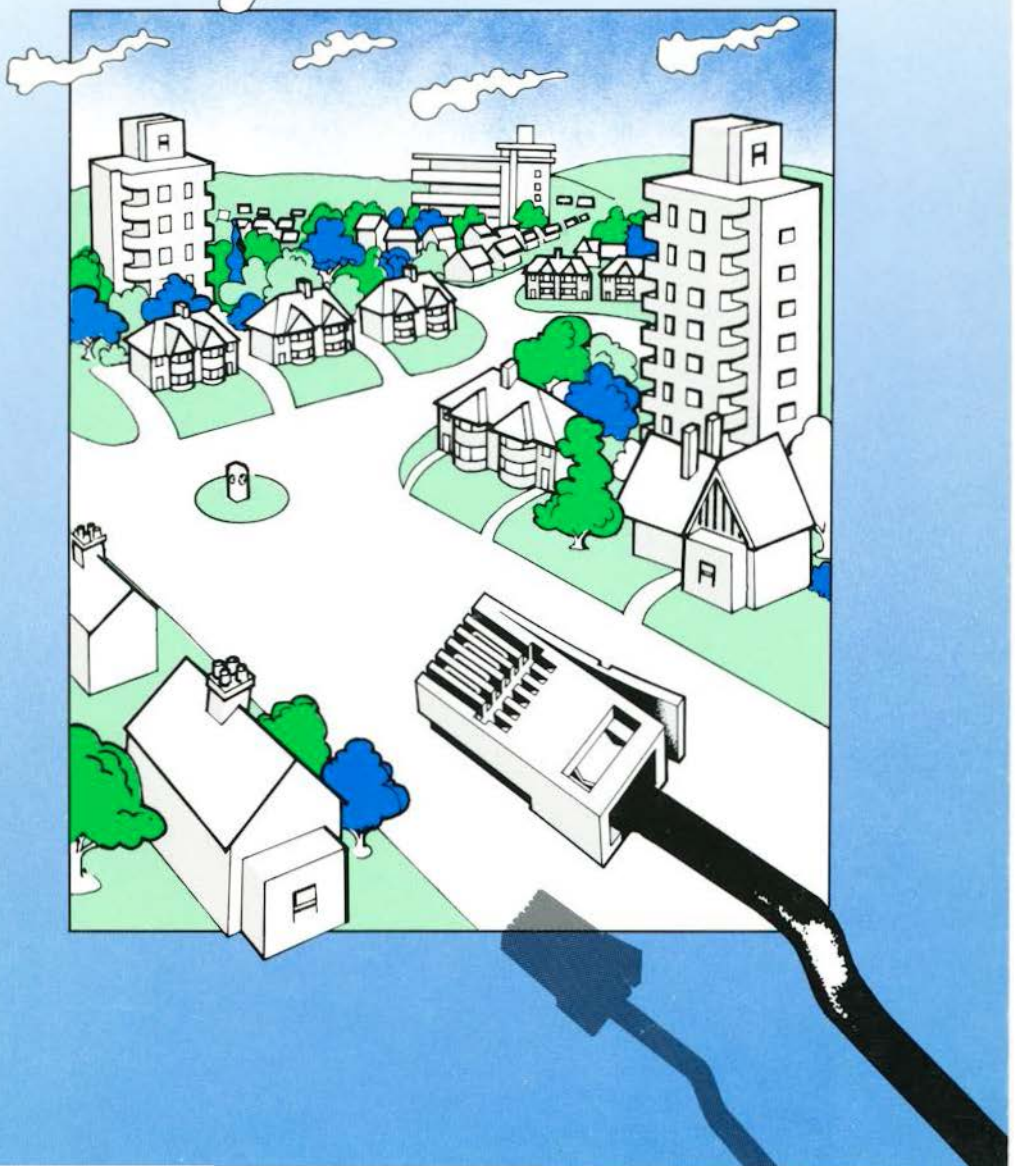
Oftel
Office of Telecommunications

THE WIRING CODE

PART 1

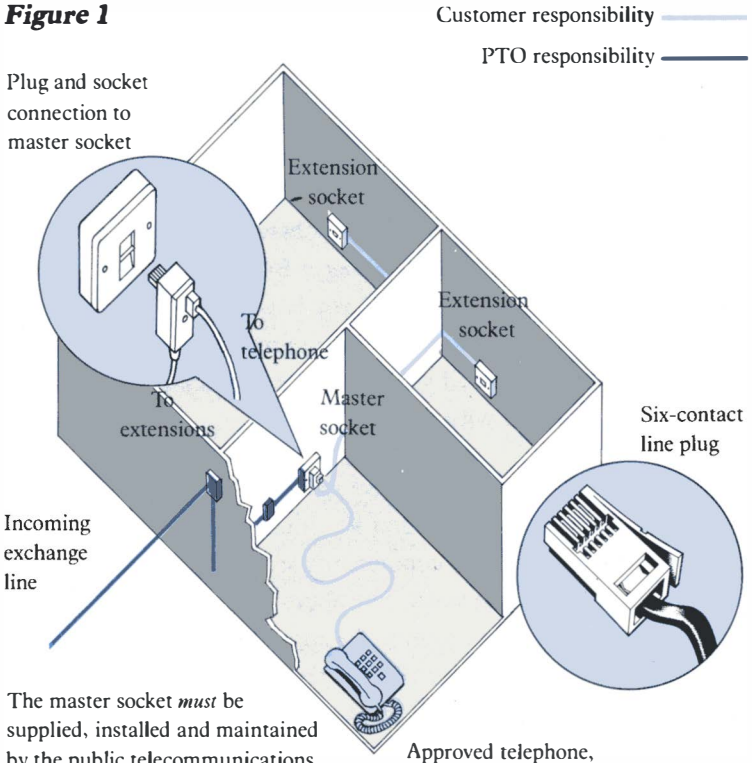
Domestic and Other Simple Installations



This edition published March 1991.

1 This handbook is Part 1 of OFTEL's *Wiring Code* and covers simple systems such as the wiring installations usually found in the home. A typical installation is shown in figure 1. If your system includes a piece of switching apparatus, for example a key system or PBX (private branch exchange), or apparatus using digital signals, you will need to look at Part 2 of the *Wiring Code* which covers business and other more complex

Figure 1



The master socket *must* be supplied, installed and maintained by the public telecommunications operator (PTO). The extension sockets may be installed by anyone. The master socket may have connection terminals accessible to users, for example BT's NTE 5 (or Linebox).

Approved telephone, the wiring and wiring components, may be installed and maintained by anyone.

systems. This Part only deals with installations containing simple apparatus and is intended as a guide to help you install an extension telephone or similar piece of apparatus using extension wiring from a master socket.

2 The principles (shown in highlighted boxes) and guidelines in this handbook are based on two legal obligations

- what you are licensed to do and
- what your apparatus is approved to do.

3 Simple domestic installations connected to the public network (ie to the telephone exchange) are considered to be **telecommunications systems** and must be run under a licence. However, you do not need to apply for your own licence because such systems are run under a **class licence** which is called the *Class Licence for the Running of Branch Telecommunication Systems* - known as the **BSGL**. All you have to do to be covered by this licence is to comply with the requirements in it. As far as your wiring is concerned, if you follow the provisions in this Code you will be complying with the BSGL.

4 You must use only **approved** apparatus in your system (see Principle C and paragraphs 9 and 10). Individual pieces of apparatus, wire and wiring components are approved to be used and connected in certain ways. The approval may become invalid (so the apparatus would no longer be approved) if you do not use the apparatus in the way described in the instructions supplied with it and in accordance with this Code.

5 All the information in this Code was correct at the date of publication (see inside front cover) but it is not a complete statement of the law. If you wish to check you have the latest edition, telephone OFTEL's Publications Section on 071-822 1519.

