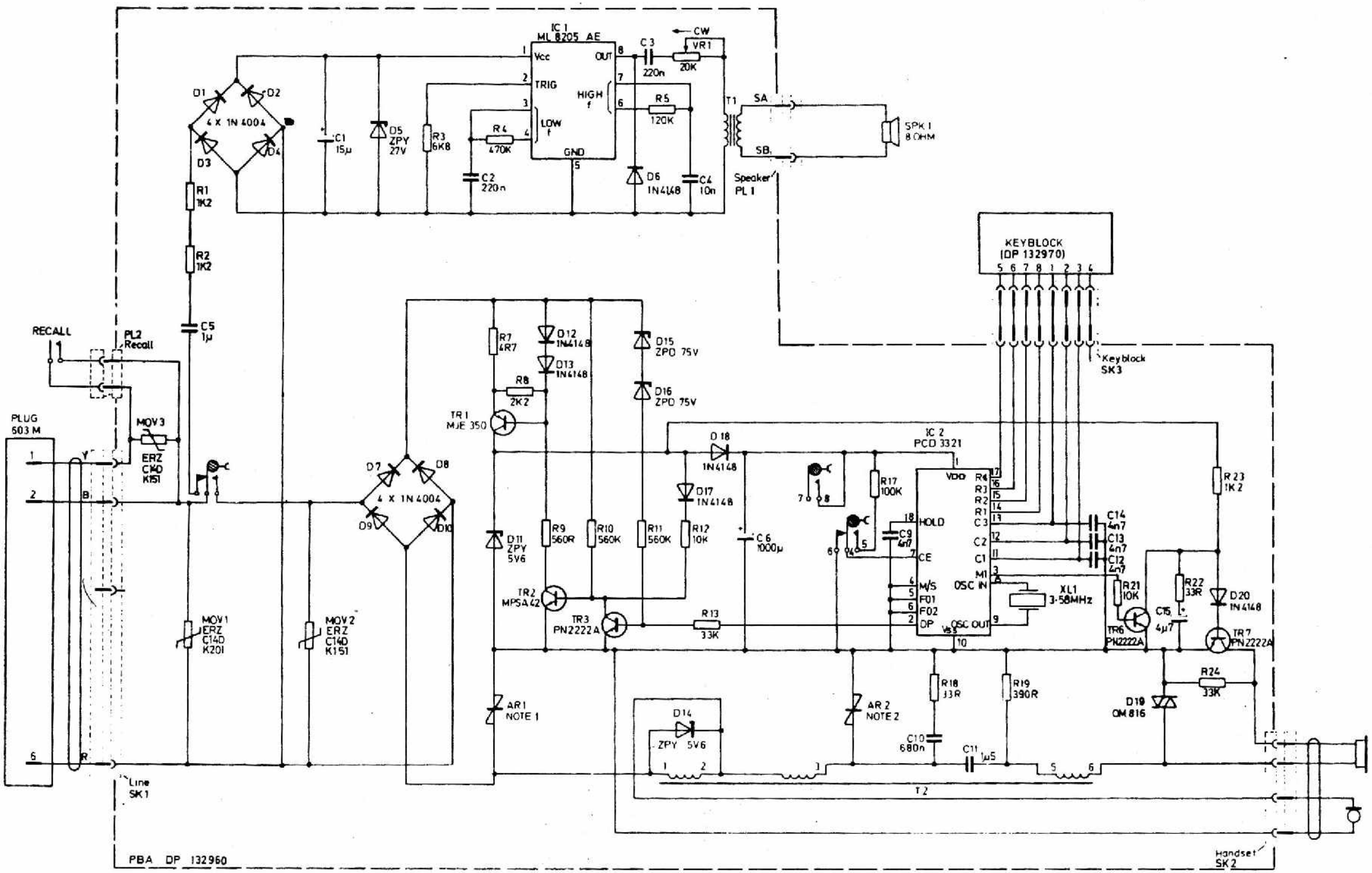


FIG 15 CIRCUIT SCHEMATIC 8071

NOTE 1) LINE VARISTOR (BLACK DOT)
2) BALANCE VARISTOR (RED DOT)

