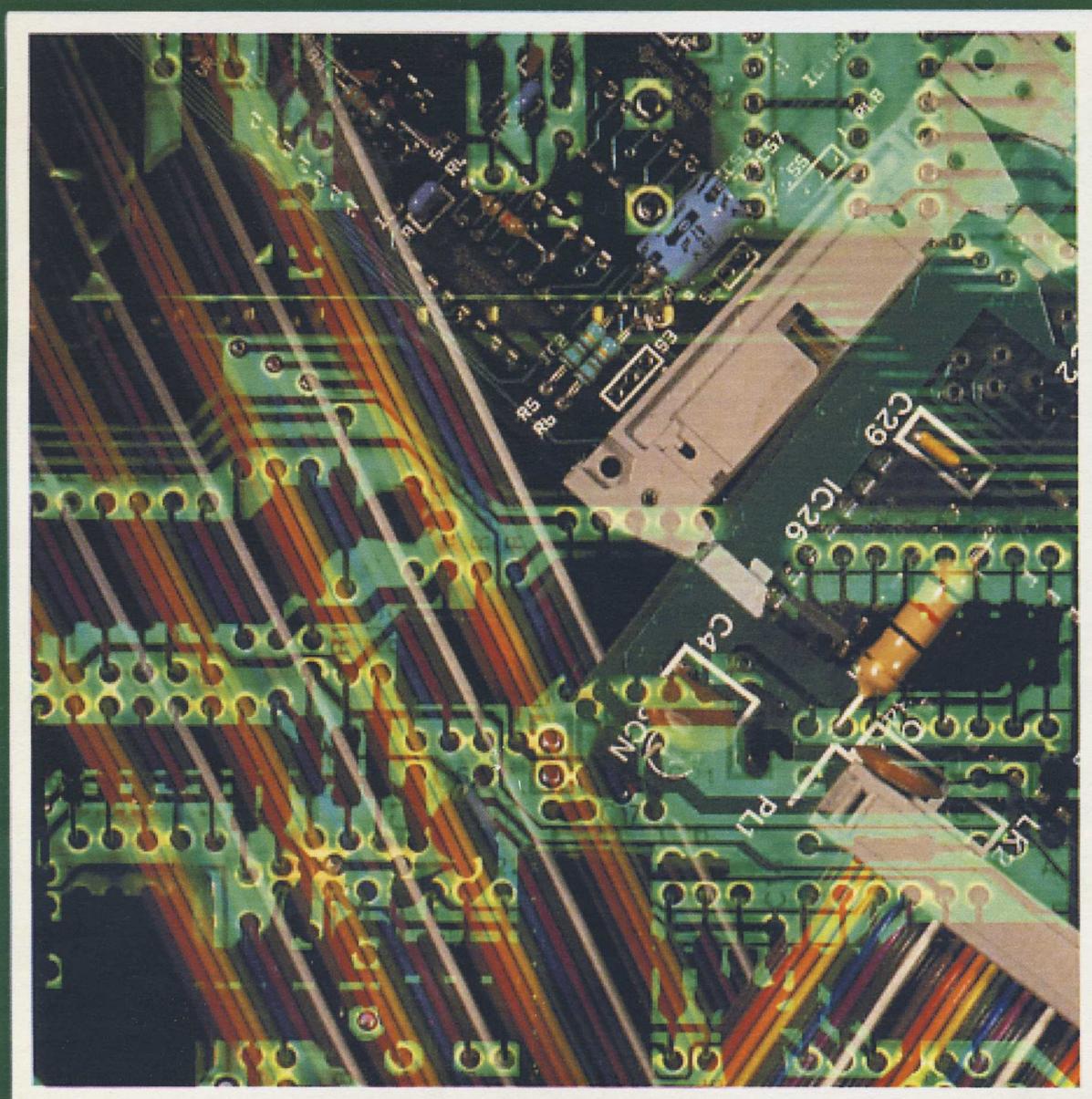


 **ACORN COMPUTER**

# Prestel Adapter Service Manual





**PRESTEL ADAPTER SERVICE MANUAL**

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August 1984

Within this publication the term 'BBC' is used as an abbreviation for 'British Broadcasting Corporation'.

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**WARNING: THE PRESTEL ADAPTER MUST BE EARTHED**

**Important:** The wires in the mains lead for the Prestel Adapter are coloured in accordance with the following code:

<b>Green and yellow</b>	<b>Earth</b>
<b>Blue</b>	<b>Neutral</b>
<b>Brown</b>	<b>Live</b>

As the colours of the wires may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured green and yellow must be connected to the terminal in the plug which is marked by the letter E, or by the safety earth symbol or coloured green, or green and yellow.

The wire which is coloured blue must be connected to the terminal which is marked with the letter N, or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L, or coloured red.

If the socket outlet available is not suitable for the plug supplied, the plug should be cut off and the appropriate plug fitted and wired as previously noted. The moulded plug which was cut off must be disposed of as it would be a potential shock hazard if it were to be plugged in with the cut off end of the mains cord exposed. The moulded plug must be used with the fuse and fuse carrier firmly in place. The fuse carrier is of the same basic colour\* as the coloured insert in the base of the plug. Different manufacturers' plugs and fuse carriers are not interchangeable. In the event of loss of the fuse carrier, the moulded plug MUST NOT be used. Either replace the moulded plug with another conventional plug wired as previously described, or obtain a replacement fuse carrier from an authorised BBC Microcomputer dealer. In the event of the fuse blowing it should be replaced, after clearing any faults, with a 3 amp fuse that is ASTA approved to BS1362.

**Exposure**

Like most electronic equipment, the Prestel Adaptor should not be exposed to direct sunlight or moisture for long periods.

\*Not necessarily the same shade of that colour.

## **1. INTRODUCTION**

This manual is intended to provide the information required to diagnose and repair faults on the PRESTEL Adapter (a part of the BBC Microcomputer system) which was designed by ACORN Computers Ltd., of Cambridge, England.

The information contained in this manual is aimed at ACORN dealers and service engineers who will be servicing the PRESTEL Adapter on behalf of ACORN Computers Ltd.

## 2. PACKAGING AND INSTALLATION

2.1 The BBC Microcomputer PRESTEL Adapter is supplied in a two part moulded polystyrene packing which is further packaged within a cardboard sleeve.

2.2 The following items are supplied with the PRESTEL Adapter:

- PRESTEL ROM
- PRESTEL Subscriber's Application Form
- PRESTEL User Guide
- PRESTEL Prompt Card for BBC Microcomputer Function Keys
- Guarantee Registration Card
- Voucher redeemable against replacement of a BBC Microcomputer MOS ROM below version 1.0.

2.3 A mains power switch is located at the rear of the PRESTEL Adapter.

2.4 A 400mA slow-blow type fuse is located at the rear of the unit. Before removing this fuse, the PRESTEL Adapter must be disconnected from the mains supply. Access to the fuse may be gained by undoing the round cover with the slot in it using a screwdriver. The mains supply must not be reconnected until the fuse is relocated in its holder and the cover screwed home.

2.3 Do not use the PRESTEL Adapter in conditions of extreme heat, cold, humidity or dust or in places subject to vibration. Do not block ventilation under or behind the computer. Ensure that no foreign objects are inserted through any openings in the adapter casing.

### 3. SPECIFICATION

The PRESTEL Adaptor

Interfaces a BBC Microcomputer to any British Telecom attached 1200/75 baud dial-up system (e.g. PRESTEL, MICRONET, TELECOM GOLD).

Operates with any BBC Microcomputer model B with 1.2 MOS or later issue.

The unit is housed in a two part rigid injection moulded case, containing a PCB carrying the following:

Modem  
Auto-Dialler  
RS232/423 compatible interface\*  
Telephone line interface  
Power Supply

Mains on/off switch on rear panel

Call set-up and auto-dialler fully computer controlled. A 1200/75 baud modem interfaces to the RS423 serial port on the BBC Microcomputer and to the telephone line via the telephone line barrier. All data processing is performed by software including the downloading of telesoftware files from MICRONET 80.

Loudspeaker monitor during call set-up

Format:	C.C.I.T.T. V23
Speed:	1200 baud receive
(operating frequency)	75 baud transmit
Operating temperature:	10° - 35°C
Power In:	240v, 50Hz, 10w
	13amp moulded-on plug

Signal Connections:  
Cable to 5-pin DIN domino plug (RS423 interface)  
Cable to BT series 400 line jack plug (telephone connection)

Complies with BS415 Class 1  
British Telecom approval no.S/1462/3/D/021864

Dimensions: 7 70mm High 210mm Wide  
350mm Deep

Weight: Unit only-	1.5kg
Packed-	1.7kg

\*see page 6

#### 4. DISASSEMBLY AND ASSEMBLY

1. In order to service the PRESTEL Adapter, first switch off and disconnect it from the mains supply, also disconnect both the RS-423 cable and telephone connector (from the BBC Microcomputer and telephone jack socket respectively).

2. The lid of the PRESTEL Adapter may be removed after undoing three fixing screws, two on the rear panel, and one underneath. When reassembling, press the lid down at the rear whilst tightening the two rear fixing screws. Take care not to lose the two spire nuts pushed on to the case lid into which the rear fixing screws locate.

3. Inside the PRESTEL Adapter are two sub-assemblies: the printed circuit board and the speaker plate assembly.

4. The printed circuit board may be removed by the following procedure:

(i) Disconnect the RS-423 and telephone cables from the PCB by removing the 9 faston tab connections at the rear of the board.

(ii) Disconnect the two mains connection wires (blue and brown) from the PCB.

(iii) Disconnect the twisted speaker cable from the PCB.

(iv) Undo the six fixing screws; the PCB may then be lifted clear.

5. The speaker plate assembly may be removed after the 6 retaining nuts and bolts are unscrewed, and the speaker cable is disconnected from the PCB.

## 5. CIRCUIT DESCRIPTION

1. This section should be read in conjunction with the block diagram and, if necessary, the circuit diagram in the Appendix.

### 2. Modem

The modem circuitry is based around the Texas TCM3101 single chip modem (IC1). It is a medium speed frequency shift keying (FSK) modem which contains modulator/demodulator and signal conditioning circuitry, and is configured to operate on CCITT V23 standard frequencies.

The modem will always accept input (RX) data at 1200 baud. The Transmit data speed is selectable to either 75 baud or 1200 baud, depending upon the state of TXT1 and TXT2 pins on IC1. In normal PRESTEL mode, TXT1 will be at logic 1 and TXT2 will be at logic 0.

Considering only the 1200/75 mode of operation, i.e. transmit @ 75 baud, receive @ 1200 baud, the operation of the modem is as follows:

To transmit data the TXD input controls an output signal on the TXA pin which is a sine wave of one of two distinct frequencies. A logic 0 on the TXD pin generates an output frequency of 450Hz, and a logic 1 will output a frequency of 390Hz. This signal is buffered through IC2 and fed to the telephone line via T1, the line matching transformer. Such signals are well suited to transmission through 'phone lines as they are well within the bandwidth of the telephone system and contain no high frequency harmonics.

Data is received from the telephone line, amplified through IC2 and fed into the RxA input of the Modem. It is again in the form of a sine wave, of one of two distinct frequencies. However, as the RxData rate is 1200 baud, the two frequencies used as a standard are different. A logic 0 appears as a 2100Hz frequency and a logic 1 as a 1300Hz frequency. Circuitry internal to the modem conditions this signal and outputs a logic 0 or 1 on the RxD pin (of IC1), depending on whether a 2100Hz or 1300Hz frequency is present at the input.

The CDT output of IC1 is a signal which becomes active if a valid signal is present on the RxA input to the modem, i.e. a sinusoidal signal. Its primary function is to indicate when communication between the modem and an external device has been established.

### 3. RS423 Line Interface\*:

This interface provides the interconnection between the PRESTEL Adapter and the BBC Microcomputer. It translates the input signal levels from +5 volts to +5v CMOS logic levels, and the converse for output signals. It carries the Receive Data, Transmit Data, CTS (Carrier Detect and Ring Indicator) and the RTS (PRESTEL Adapter Control) signals.

#### **4. Relay Drivers:**

These are Darlington current drivers, contained in a single IC package (IC11), controlled by CMOS logic. They are able to sink the high current levels required to drive the relay coils.

#### **5. Amplifiers:**

The modulated data output and data input of the modem chip are buffered by amplifiers (IC2). Also, the telephone line may be audibly monitored through the loudspeaker, which is driven by the amplifier IC5.

#### **6. Control and Decode:**

This section contains all the logic within the Adapter. Driven from the main modem clock (frequency 4.43 MHz) the decode circuitry will detect one of two pulses of a predetermined width, on the RTS input line. The first type of pulse will cause all of the control circuitry to be reset to its initial on-hook state. The second type of pulse may then be repeatedly applied to the RTS line to step the control circuitry through a series of control states. In this manner the following control functions are provided:

- (i) Modem Mode select (Transmit baud rates, Originate/Answer).
- (ii) Activation of Line Seize, Dial-on and Digit Relays
- (iii) Loudspeaker on/off state.
- (iv) Control of CTS o/p line such that it provides the function of Carrier Detect or Ring Indicator.

Also, in conjunction with the Transmit Data line, the Dial relays may be controlled to generate the digits required for Pulse dialling.

#### **7. PSU:**

The power supply unit produces +5 volts at around 200mA and -5volts at around 50mA. It requires a 240v, 50Hz AC mains input and is a linear power supply circuit using three terminal regulators and a mains transformer. The circuitry is protected by fuses on both positive and negative output rails.