YOUR INTERFACE WITH THE PUBLIC NETWORK

6 British Telecom, Mercury Communications and Kingston Communications (in Hull) are all licensed as **public telecommunications operators (PTOs)** and operate the fixed public networks. You may have a local cable TV company in your area offering telephony services – these are also licensed as PTOs. The PTO will supply service from the public network (ie an exchange line) by installing a pair of wires to your home. You should note the following:

A Wiring that is part of the public telecommunications system is the exclusive responsibility of the licensed operator of that system.

B Wiring that does not form part of a public telecommunication system may be supplied and installed by anyone with suitable skills.

7 Principle A states that the PTOs alone are responsible for supplying, installing, bringing into service and maintaining all the wiring and apparatus which forms part of their public systems. It is therefore important that you know where the boundary is between your system and the public network (this is discussed later on – see paragraph 13).

8 Principle B refers to wiring in your own system, ie on your side of the network boundary. Wiring and apparatus in your system does not have to be installed by the PTO but may be installed by you or somebody suitable you employ to do it, such as a local telecommunications or electrical engineer.

APPROVED APPARATUS

C Only approved apparatus, wiring and components may be used.

9 When buying a telephone, payphone or any other apparatus (eg wiring, answering and fax machines) for use in your system, you should check that it is approved. All approved apparatus you might wish to install, with the exception of some approved fax machines, will have a *green spot* label attached as shown in figure 2a. Wiring and wiring components or the packaging in which they are sold are also marked either with the green spot or with alternative approval labels like those shown in figure 2b.

10 Apparatus which has **not** been approved for connection to the public network should display a *red triangle* (figure 2c). This apparatus can legally be bought and sold (with the exception of cordless telephones), providing it is correctly marked, but you must not connect it directly or indirectly to your exchange line.

Figure 2(a)
Before buying a telephone, payphone or any other apparatus, make sure it is approved. All approved apparatus, with the exception of some fax machines, will have an 'approved' label as shown. Only approved apparatus may be used in your system.

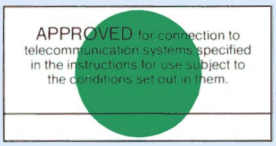


Figure 2(b)
Examples of alternative marking for some wiring and wiring components

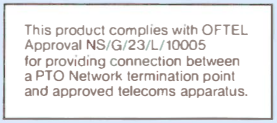
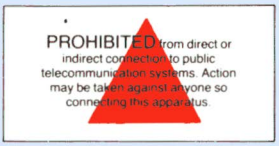


Figure 2(c)
Apparatus with a 'red triangle' label must not be connected to the public network.



'BRINGING INTO SERVICE'

11 Following the installation of the PTO's wiring and apparatus and the installation of your own wiring and apparatus, the system can be 'brought into service':

D Wiring and apparatus that is directly connected to a public telecommunication system other than by means of an approved plug compatible with a PTO master socket must be brought into service by the operator of that system or by a person authorised by him.

E Wiring or apparatus that is connected to a public telecommunication system by means of an approved plug, compatible with a PTO master socket, may be brought into service by anyone able to follow the instructions supplied with wiring kits and apparatus.

12 In this Code **bringing into service** has a specific meaning – it is the actual process of connecting an item of apparatus or wiring to a public telecommunication system so that everything is completely ready for the system to be used. The term also applies to disconnecting apparatus and wiring – in other words, the same restrictions in Principles D and E about who can connect apply to who can disconnect.

MASTER SOCKETS

13 The master socket is the first socket at your end of the exchange line and is supplied by the PTO. The master socket forms the boundary between your system and the public network (see paragraph 7) – it is the **network termination point (NTP)**. The socket itself and the wiring from it on the public network side (ie to the telephone exchange) are the responsibility of the PTO.