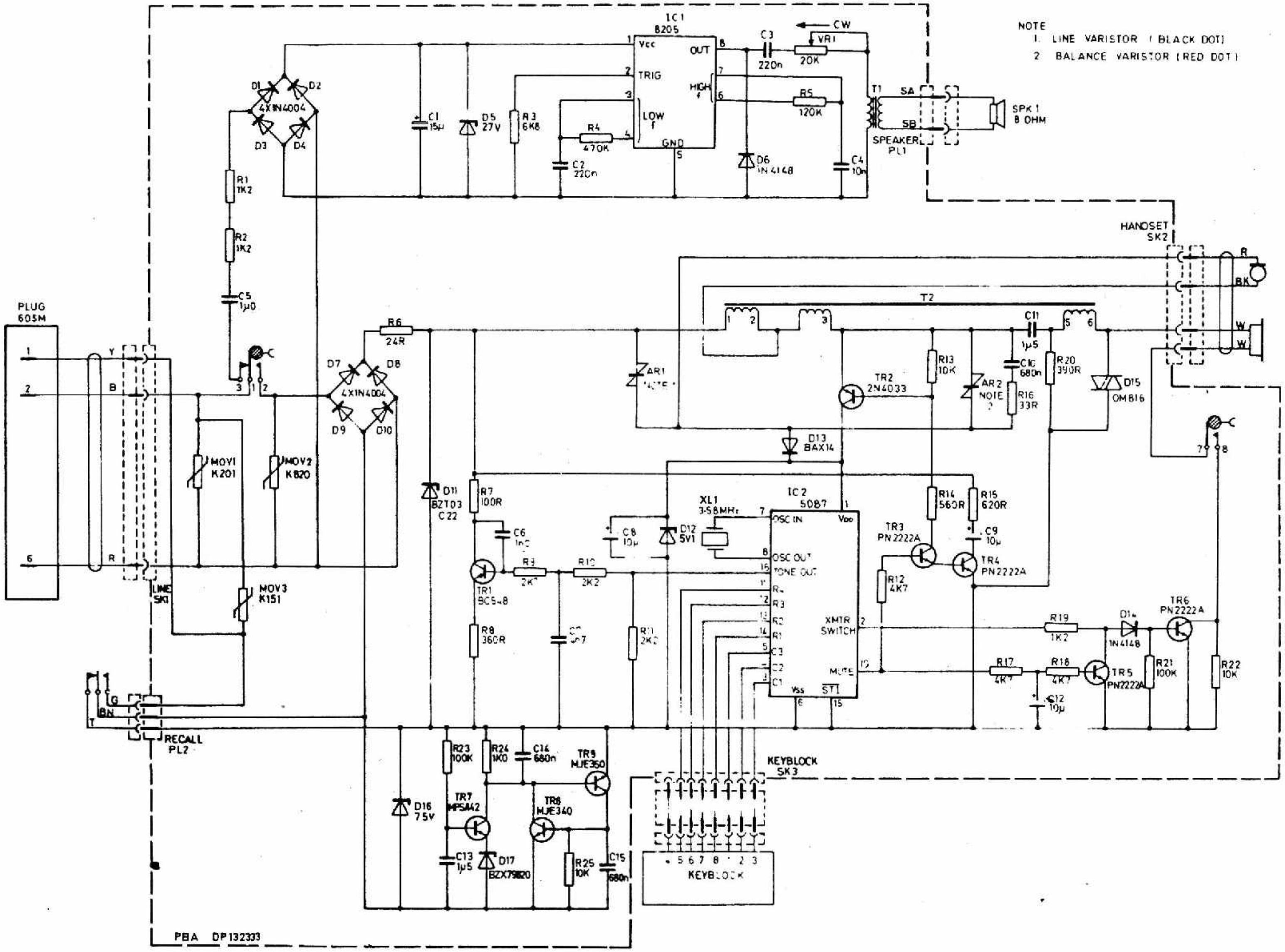


FIG 16 CIRCUIT SCHMEATIC 8081

5. INSTALLATION

The new Touchfones are two wire telephones (plus earth for recall 8071 and 8081) and can be used on single and composite telephone services. the telephones have "anti-tinkle"features built into the ringer circuits and therefore should not respond to outpulsing from a parallel decadic telephone. A maximum number of three telephones or signalling devices is permitted on any one service.