\*Note: The Line Interface signal is RS232/423 compatible. The PRESTEL Adapter 5-pin DIN 'domino' plug connects to the RS423 serial port on the BBC Micro; for clarity, the interface signal is therefore referred to as 'RS423' throughout this manual.

## 6. DETAILED CIRCUIT OPERATION

The operation of the PRESTEL Adapter is controlled by the RTS input signal from the RS423 interface. A pulse of approx 2.35mSec width on the RTS line will cause the internal circuitry to step through the various control states shown in Fig. (i). This is called a "STEP pulse"

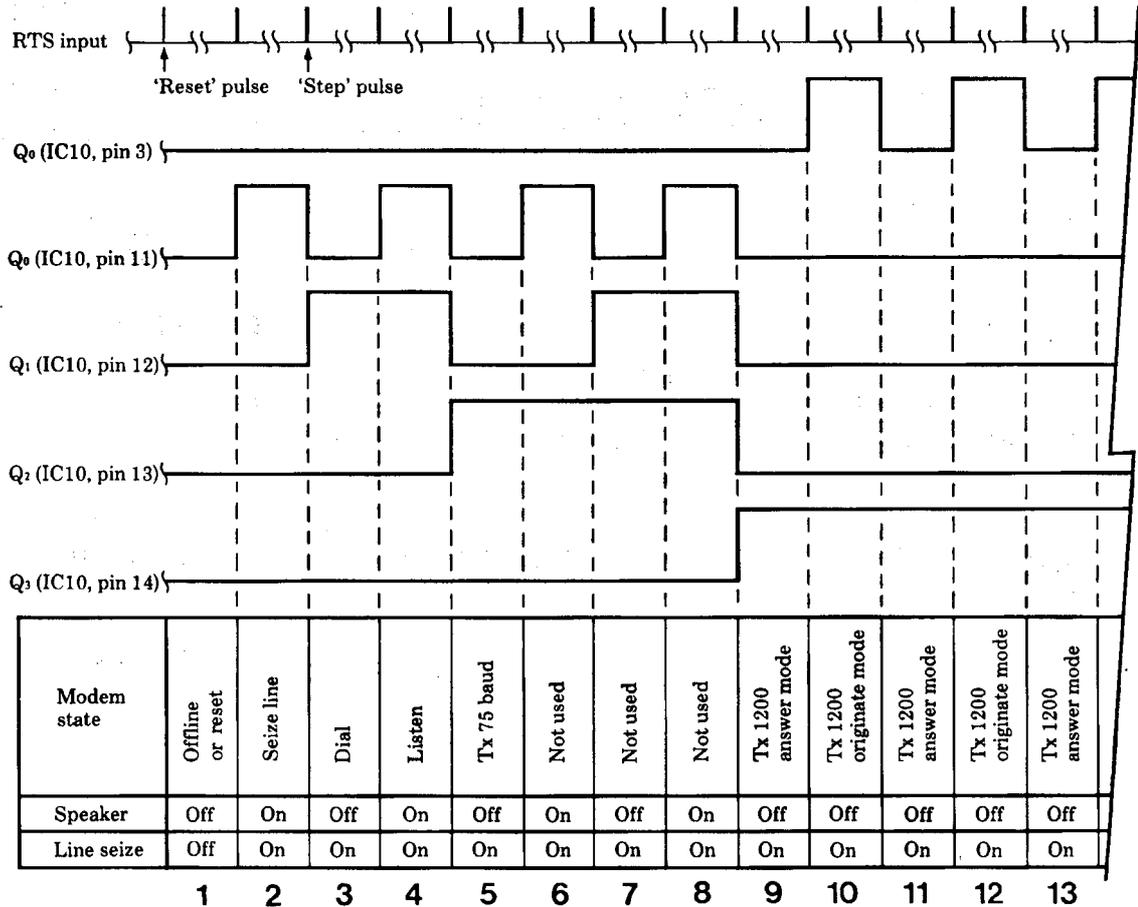


Fig. (i) PRESTEL Adapter State Diagram

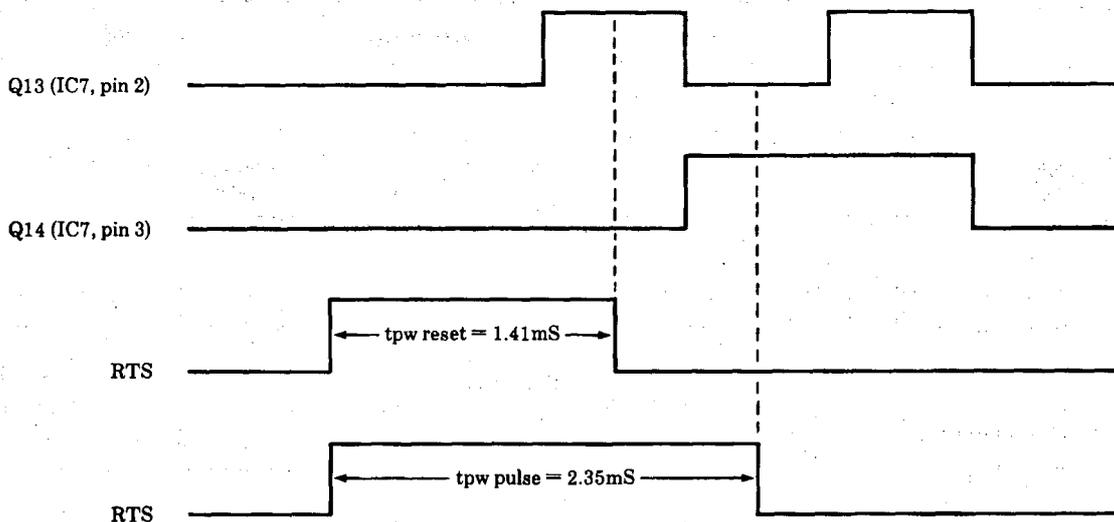
A pulse of approx 1.41ms will be internally decoded as a "RESET pulse" and will reset the PRESTEL Adapter to its 'offline' or initialised state. Using these two pulse signals it is possible to configure the Adapter to any one of the modes shown in Fig. (i).

Internal decoding of these pulses is accomplished by IC7 and IC9, these are a 14-stage binary ripple counter and a 2-to-4 line decoder. The counter, IC7, is clocked by the stable 4.43 MHz crystal controlled oscillator internal to the TCM 3101 Modem chip (IC1). The final two stages of the counter, Q13 and Q14, drive the decoder. The sequence of operation is as follows:

When a pulse is applied on the RTS input the counter IC7, is enabled (RST, pin 11 goes low) and starts counting at 4.43 MHz, and continues to do so as long as the pulse on RTS is active.

When the pulse goes low, Q13 and Q14 will be in a certain state, dependent upon the width of the RTS pulse, and the decoder, IC9, will be enabled, and will decode Q13, Q14 to produce an output on Q0 to Q3 of IC9. Only Q1 and Q2 of IC9 are used and they will produce a short negative pulse under the following states:

- (i) Step pulse (on Q2 of IC9) if Q13 low and Q14 high.
  - (ii) Reset pulse (on Q1 of IC9) if Q13 high and Q14 low. Any other states on Q13 and Q14 are not recognised.
- See Fig. (ii).



**Fig. (ii) RTS-Pulse Timings**

Note: Although the counter is reset as soon as the RTS pulse goes low, i.e. all Q outputs of IC7 are set to zero, internal gate delays allow the end count conditions on Q13, Q14 to be decoded by IC9 before they are set to zero. This produces a very short negative pulse on the Q1 or Q2 outputs of the decoder (IC9).

These internal Step and Reset pulses from IC9 are used to generate the control signals required to configure the states shown in Fig. (i).

These control signals are the outputs of two 4 bit binary counters (IC10). The Reset pulse simply resets the main counter (on IC10, pin 15) such that all outputs are low, a power-on reset is also provided by R16 and C31.

The Step pulse is applied to the clock inputs of IC10 to sequentially enable/disable the control outputs (Q0 to Q3) in a binary count. These outputs are gated through IC6 and IC8 to activate the relays, as required in the correct sequence.

The output Q0 is a speaker on/off switch and can activate the line seize relay. The output Q1 always activates the line seize relay. The output Q2 always activates the line seize relay, provides modem mode control, and, if LK3 is set, will disable the second of the two 4 bit counters. The output Q3 always enables the line seize relay, and, if LK3 is set as shown in the PCB assembly diagram, will enable the second of the two 4 bit counters.

If the second of the two counters is enabled then the Q0 output of the second counter provides additional mode control to the modem.

The link, LK3, is provided to enable a Transmit Data at 1200 baud mode on the modem. It should always be set to enable this mode, as shown in the PCB Layout on page 41 (items 73,74, LK3 fitted in position shown by solid black area).

Normally, the link connects Q3 on the first counter to the Enable input on the second counter and all states shown in Fig. (i) are available. This is the default setting for LK3 for normal PRESTEL operation.

If LK3 is set such that Q2 is connected to the enable input of the first counter, then Q3 is never clocked high thus keeping the second counter in the reset state. The PRESTEL Adapter can therefore only step through control states 1 to 8 [see Fig. (i)].

The operation of the relays in the telephone line interface is in the following manner:

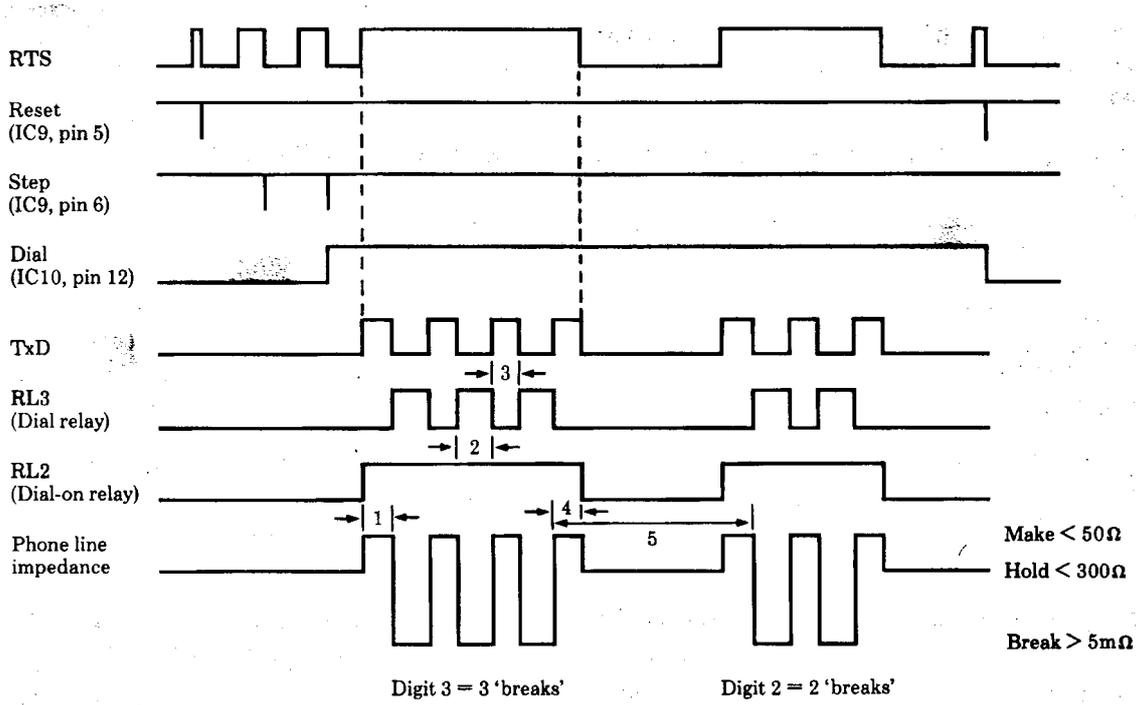
The Line Seize relay (RL1) is normally open and is activated (closed) to seize the line to enable data transmission and dialling. To enable the data link only RL1 need be on (closed).

To generate dialling signals the relays RL2 and RL3 operate as shown in Fig. (iii). To dial a digit the Dial-on relay is closed and the Dial Relay, RL3, is opened and closed the same number of times as the digit to be dialled, with timings as shown in Fig. (iii).

IC8 allows the TxD line, from the RS423 interface to control the Dial relay RL3, when the Dial-on-relay (RL2) is closed. Thus to dial a digit the Dial-on relay needs to be closed and a series of pulses sent along the TxD line with timings as shown in Fig. (iii).

The Ring Detector IC3<sup>1</sup> provides a logic 0 signal if a ringing signal is detected on the telephone line whilst the Line Seize relay is open. This signal is gated through to the CTS output on the RS423 interface. The gates IC14 and IC8 control the CTS output such that it provides both a Carrier Detect and a Ringing Detect output, depending upon the state of the Line Seize and Dial-on relays. If the line is seized and the Adapter is not dialling then the Carrier Detect output from the Modem is gated onto CTS. If the line is not seized then the Ring Detector signal is gated onto CTS.

<sup>1</sup> Not fitted to current production



Example shows the digits 3 and 2 being dialled

- |    |                           |           |
|----|---------------------------|-----------|
| 1. | DIAL-ON RELAY SET-UP TIME | >5mS      |
| 2. | BREAK PULSE WIDTH         | 66mS ±6mS |
| 3. | MAKE PULSE WIDTH          | 33mS ±3mS |
| 4. | DIAL-ON RELAY HOLD TIME   | >5mS      |
| 5. | INTER-DIGIT DELAY TIME    | >850mS    |

**Fig. (iii) Dial Characteristics Timing Diagram**

## 7. FAULT FINDING ON THE PRESTEL ADAPTER

### 7.1 General

Any description or accompanying note giving details of the fault and how it came about should be read carefully. Always ensure that there is a fault with the hardware and that it is not due to the user's software or the user's understanding of the PRESTEL Adapter which is the problem.