14 You may connect approved wiring and apparatus to the master socket using the plug provided with the apparatus (see

Principle E). You will find a hole in the master socket, normally under a small sliding protective cover, which will accept a rectangular six-contact plug of the type shown in the insets to figure 1 (see also paragraph 16 below). The plug must be inserted the correct way round. In this way you can install and bring into service your own extension wiring and apparatus. Examples are shown in figures 3a and 3b.

15 Recent installations will have a master socket as described in this section. If you have one of the older, **hard-wired** type of installations with no master socket, see paragraphs 19-22.

Special master sockets

16 British Telecom has introduced a special master socket - **the NTE 5** (or **Linebox**) - which allows you direct access to wiring terminals as an alternative to using the standard plug (see figure 3c). You can remove the lower part of the front panel of the NTE 5 (see figure 6a on page 16) and you will find the wiring terminals on the back of this detachable panel. You can then wire your extension wiring directly on to the terminals, following the instructions provided, and replace the front plate. Even though you have wired up using a tool, Principle E is still met because you then *plug* the panel back into the PTO system - the rest of the NTE 5 socket.

17 Instructions on connecting up your wiring to an NTE 5 are given at the end of this handbook on page 16.

18 The diagrams in this handbook are based on British Telecom's system. Other PTOs (as mentioned in paragraph 6) may use slightly different techniques and apparatus from those shown in the diagrams but the principles will be the same. If you do have some doubt about what you can and cannot do, ask your PTO for advice.

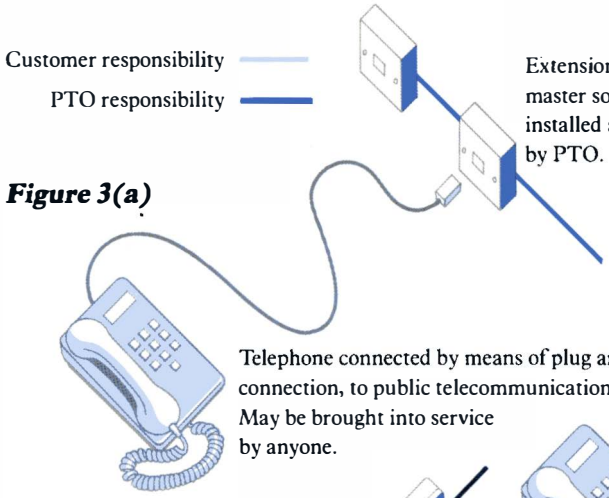
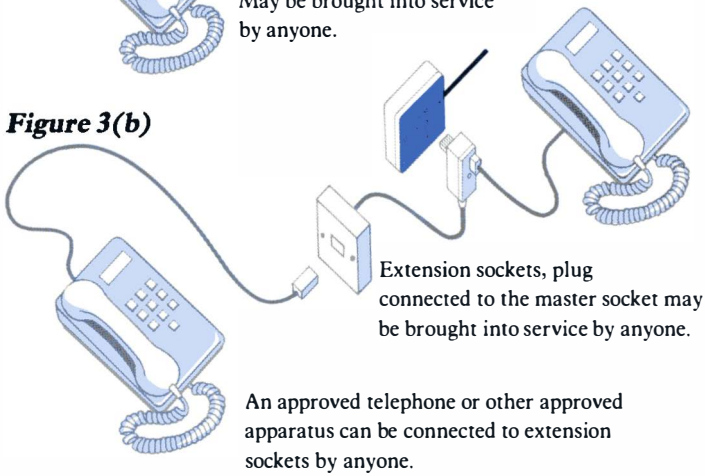


Figure 3(a)

Telephone connected by means of plug and socket connection, to public telecommunication system. May be brought into service by anyone.