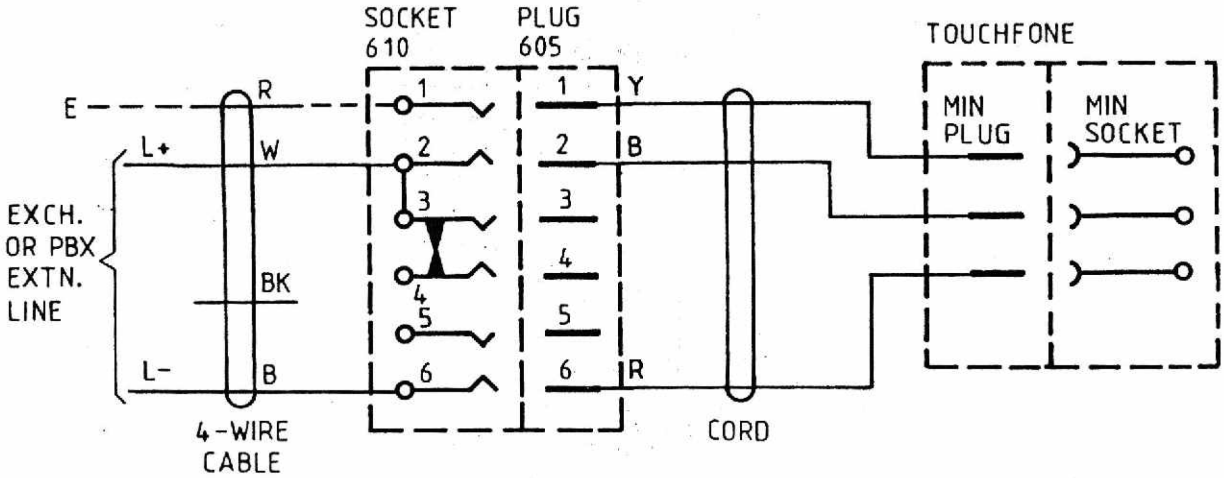


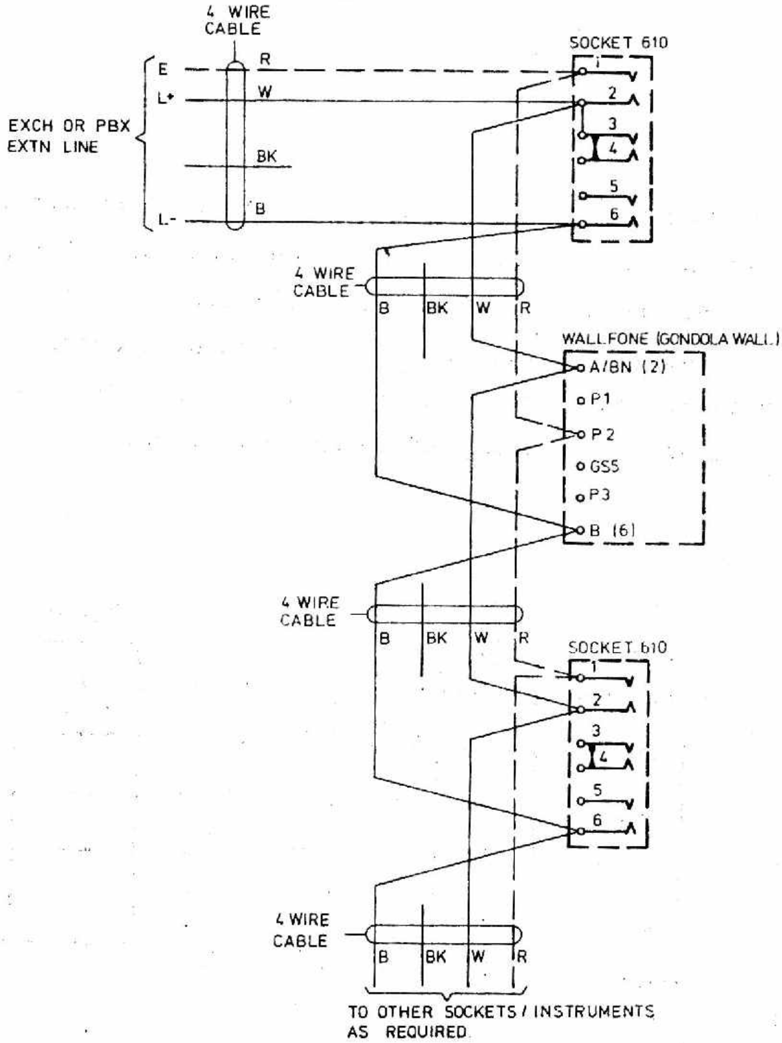
FIG 17 SINGLE TELEPHONE SERVICE

NOTES:

1. Connect alarm equipment to terminals 2 and 6 of 610 socket. (Alarm equipment must be fitted with an "Anti-tinkle Module" and a 1uF capacitor.

2. Bell circuits fitted with Anti-tinkle Modules may not respond to ringback from Automatic Line Testers. A ringback through the network should be used to check bell circuit operation.

3. Disconnect the earth from terminal 1 of the 610 socket if Timed Loop Break recall is used. (8081).



TYPICAL WIRING DIAGRAM

FIG 18 COMPOSITE TELEPHONE SERVICES

NOTES:

1. Connect alarm equipment between terminals 2 and 6 of any socket (or telephone). Alarm equipment must be fitted with an "Anti-Tinkle Module' (S311/330) and a 1uF capacitor.

2. All telephones which do not include an anti-tinkle device must be fitted with an "Anti-Tinkle Module" in series with the bell circuit.

3. Bell circuits fitted with Anti-Tinkle Modules may not respond to ringback from Automatic Line Testers. A ringback through the network should be used to check bell circuit operation.

6. MAINTENANCE PROCEDURE

Initially field maintenance for faulty touchfones will be limited to replacing faulty cords, transmitter, receiver and PBA, otherwise the complete telephone should be changed. No attempt should be made to repair the PBA in the field.