Always check the power supply voltages on the PCB as a matter of course. (See 'Power Supply Checks', page 15)

Also check all the fuses on the PCB itself; there are six PCB mounted fuses which may become loose if the PRESTEL Adapter has been subjected to excessively rough handling.

If a fault has to be traced through on the PCB, a useful debugging program for the BBC Microcomputer is given in Appendix A. This routine configures the function keys as follows:

f0	STEP PULSE
f1	RESET PULSE
f2	CONTINUOUS STEP PULSES
f3	CONTINUOUS RESET PULSES
f4	RL1 ON
f5	RL2 ON
f6	RL3 ON

Keys f2 and f3 may be used to trace the progress of a STEP or RESET pulse through the decoding circuitry.

Keys f3, f4 and f5 will activate relays RL1, RL2 and RL3 respectively so that their operation can be individually checked.

### 7.1 Fault Conditions

A PRESTEL Adapter failure can usually be related to one of the following fault conditions:.

#### **No PRESTEL display after entering \*PRESTEL**

This will occur if:

- a) A PRESTEL ROM version 1.0 or higher has not been installed in the BBC Microcomputer to which the PRESTEL Adapter is connected.
- b) The PRESTEL ROM is not installed in the BBC Micro.
- c) The PRESTEL ROM has failed.

**Failure to recognise that the adapter is plugged in and switched on.**

This will be shown by the '**Adapter?**' error message being displayed by the BBC micro when dialling is attempted.

This may be the result of:

- a) The RS423 connector inserted into the BBC microcomputer socket incorrectly (the cut-out should be facing UP).
- b) The Mains fuse in the rear of the Adapter blown.
- c) Loose or faulty internal fuse (FS4).
- d) Internal power supply circuitry faulty.

**Failure to seize the telephone line.**

This will be apparent by failure to hear the 'dial tone' through the Adapter's speaker when dialling starts.

This may be the result of:

- a) Poor or incorrect connection to the telephone line socket.
- b) Faulty speaker connections or speaker.
- c) Internal power supply circuitry faulty.
- d) Circuit fault.
- e) Faulty relay (RL1)

**Failure to dial correctly.**

This will be apparent by failure to hear the dail relays within the adapter clicking as dialling proceeds.

Note: this sound is weak, and the ear may need to be close to the Adapter to hear it. It is produced by the mechanical action of the relays opening and closing and is not heard through the speaker.

This may be the result of:

- a) Loose or faulty internal fuse (FS1 and FS2)
- b) Circuit fault
- c) Internal power supply faulty
- d) Faulty relay (RL2 or RL3)

**Failure to establish a call to a PRESTEL Computer after correct dialling.**

This will be apparent by failure of the PRESTEL 'Welcome ' frame to appear, failure of the '**online**' message to appear at the bottom of the screen, and no answer tone heard through the speaker once a telephone connection is made.

This may be the result of:

- a) Loose or faulty internal fuse (FS3)
- b) Modem IC1 faulty
- c) Circuit fault
- d) Internal power supply faulty
- e) Incorrect number being dialled

### **No response to keyboard.**

This may be the result of:

- a) Power Supply faulty
- b) Modem IC1 faulty
- c) Circuit fault
- d) BBC Micro fault

Diagnostic Flowcharts for the above conditions are given in Appendix B. These should be read in conjunction with the following Circuit Checks:

### **Circuit Checks**

It is assumed that the PRESTEL Adapter is connected to a BBC micro installed with a PRESTEL ROM. The Adapter MUST NOT be connected to a ' phone line. The following equipment is also required:

- I 20MHz oscilloscope, dual trace
- II DVM to measure  $\pm 5$  volts to within  $\pm 0.01$  volts

The function of the Adapter circuitry is to decode input pulses from the RTS input and configure the 'phone line interface (relays) and modem chip mode control as shown in the State Diagram, Fig.(i). A fault in this circuitry may manifest itself in a number of ways, and could give rise to any of the faults stated above.

The best method of checking through the circuitry is by exercising the Adapter using the debugging program given in Appendix A (see above). This program will configure the function keys to produce RESET and STEP pulses, and to produce a continuous stream of either. The decode circuitry may be checked by observing the progress of pulses sent through the RTS line.

A continuous series of RESET pulses may be sent to the Adapter by pressing the "RESET LOOP" function key, f3.

The path of the signal from the RTS input to pin 11 of IC7 should be traced, using a 'scope. Triggering the 'scope on the rising edge of the RTS input signal (use FS1), a second 'scope probe should be attached to IC7 pins 2 and 3 in turn. Their states at the falling edge of the RTS pulse should be as shown in the RTS-Pulse Timing Diagram, Fig.(ii), for a 'reset' pulse.

Press ESCAPE and then press the "STEP LOOP" function key, f2.

Observe the signals on IC7 pins 2 and 3 again. Their states at the falling edge of the RTS signal pulse should be as shown in Fig.(ii) for a STEP pulse. If their states are incorrect, check the clock input, IC7 pin 10. This should be a continuous 4.43 MHz clock signal. (Note: this is a fairly fast signal for CMOS logic and slow edges to the clock signal are to be expected ). If this

is not present, check IC6 pin 8, where the clock should also be seen, and that IC6 pin 9 is at a logic 0. This signal goes to a logic 1 only when the RTS input is held continuously high, thus disabling the clock input; short pulses such as STEP and RESET pulses on the RTS input will not affect it.

If the clock is still not present then check for open circuits / track shorts around the crystal XTAL1 and its connections.

To continue checking the decode circuitry, set the 'scope to trigger the falling edge of the RTS input pulse and observe the signal on IC9 pin 6. This should be a very short negative pulse of not less than 250 nSec (note: this is a single short pulse that occurs every few milliseconds so a high level on the 'scope intensity and a fast timebase is required to observe it). It is this pulse that is used as a clock input to step through the counter IC10 whose outputs control the Adapter state (see Fig.i).

If the "RESET LOOP" is again applied to the adapter (f3) a similar signal should be seen at IC9 pin 5. Ensure that this pulse is also present at IC10 pin 15. If it is not check that IC12 pin 6 is at a logic 1; this input is a power-on-reset signal which should be high at all times.

**To check the action of the counter:**

From the reset state, repeatedly press the "CALL STEP" function key ( f0), and observe the counter outputs from IC10, pins 11,12,13 and 14. These outputs should perform a binary count from 0 through to 8 (binary 1000), as each STEP pulse is applied from the f0 function key. Once it reaches a count of 8, then further STEP pulses should have no further effect on the counter. However, further STEP pulses after a count of 8 should then start to cause the signal on IC10 pin 3 to toggle between 0 and 1. If the link LK3 is in the wrong position, then the counter outputs from IC10 will only count up to binary 4 and IC10 pin 3 will be permanently low.

**To check the action of the relays:**

The debugging program given in Appendix A configures the function keys f4, f5, f6 to activate RL1, RL2 and RL3 respectively. Thus alternately pressing the respective function key and f1 (RESET) will cause that relay to open and close. This sound should be audible and is a way of checking their operation. However, the contact resistance of each one should also be checked with a meter.

RL1 may be checked for operation by alternately pressing the f4 key and the f1 key. Using the 'scope observe IC11 pin 13, which should be switching between 0 and 1 (note: its logic 0 output may be up to 1 volt). Also listen carefully and the mechanical action of the relay opening and closing should be heard. If the signal is switching but no clicking is heard, check the resistance between the connections A and C at the 'phone cable connections at the rear of the pcb. It should be alternating between open circuit ( >1 Mega ohm) when open and less than 100 ohms when closed. If this is not so then replace RL1.

For RL2 press the f5 function key. The resistance across the A and C terminals should be less than 25 ohms.

For RL3 press the f6 function key. The resistance across the A and C terminals should be >1 Mega ohm with RL3 active.

If any of these are incorrect then replace the appropriate relay

**To check the operation of the modem chip IC1:**

Pin 10 is the Carrier detect level adjustment and is set by R19 and R20 to be a constant 3.2 volts  $\pm$  0.2 volts. Pin 7 is the Receive bias adjustment and is set by R18 and R20 to be a constant 2.7 volts  $\pm$  0.2 volts. If either of these are incorrect then data transfer problems may be encountered. Check and replace resistors if necessary. Pin 3 is the Carrier Detect output and is low in the RESET state. Providing 9 STEP pulses will switch the output to a logic 1. If this does not occur a fault exists within the modem chip IC1, or in the line amplifiers circuitry. Pin 13 and 12 are the modem mode control inputs, TXT1 and TXT2. They should both be a logic 1 on reset. After 4 STEP pulses the modem will be configured to a transmit at 75 baud mode and pin 12 will go low. Step 8 takes it to the Recieve at 1200 baud mode and pin 12 returns high. Subsequent STEP pulses will toggle both pins 12 and 13 between logic 0 and 1. The modem chip modes for combinations of these two inputs are:

TXT1	TXT2	Modem IC mode
0	0	Tx at 1200 (1200/1200)
0	1	Tx at 600 (not used)
1	0	TX at 75 (1200/75)
1	1	Rx at 1200 (1200/1200)

Pin 11 is the Transmit analog output. It is the modulated output corresponding to the state of the TXD input pin (14).

**Power Supply Checks**

Before examining signals on the PCB it should be ensured that the power supply is providing the correct voltages. Use a DVM to ensure that TP9 is at +5 volts ( $\pm$ 100mV), and that TP7 is at -5volts ( $\pm$ 200mV). Also check that this voltage is present across fuses FS5 and FS6 respectively (a drop of up to 0.1 volt across each fuse may be expected). If a fuse has blown the Adapter should be switched off and the fuse replaced. If it continues to blow, check for short circuits on the pcb.

If the voltages are not within specification, then the PSU circuitry may be checked as follows.

Firstly, disconnect the Adapter from the mains supply. Remove the 6 screws securing the PCB, and disconnect the speaker. Remove the 4 M3 bolts, washers and nuts securing the plastic enlosure covering the PSU components.

If the voltage on one of the Test Points is only slightly out of spec. then the voltage regulator associated with that voltage is suspect and should be replaced, e.g. IC15 for the +5 volt rail, and IC16 for the -5 volt rail.

Reposition the PCB in the lower case, ensuring that no washers, bolts etc. have been left in the base, and switch on the Adapter. Using a scope, observe the "15V" pin protruding from the PSU transformer to check for a 15 volt AC waveform. If it is not present, then disconnect from the mains and check the continuity of the mains wiring from cable to PCB. If this is OK then replace the transformer. If the 15 V AC is present, check the (+)ve terminal of C34 for a DC voltage of +20 volts with up to a 15 volt peak-to-peak ripple. If the voltage is incorrect then replace the bridge BR1 and the regulator IC15. Repeat this for the negative rail by checking that the voltage at the (-)ve end of C37 is at -22 volts with up to a 5 volt peak-to-peak ripple. If not then replace BR1 and IC16.

If a fault still persists, then check for short and open circuits around the PSU circuitry.

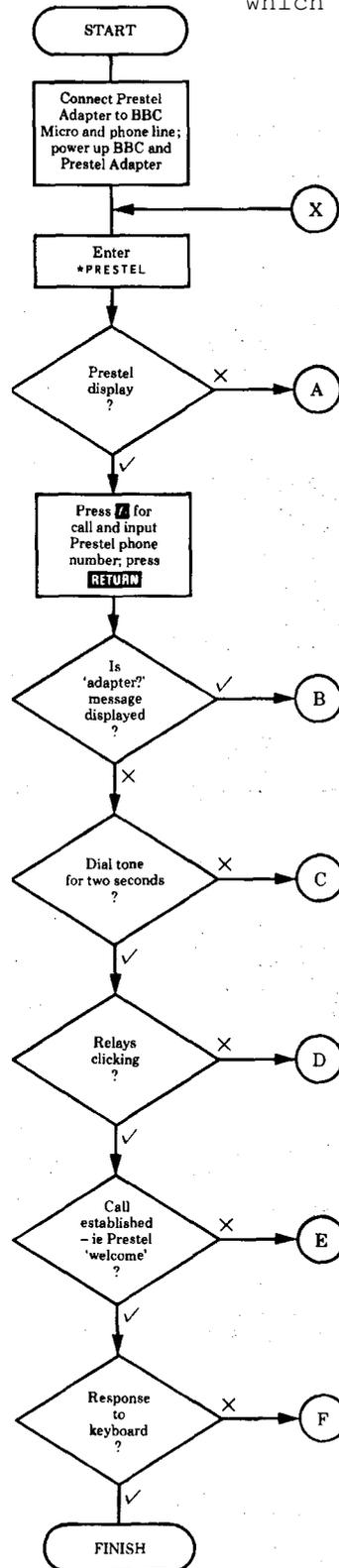
**APPENDIX A - PRESTEL Adapter Debugging Program  
for the BBC Microcomputer model B**

```
10 REM This listing configures the
20 REM function keys f0 and f1 to
30 REM generate "STEP" and "RESET"
40 REM pulses to assist debugging of
50 REM PRESTEL Adapters.
60
70 REM Note: this routine expects a
80 REM PRESTEL ROM to be installed.
90
100 UARTS=&FE08
110 RTSHTXDH=&6A
120 RTSHTXDL=&0A
130 DIMQ%100
140 FOR I%=0 TO 2 STEP 2
150 P%=Q%
160 [ OPT I%
170 \
180 .XSTEP
190 LDA #1
200 JMP OSWORD
210 \
220 .XRESET
230 LDA #0
240 \
250 .OSWORD
260 STA PB
270 LDX #PB MOD 256
280 LDY #PB DIV 256
290 SEI
300 LDA #&7B
310 JSR &FFF1
320 CLI
330 RTS
340 \
344 .RL1ON
350 JSR XRESET
355 JSR XSTEP
360 JMP XSTEP
370 \
380 .RL2ON
390 JSR RL1ON
400 LDA #RTSHTXDH
410 STA UARTS
420 RTS
430 \
440 .RL3ON
450 JSR RL2ON
460 LDA #RTSHTXDL
470 STA UARTS
480 RTS
490 \
500 .PB EQUB 0
510 \
520 ]
```

```
530 NEXT 540. PRINT
550 PRINT"FUNCTION KEY CONFIGURATION:_"
560 PRINT"f0...CALL STEP"
570 PRINT"f1...CALL RESET"
580 PRINT"f2...STEP LOOP"
590 PRINT"f3...RESET LOOP"
591 PRINT"f4...CALL RL1ON"
592 PRINT"f5...CALL RL2ON"
593 PRINT"f6...CALL RL3ON"
600 PRINT
610 *K.0 CALL XSTEP|M
620 *K.1 CALL XRESET|M
630 *K.2 REPEAT:CALL XSTEP:UNTIL 0|M
640 *K.3 REPEAT:CALL XRESET:UNTIL 0|M
641 *K.4 CALL RL1ON M
642 *K.5 CALL RL2ON M
643 *K.6 CALL RL3ON M
650 END
```