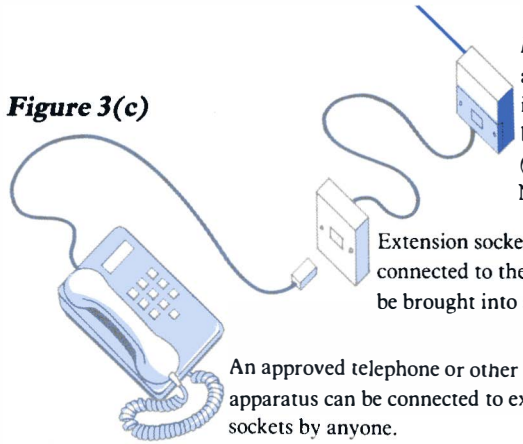
Figure 3(b)



Extension sockets, plug connected to the master socket may be brought into service by anyone.

An approved telephone or other approved apparatus can be connected to extension sockets by anyone.

Figure 3(c)



Master socket with user accessible connectors, installed and maintained by public operator (for example BT's NTE 5 or Linebox).

Extension sockets and wiring connected to the NTE 5 may be brought into service by anyone.

An approved telephone or other approved apparatus can be connected to extension sockets by anyone.

OLDER APPARATUS AND WIRING

19 If you have the older **hard-wired** type of installation in your home, as shown in figure 4, you will not have a master socket into which you can plug your wiring and apparatus. In fact **all** the wiring and apparatus in your hard-wired system has to be connected using tools and remains the responsibility of the PTO.

20 Certain types of apparatus, such as older rented telephones, may only be approved for connection with leads that are hard wired and not for a plug and socket connection. You may not connect these older telephones to a master socket of any type (including the NTE 5) because they are not approved for this kind of connection. You cannot bring this older apparatus into service - only a PTO can do so.

21 Some older telephones and other apparatus are connected by means of round pin plugs. The sockets into which these are plugged are **not** master sockets as defined in this Code. Again, for this type of installation, all the wiring, sockets and apparatus are the responsibility of the PTO and you cannot make any changes.

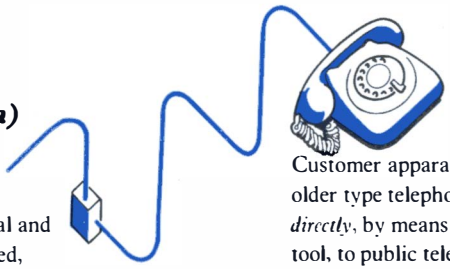
22 If you wish to change an older hard-wired system to a more modern plug and socket system, contact your PTO. Remember that the master socket must be installed by the PTO and there will normally be a charge for this work.

WIRING EXTENSIONS TO DIRECT EXCHANGE LINES

23 You can now buy modern sockets and wiring which have been approved to be used in extending your exchange line. These extension sockets may be installed on your side of the master socket. They are **not** the same as master sockets, which may only be provided by PTOs (see also paragraph 27).

24 Extension sockets are considered to be wiring components. Principles B to E apply for installing and bringing into service all your wiring and apparatus. In addition:

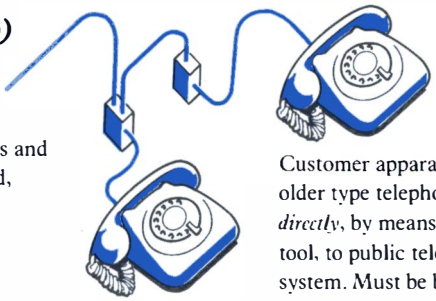
Figure 4(a)



Block terminal and wiring supplied, installed and maintained by PTO

Customer apparatus (for example, older type telephone) connected *directly*, by means requiring use of a tool, to public telecommunication system. Must be brought into service by PTO or a person authorised by him.

Figure 4(b)

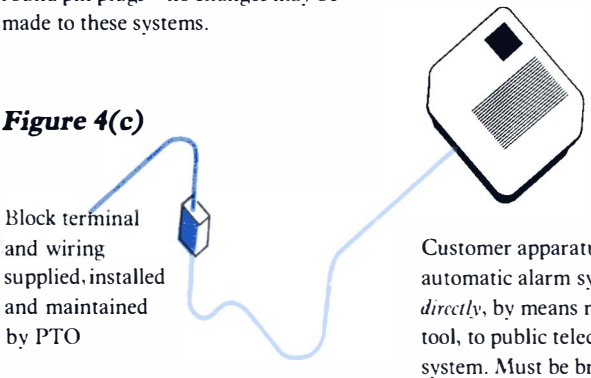


Block terminals and wiring supplied, installed and maintained by PTO

Customer apparatus (for example, older type telephones) connected *directly*, by means requiring use of a tool, to public telecommunication system. Must be brought into service by PTO or a person authorised by him.