A Customer Equipment Fault Report Label (E441) providing as much detail about the fault should be attached to the faulty PBA (or telephone). The PBA should then be suitably packed and returned to your PBA Change Over Centre. (Correct PBA handling procedures should be applied). Faulty telephones are to be handled as per State procedures.

7. STORES ITEMS

TELEPHONES

Serial/Item	Description
1/500	807, Sage Green
1/501	897, Fleece White
1/502	807, Golden Haze
1/503	807, Cinnamon
1/504	807, Musk
1/510	8071, Sage Green
1/511	8071, Fleece White
1/512	8071, Golden Haze
1/513	8071, Cinnamon
1/514	8071, Musk
1/530	8081, Sage Green
1/531	8081. Fleece White
1/532	8081, Golden Haze
1/533	8081, Cinnamon
1/534	8081, Musk

SPARE PARTS

Serial/Item	Description
311/146	PCA 180 (PBA for 807 Telephones)
311/147	PCA 181 (PBA for 8071 Telephones)
311/148	PCA 182 (PBA for 8081 Telephones)
20/43	Receiver inset 4T
19/68	Electronic Transmitter No. 20E

CORDS

Serial/Item	Description	Code
30/204	Line Cord, Cinnamon 1.8 meters	3/04 LSF 1800
30/205	Line Cord, Cinnamon 3.0 meters	3/04 LSF 3000
30/216	Handset Cord, Fleece White	4/07 HCF 1500
30/217	Handset Cord, Golden Haze	4/07 HCF 1500
30/218	Handset Cord, Cinnamon	4/07 HCF 1500
30/219	Handset Cord, Sage Green	4/07 HCF 1500
30/220	Handset Cord, Musk	4/07 HCF 1500