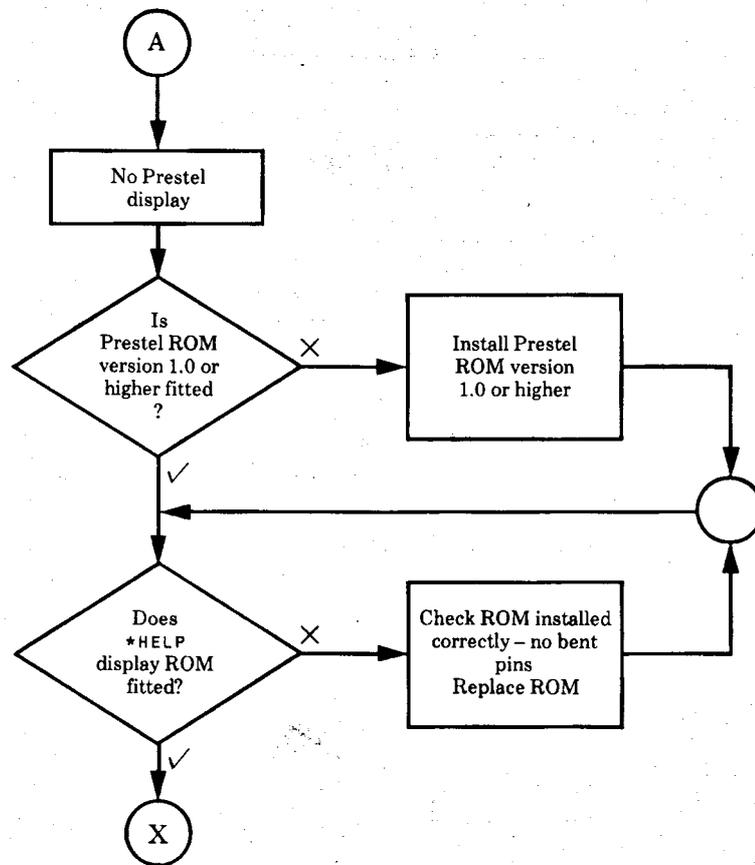
APPENDIX B  
DIAGNOSTIC FLOWCHARTS

The letters in circles refer to the relevant flowcharts which follow.