NB Some older Plan Systems may use round pin plugs – no changes may be made to these systems.

Figure 4(c)



Block terminal and wiring supplied, installed and maintained by PTO

Customer apparatus (for example, automatic alarm system) connected *directly*, by means requiring use of a tool, to public telecommunication system. Must be brought into service by PTO or a person authorised by him.

Figure 5(a)

The length of wiring between the most distant socket (A) and the master socket may not exceed 50 metres. Not more than 100 metres of cable may be used overall, unless Prinicple H is complied with (see b below).

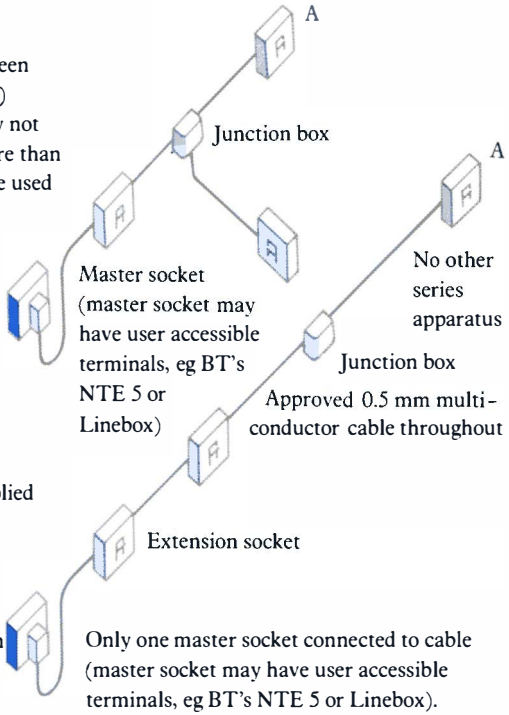


Figure 5(b)

When Principle H is complied with, the length of wiring between the most distant socket (A) and the master socket may not exceed 250 metres. Not more than 250 metres of cable may be used overall.

F Wiring and extension sockets connected to a master socket must be installed in accordance with the instructions supplied with the approved apparatus. These instructions tell you how to make the installation safely and ensure that it functions correctly.

25 Principles G and H concern the length of extension wiring you may connect to the master socket.

G Except in the circumstances defined in Principle H, extension sockets may be linked to the master socket via not more than 50 metres of wiring and where that wiring has more than one branch, not more than 100 metres of wiring shall be used overall (see figure 5a). Up to these lengths, a large ('multi-pair') cable may be used to carry extension wiring for several separate exchange lines.

The length of your wiring can be extended as described in Principle H below.

H If a longer extension is required, extension sockets may be linked to a master socket via not more than 250 metres of 0.5 mm wiring and the total length of wiring attached to a master socket, including the length of any branches, should not be more than 250 metres overall. At these lengths, extension wiring from one exchange line must *not* be shared with that of other exchange lines in a multi-pair cable. No additional apparatus (other than wiring accessories) should be connected in series with the telephone or other single piece of apparatus forming the terminal (see figure 5b).

26 You can buy approved kits which include a pre-wired adaptor to plug extension wiring into a master socket. You can also obtain a two-way adaptor that plugs into a master socket and enables you to plug in a telephone or other piece of apparatus, as well as the extension wiring, at the master socket. This type of connector is shown in the left-hand inset in figure 1.

27 Master sockets are more complex than extension sockets and contain additional components. It is sometimes possible to obtain master sockets but they should never be used as extension sockets – they are not approved for this use and are likely to cause problems in your system. Remember, only a PTO may wire in a master socket to an exchange line so there is never a situation where you could wire in a master socket.