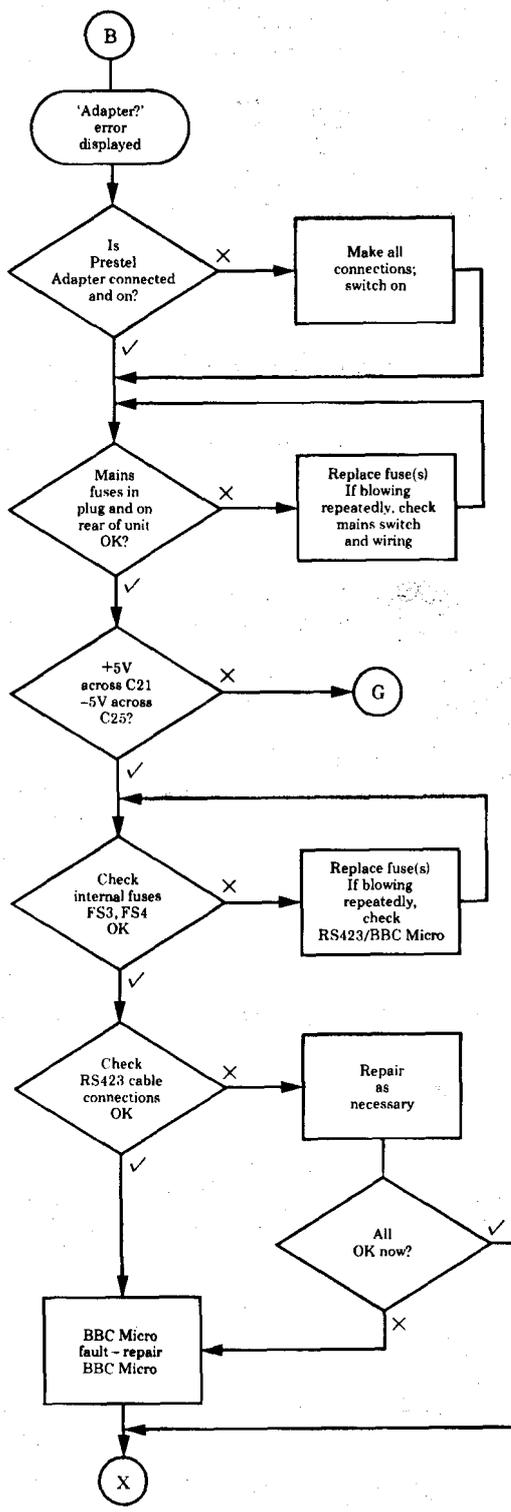


Master Flowchart

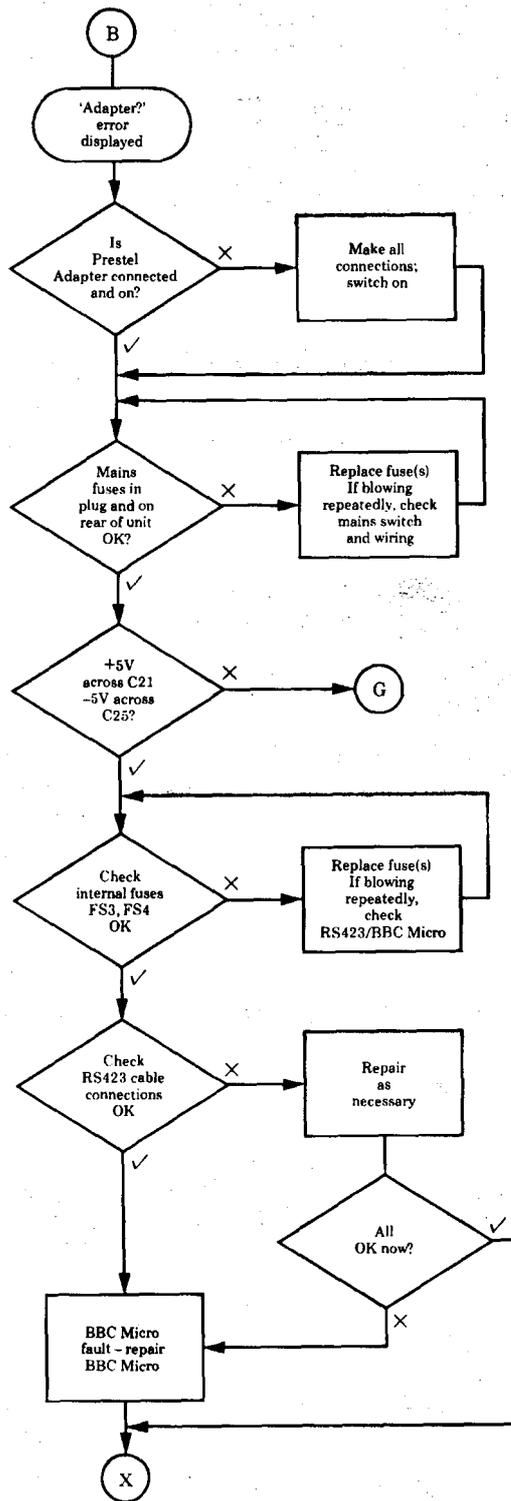




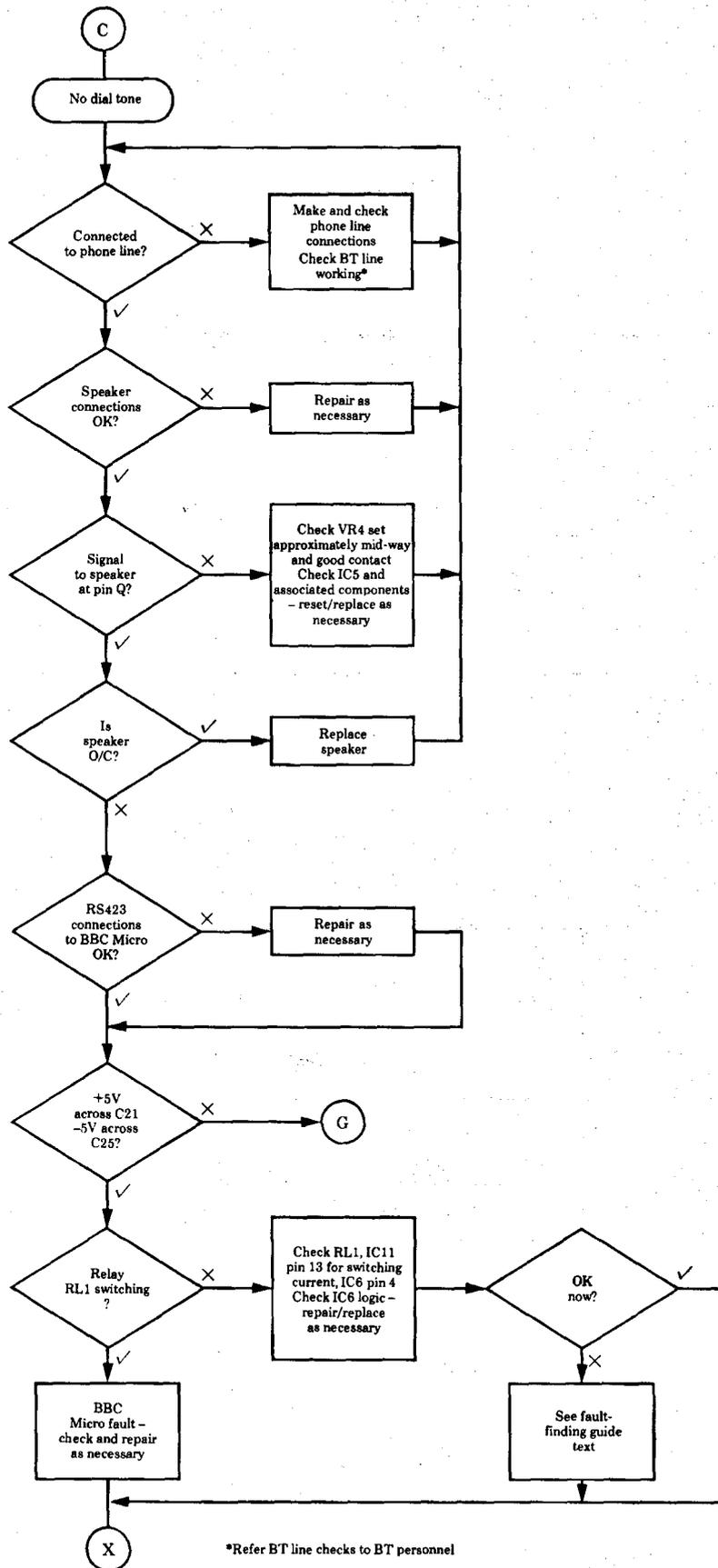




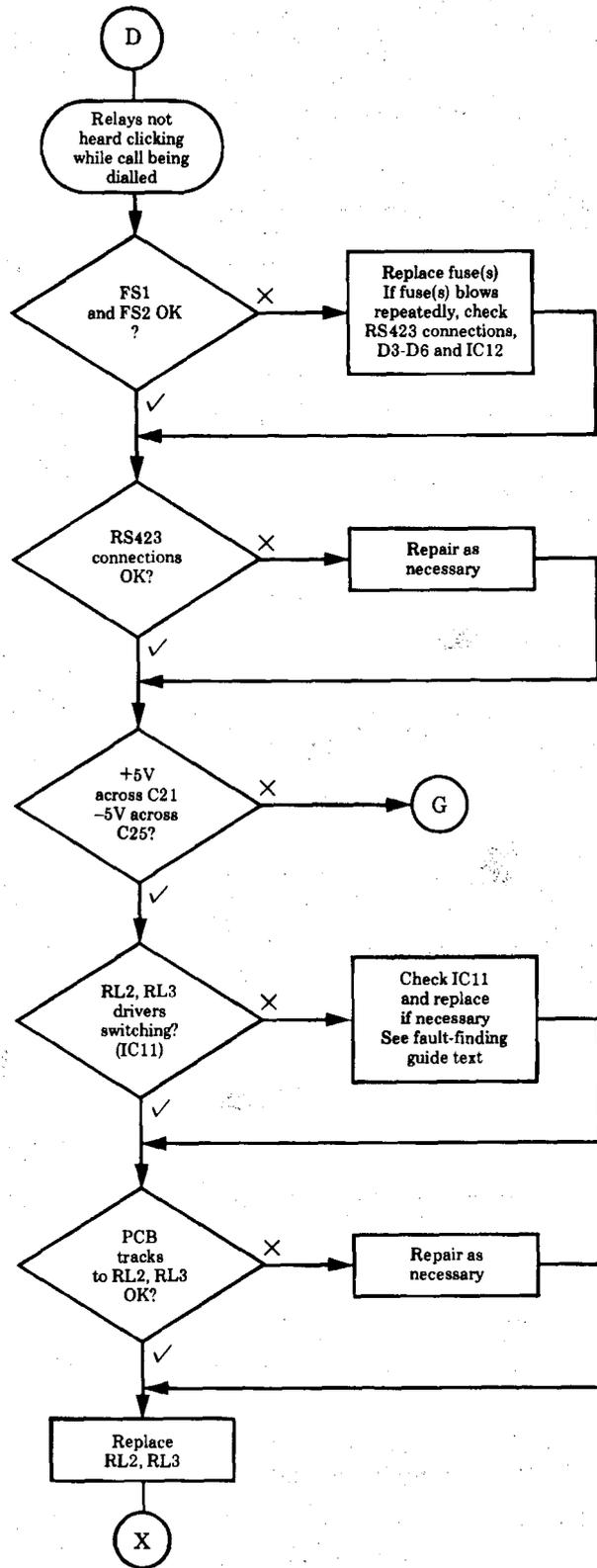




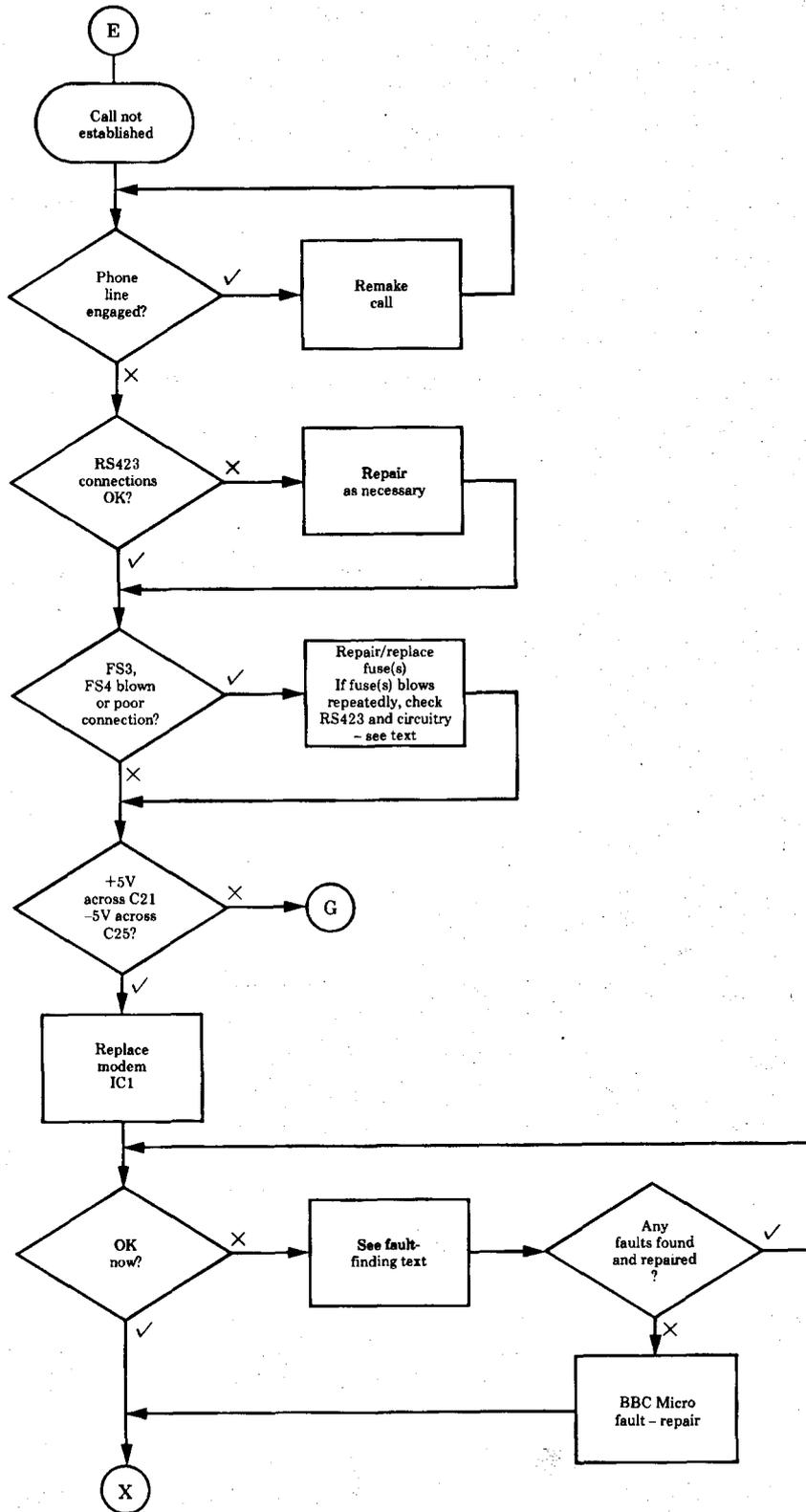




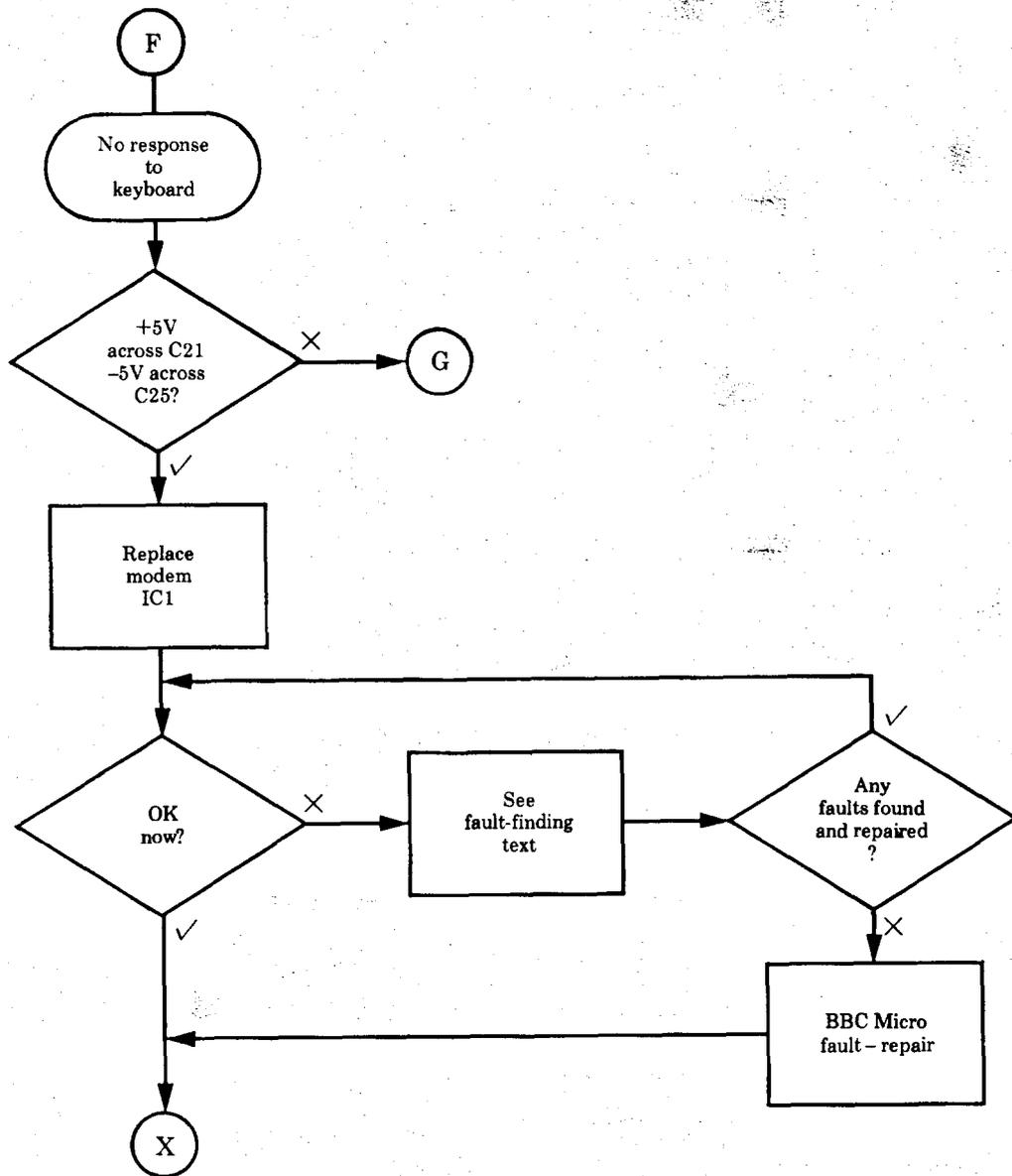




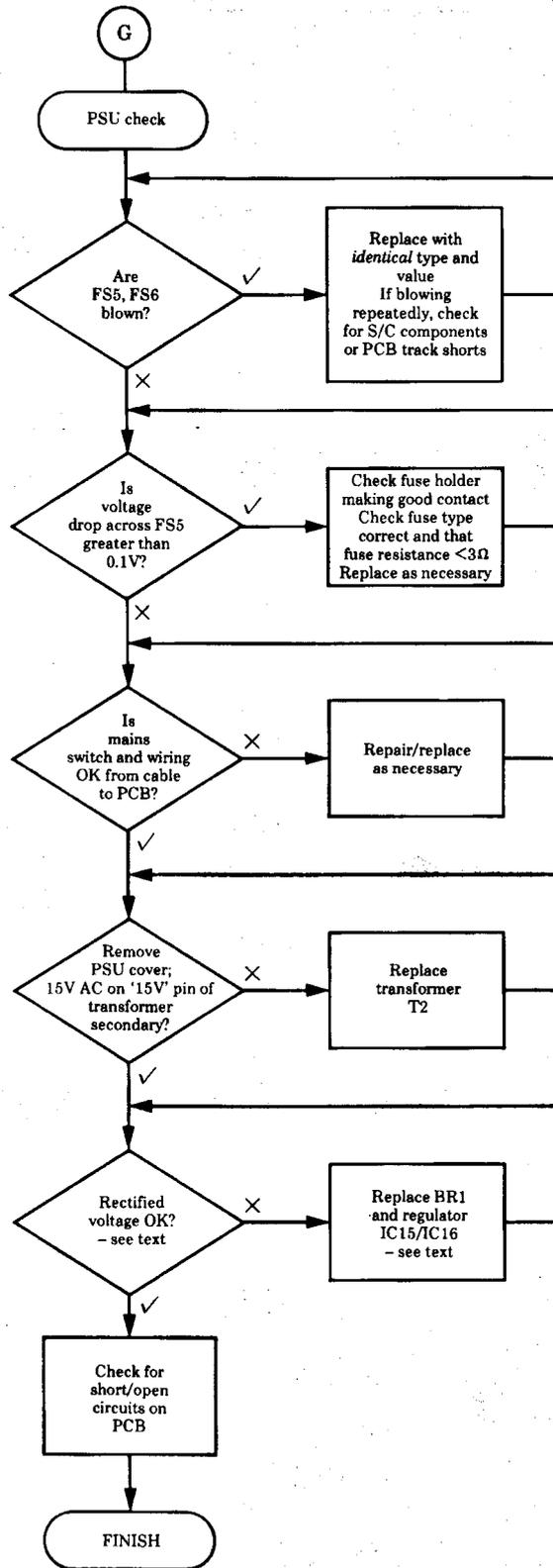




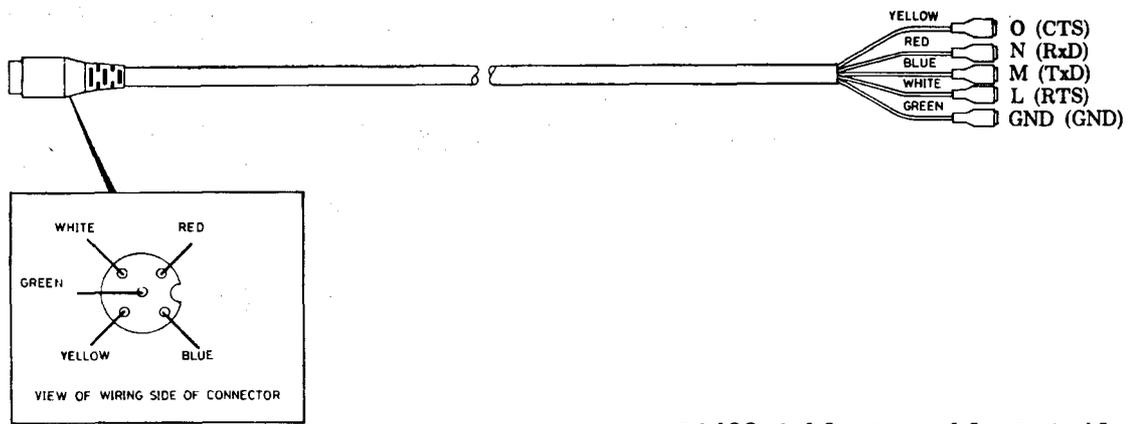




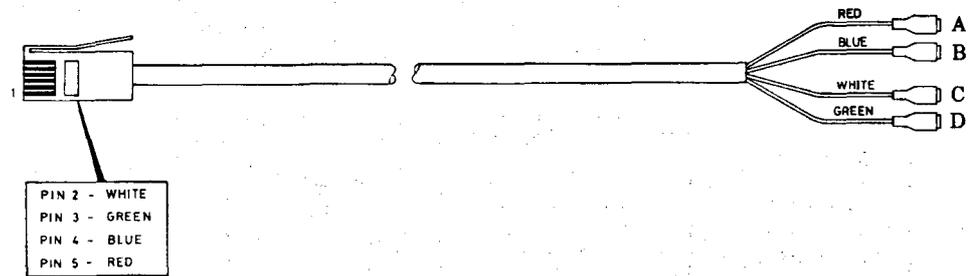




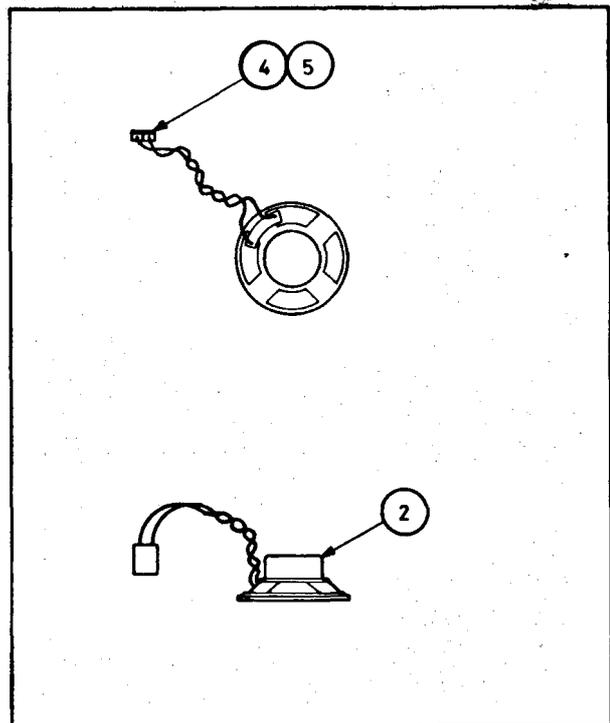




RS423 Cable Assembly Detail

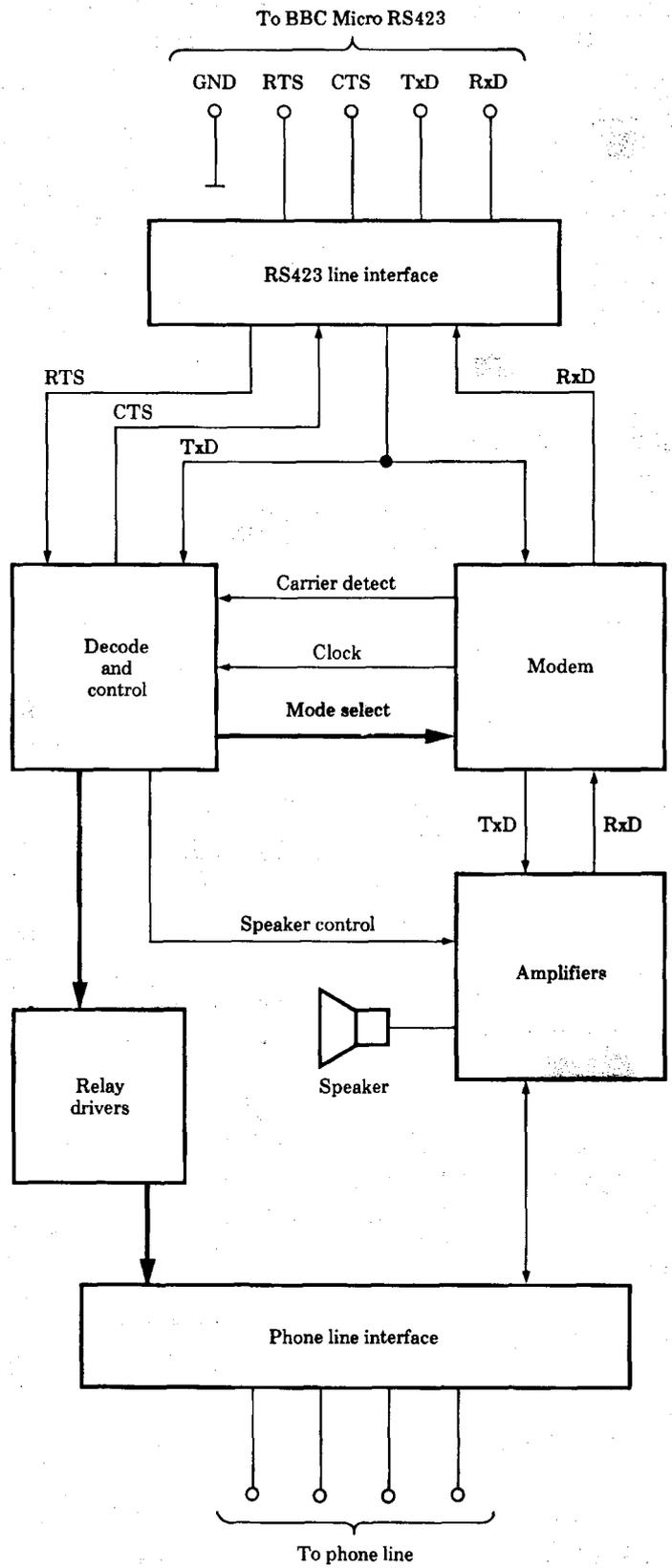


Telephone Cable Assembly Detail

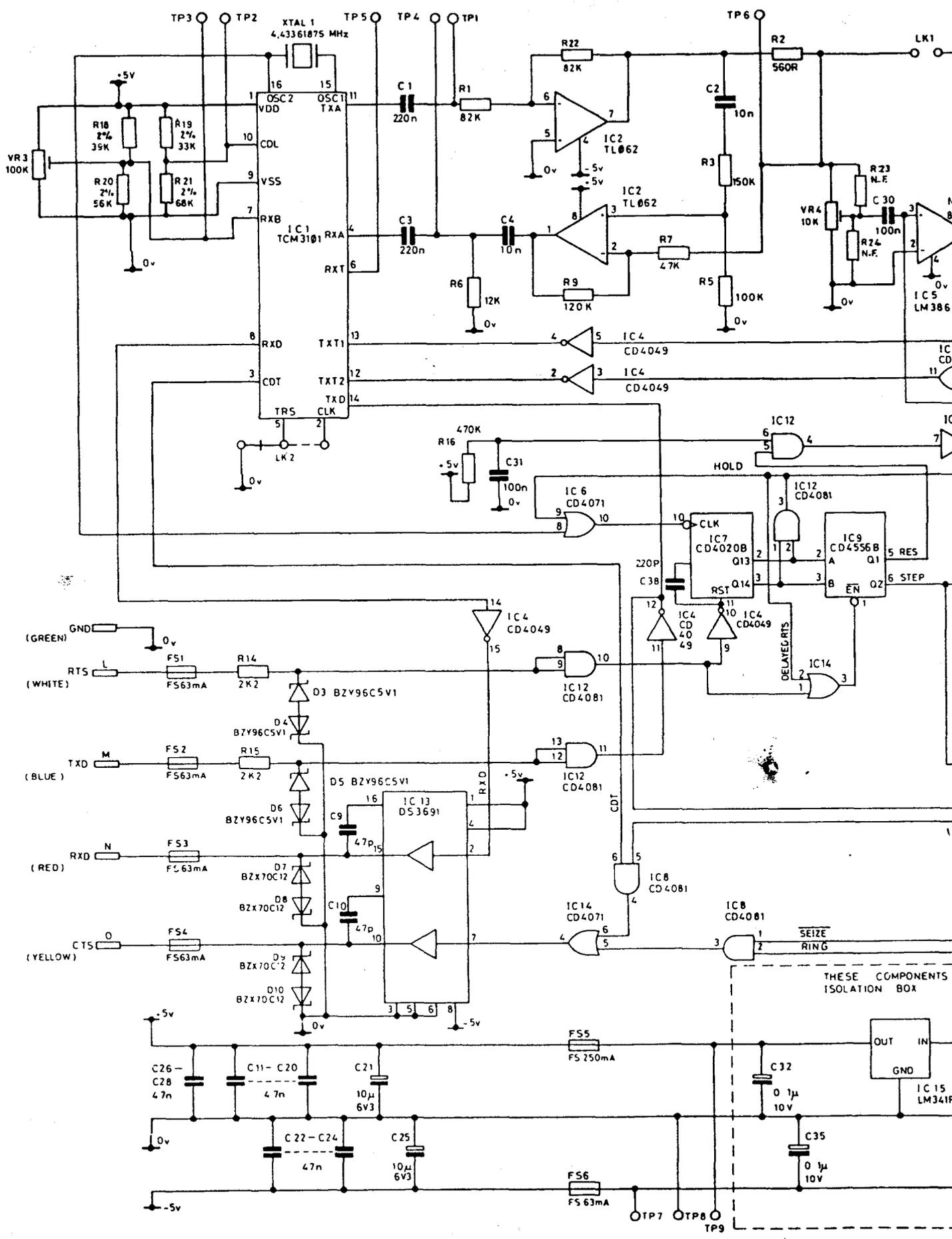


Speaker Assembly Detail









THESE COMPONENTS ISOLATION BOX

IC 15 LM339

IC 5 LM386

IC 12 CD4081

IC 9 CD4556B

IC 4 CD4049

IC 12 CD4081

IC 13 DS3691

IC 14 CD4071

IC 8 CD4081

IC 8 CD4081

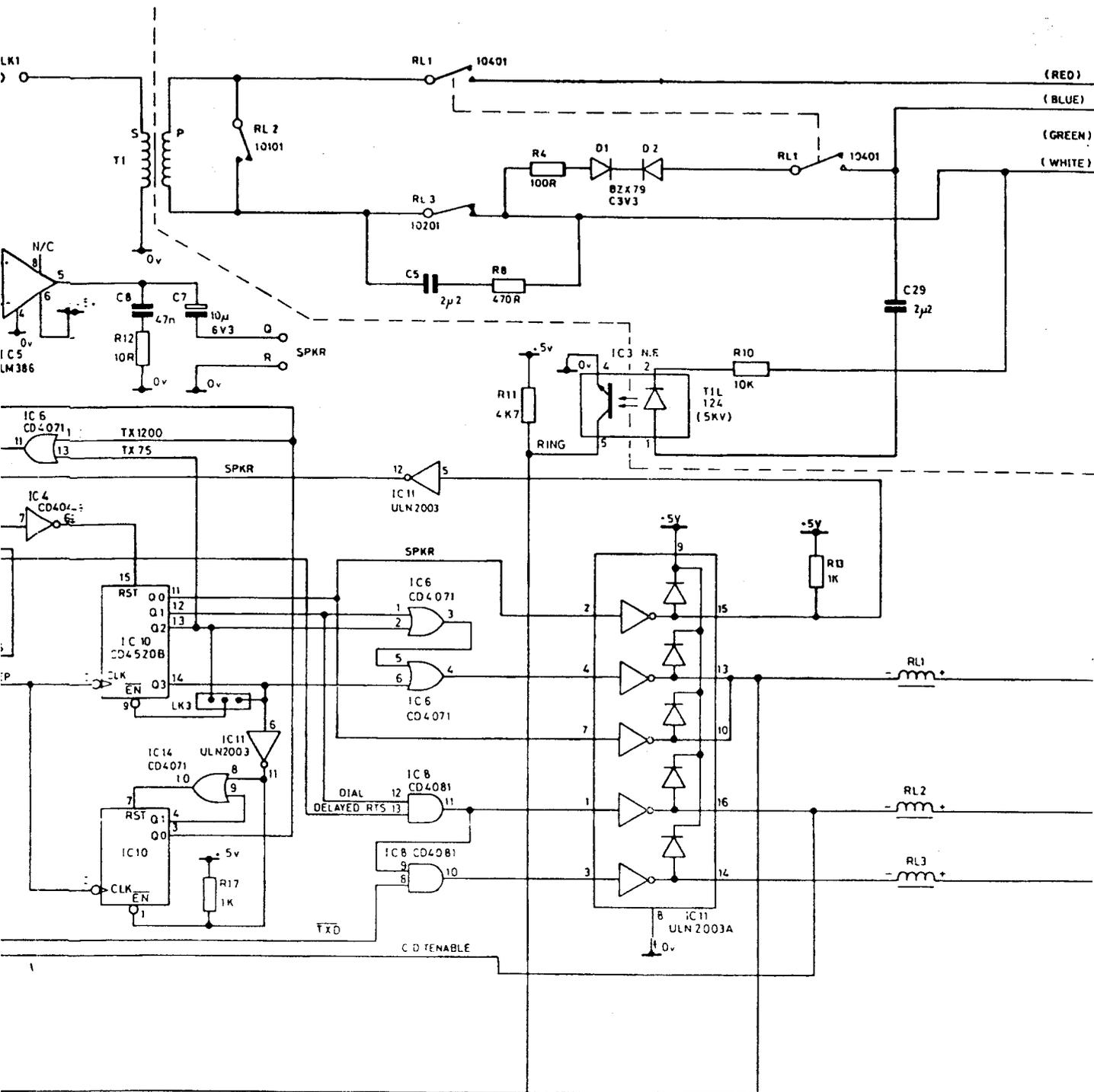
IC 7 CD4020B

IC 4 CD4049

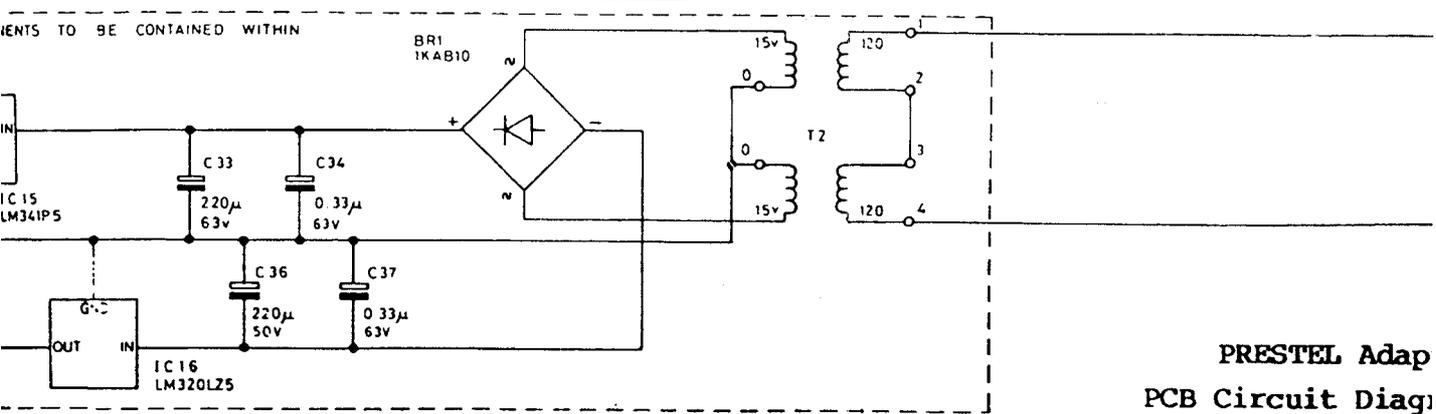
IC 2 TL062

IC 2 TL062

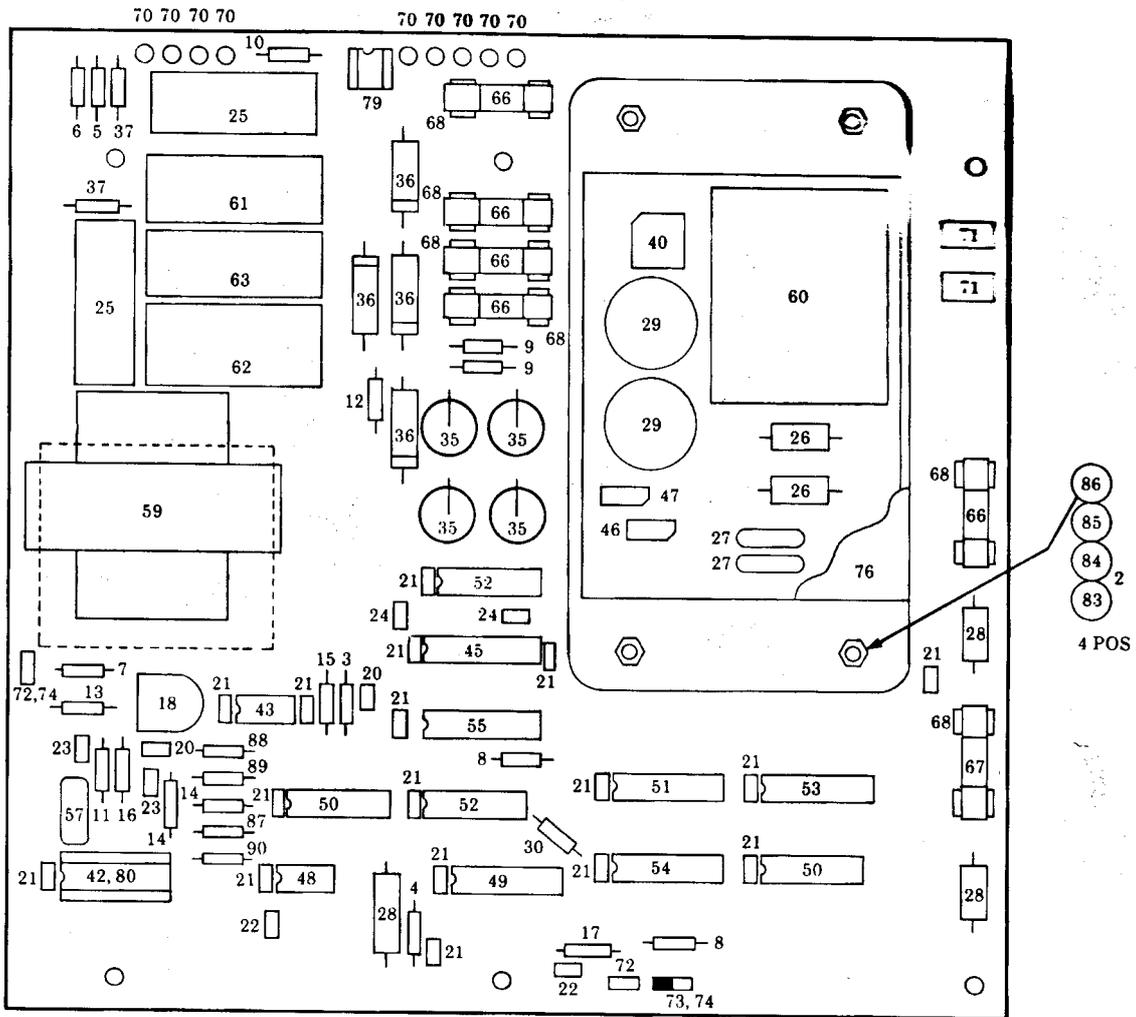
IC 1 TCM3101



(RED)  
 (BLUE)  
 (GREEN)  
 (WHITE)



**PRESTEL Adap  
 PCB Circuit Diagram**

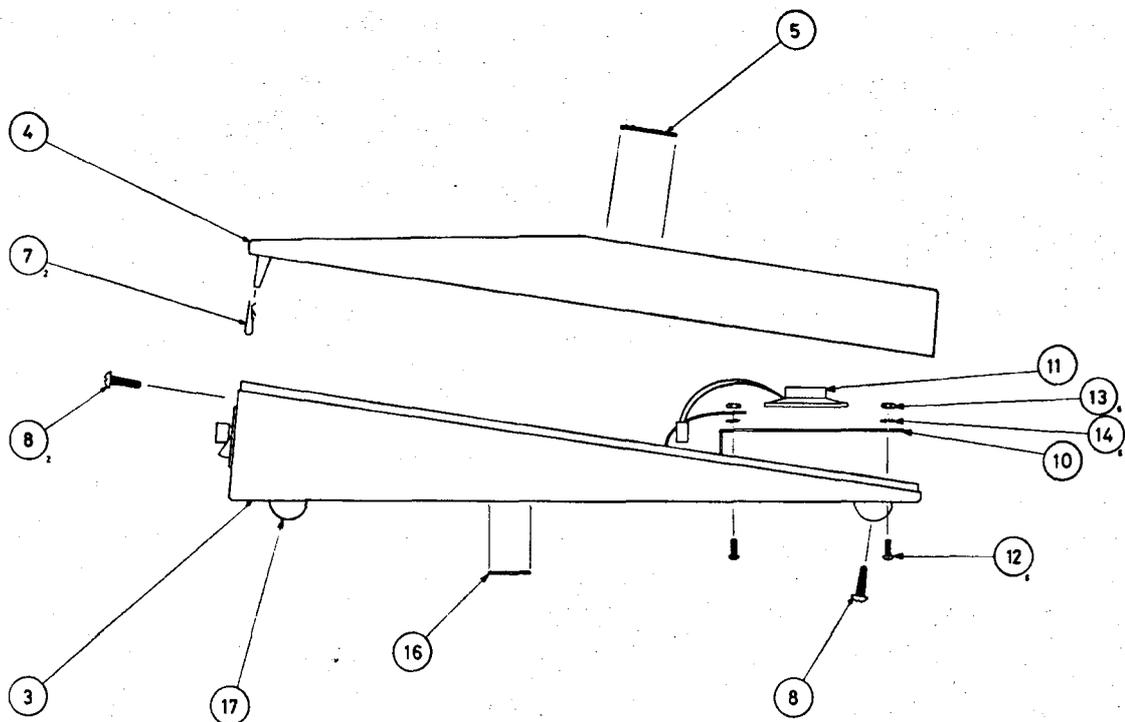


PRESTEL Adapter PCB Component Layout





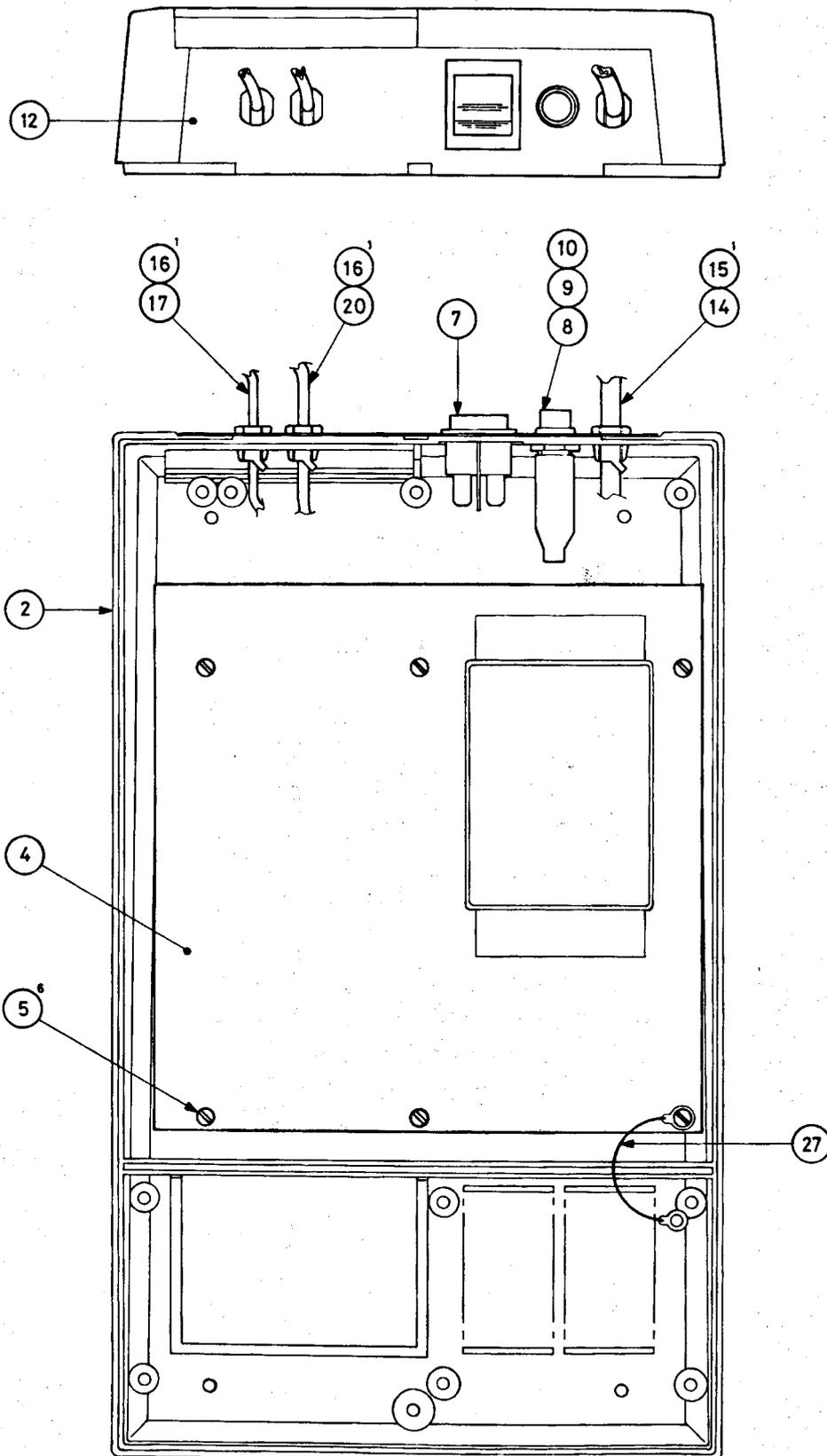




NOTE:  
 SPEAKER INSERTED UNDER MOUNTING LUGS,  
 LUGS BENT DOWN AND ADHESIVE APPLIED  
 TO SECURE SPEAKER TO LUGS.

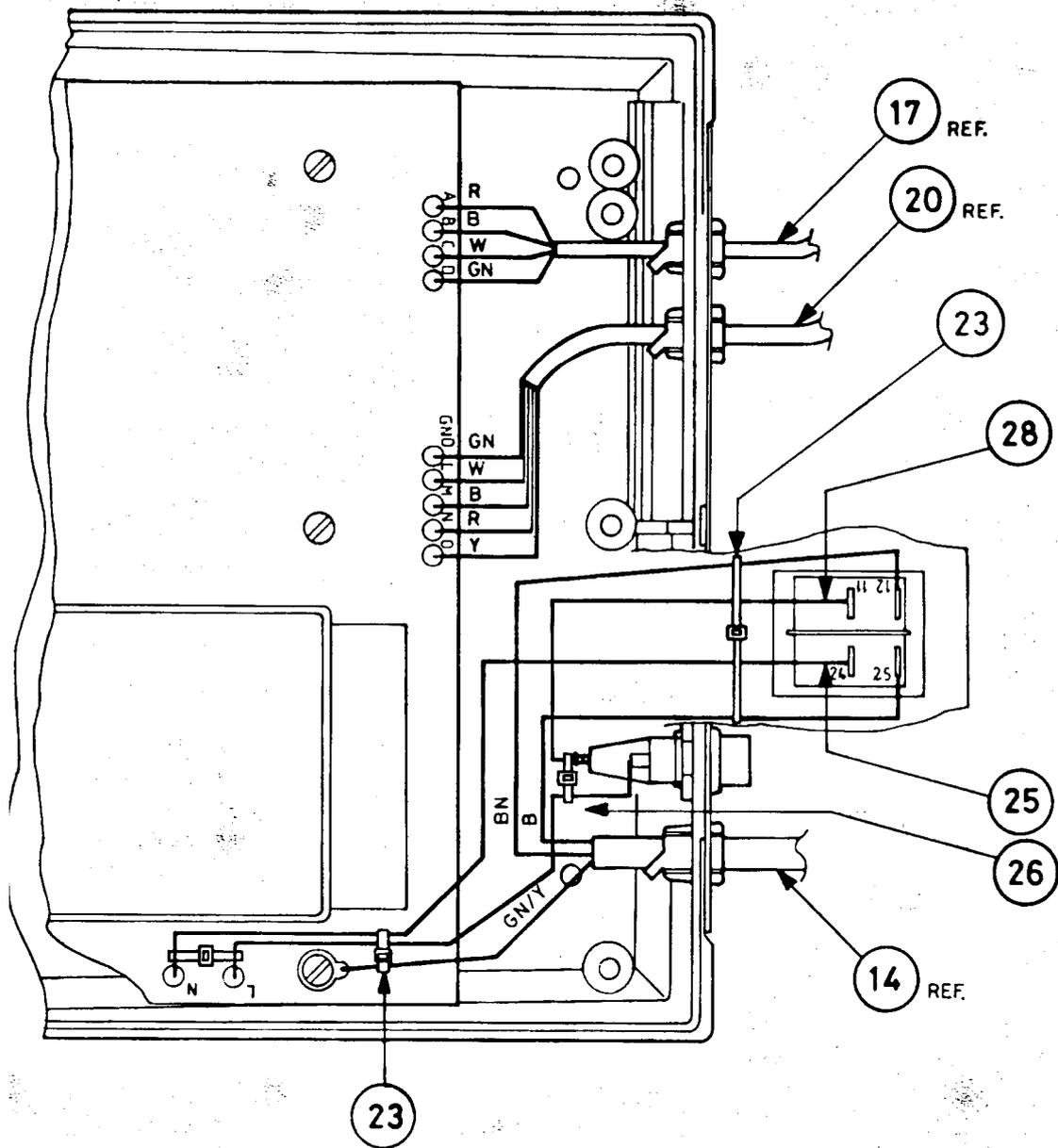
PRESTEL Adapter Final Assembly





PRESTEL Adapter Case Lower Assembly





PRESTEL Adapter Case Lower Assembly Wiring Diagram



**PRESTEL ADAPTER PARTS LISTS**

**NOTE:** Items indentified by \* are normally available as spare parts - please contact your supplier for details of availability.  
 + denotes SAFETY CRITICAL COMPONENT - see below

**IMPORTANT**

In order to comply with BT approval regulations, components used within this unit must only be replaced with exact equivalent parts. All replacement parts identified in the list below are deemed to be "Safety Critical" and must be obtained from the Customer Services department of Acorn Computers Limited. On no account may any other part be substituted. Failure to comply with this may result in a breach of approval regulations and may cause the product to become unsafe.

**SAFETY CRITICAL COMPONENTS**

ACORN PART NO.	DESCRIPTION
810,005	RELAY
810,004	RELAY
810,003	RELAY
865,002	BARRIER TRANSFORMER

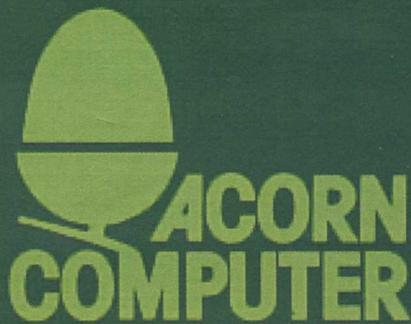
ITEM PART No.	DESCRIPTION	QTY	REMARKS
<b>PRESTEL Adapter Final Assembly (SEE PAGE 45)</b>			
3	SEE BELOW CASE ASSEMBLY, LOWER		
4	201,109 * CASE MOULDING, UPPER	1	
5	201,182 * LABEL, CASE, UPPER	1	
7	882,946 * NUT, SPIRE No.6	2	
8	882,665 SCREW, No.6 x 13mm SELFTAP PAN HD	3	BLACK
10	201,183 PLATE, SPEAKER FIXING	1	
11	SPEAKER ASSEMBLY (SEE PAGE 35)		
2	835,001 * LOUDSPEAKER, 16 OHM, 0.2W	1	
4	800,082 SHELL, 2 WAY	1	
5	800,080 CONNECTOR, CRIMP	2	
12	882,022 SCREW, M3 x 8mm SL CH HD SCR	6	
13	882,902 NUT, M3 HEX. FULL	6	
14	882,972 WASHER, M3 INT.TEETH		
17	890,000 * FOOT, 'STICK-ON'	4	

ITEM	PART No.	DESCRIPTION	QTY	REMARKS
<b>PRESTEL Case Lower Assembly (SEE PAGES 47 &amp; 49)</b>				
2	201,110 *	CASE MOULDING, LOWER	1	
4		PCB ASSEMBLY		
5	882,652	SCREW, No6 x 6mm SELFTAP	6	
7	805,003 *	SWITCH, MAINS	1	
8	815,900	HOLDER, FUSE	1	
9	815,209 *	FUSE 20mm x 5mm 400mA TYPE T	1	SLO BLO
10	815,901	SHROUD, FUSE HOLDER	1	
12	201,184 *	LABEL, REAR	1	
14	201,185	CABLE, MAINS, C/W PLUG	1	
15	880,026	GROMMET, TELEPHONE CABLE	1	
16	880,025	GROMMET, MAINS/RS423 CABLE	2	
17	201,186 *	CABLE ASSEMBLY, TELEPHONE	1	
20	201,187 *	CABLE ASSEMBLY, RS423	1	
23	880,101	TIE, CABLE	4	
25	201,188	JUMPER, NEUTRAL	1	
26	201,189	JUMPER, LIVE	1	
27	201,190	STRAP, EARTH	1	
28	201,191	JUMPER, FUSE	1	
<b>PRESTEL PCB Assembly (SEE PAGES 41 &amp; 43)</b>				
3	502,154	RESISTOR 150K $\frac{1}{4}W$ 5%	1	R3
4	502,100	RESISTOR 10R $\frac{1}{4}W$ 5%	1	R12
5	502,101	RESISTOR 100R $\frac{1}{4}W$ 5%	1	R4
6	502,471	RESISTOR 470R $\frac{1}{4}W$ 5%	1	R8
7	502,561	RESISTOR 560R $\frac{1}{4}W$ 5%	1	R2
8	502,102	RESISTOR 1K $\frac{1}{4}W$ 5%	2	R13,17
9	502,222	RESISTOR 2K2 $\frac{1}{4}W$ 5%	2	R14,15
10	502,103	RESISTOR 10K $\frac{1}{4}W$ 5%	1	R11
11	502,123	RESISTOR 12K $\frac{1}{4}W$ 5%	1	R6
12	502,472	RESISTOR 4K7 $\frac{1}{4}W$ 5%	1	R11
13	502,473	RESISTOR 47K $\frac{1}{4}W$ 5%	1	R7
14	502,823	RESISTOR 82K $\frac{1}{4}W$ 5%	2	R1,22
15	502,104	RESISTOR 100K $\frac{1}{4}W$ 5%	1	R5
16	502,124	RESISTOR 120K $\frac{1}{4}W$ 5%	1	R9
17	502,474	RESISTOR 470K $\frac{1}{4}W$ 5%	1	R16
18	581,103	POTENTIOMETER 10K PRE-SET	1	VR4
20	629,010	CAPACITOR 10nF PLATE CERAMIC	2	C2,4
21	680,002	CAPACITOR 47nF/33nF DECOUPLER	17	
22	628,101	CAPACITOR 100nF DISC CERAMIC	2	C30,31
23	651,224	CAPACITOR 220nF DISC CERAMIC	2	C1,3
24	632,047	CAPACITOR 47pF MIN. PLATE	2	C9,10
25	670,222 *	CAPACITOR 2 $\mu$ 2 250V	2	C5,29
26	620,047	CAPACITOR 0 $\mu$ 47 25V ELECT. AXIAL	2	C34,37
27	636,010	CAPACITOR 0 $\mu$ 1 40V ELECT. AXIAL	2	C32,35
28	622,100	CAPACITOR 10 $\mu$ 16V ELECT. AXIAL	3	C21,25,7
29	639,221	CAPACITOR 220 $\mu$ 63V ELECT. AXIAL	1	C33,36
30	628,221	CAPACITOR 220pF 63V MIN. PLATE	1	C38
35	795,005 *	DIODE BZY96C5V1	4	D3,4,5,6
36	795,012 *	DIODE BZX70C12	4	D7,8,9,10
37	795,003 *	DIODE BZX79C3V3	2	D1,2

ITEM	PART No.	DESCRIPTION	QTY	REMARKS
<b>PRESTEL PCB Assembly (SEE PAGES 41 &amp; 43) - cont'd</b>				
40	798,101 *	BRIDGE RECTIFIER 1KAB10	1	BR1
42	763,101 *	INTEGRATED CIRCUIT TCM3101	1	IC1
43	770,062 *	INTEGRATED CIRCUIT TLO62	1	IC2
45	733,691 *	INTEGRATED CIRCUIT DS3691	1	IC13
46	779,001 *	INTEGRATED CIRCUIT LM320LZ5	1	IC16
47	778,006 *	INTEGRATED CIRCUIT LM341P5	1	C15
48	770,386 *	INTEGRATED CIRCUIT LM386	1	IC5
49	754,049 *	INTEGRATED CIRCUIT 4049B	1	IC4
50	754,071 *	INTEGRATED CIRCUIT 4071B	2	IC6,14
51	754,020 *	INTEGRATED CIRCUIT 4020B	1	IC7
52	754,081 *	INTEGRATED CIRCUIT 4081B	2	IC8,12
53	754,556 *	INTEGRATED CIRCUIT 4556B	1	IC9
54	754,520 *	INTEGRATED CIRCUIT 4520B	1	IC10
55	772,003 *	INTEGRATED CIRCUIT ULN2003A	1	IC11
57	820,043 *	CRYSTAL 4,433619 MHZ	1	XTAL 1
59	865,002 +	TRANSFORMER, BARRIER	1	T1
60	865,001 *	TRANSFORMER, MAINS	1	T2
61	810,003 +	RELAY	1	RL1
62	810,005 +	RELAY	1	RL2
63	810,004 +	RELAY	1	RL3
66	815,016 *	FUSE, 20mm x 5mm, 63mA TYPE F	5	FS1,2,3,4,6
67	815,003 *	FUSE, 20mm x 5mm, 250mA TYPE F	1	FS5
68	815,910	HOLDER, FUSE, PCB MTG	12	
70	800,200	FASTON TAB, 0,110"	9	
71	800,203	FASTON TAB, 0,250"	2	
72	800,250	PIN, 2 WAY	2	LK1
73	800,051	PIN, 3 WAY	1	LK3
74	800,070	SHUNT	2	LK1,LK2
76	885,103	PLASTIC BOX	1	
79	800,108	SOCKET, I.C., 8 WAY, DIL	1	
80	800,116	SOCKET, I.C., 16 WAY, DIL	1	FOR IC1
83	882,972	WASHER, M3, SHAKEPROOF	4	
84	882,962	WASHER, M3, PLAIN	8	
85	882,902	NUT, M3, FULL	4	
86	882,122	SCREW, M3 x 6mm PAN HD	4	
87	505,683	RESISTOR 68K $\frac{1}{4}$ W 2%	1	R21
88	505,393	RESISTOR 39K $\frac{1}{4}$ W 2%	1	R18
89	505,563	RESISTOR 56K $\frac{1}{4}$ W 2%	1	R20
90	505,333	RESISTOR 33K $\frac{1}{4}$ W 2%	1	R19







Acorn Computers Limited, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN, England