WIRING PRACTICE

28 You must take great care when you install your wiring and extension sockets and make sure that it is done in a safe way. Simple precautions will not only protect you and people using your system but will also ensure that it functions correctly and that the public network or the telephone service for others is not harmed in any way. Poor installation or maintenance of your wiring and apparatus is likely to reduce the quality of your

service – for example making it more difficult to carry on a conversation or receive a clear fax transmission. This could increase costs for yourself and those who call you.

29 If the PTO has good reasons to believe that your installation is impairing the public network, the PTO could disconnect your exchange line.

30 Sockets should be placed at least 50 mm away from mains electrical outlets and must not share the same fixings or connection boxes as your electrical circuits. You should fix telephone wiring so that it is always kept at least 50 mm away from all your mains electrical cabling. If you are unable to avoid a crossing point where this distance cannot be maintained, use an extra insulated divider. Where you are using protective trunking or a conduit system, the telephone wiring should be separated by a divider from any mains electrical cabling in the same conduit.

31 Take care to avoid kinks in the telephone wiring and do not install it where the wiring may be easily damaged externally or internally. For example, the insulation round the wires can be damaged by excessive pressure or snagged on the gripper strips used to hold down carpets. Approved sockets are seldom designed for use outdoors or where they may be exposed to a lot of damp, steam or condensation, or in other hazardous places. Avoid installing in these places.

RINGER EQUIVALENCE NUMBER

32 There is no limit to the number of extension sockets you may connect to a single master socket. However, if you plug in too much apparatus the exchange line might not be able to provide enough power for all the telephone bells to ring. Apparatus, such as a telephone which includes a bell or some other device to recognise or signal that you are being called, will have a **ringer equivalence number (REN)**. You should find this number marked on the apparatus or the packaging.

33 Your apparatus is likely to function satisfactorily where the sum total of the RENs in your system connected via a master socket to a single exchange line does not exceed **4**. If you have installed a variety of different apparatus, your apparatus might fail to work correctly even if the total of the RENs is less than 4. Check if this is the problem by disconnecting some of the apparatus.

FINDING A FAULT

34 If your telephone service is not operating correctly, you should first check your own apparatus. If you have more than one telephone try another in the same socket. If neither work, try them in a different extension socket. If none of the telephones or extension sockets appear to be functioning correctly, disconnect your extension wiring at the master socket (or remove the lower front panel of the NTE 5) and plug a telephone directly into the master socket (the NTE 5 has a test socket behind the lower front panel – see figure 6b on page 18). If you can then make a satisfactory call, the fault lies in your installation and you should check the wiring, extension sockets and apparatus.

35 If the fault is in your apparatus or wiring, you must correct it yourself by having the apparatus or wiring repaired or replaced. You should not attempt to repair apparatus yourself as the apparatus will then no longer be approved. Apparatus can, of course, be maintained in accordance with the manufacturer's instructions, for example by replacing batteries.

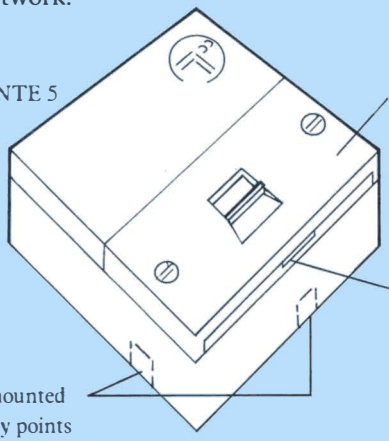
36 If you still cannot make a call with your telephone plugged into the master socket you should report the fault to your PTO. The PTO is able to test your line from the exchange to the master socket. If the fault is in the PTO system, the PTO will repair it.

37 If a PTO engineer is called out to a suspected line fault and it is proved to be on your side of the master socket, it is not the PTO's responsibility and you may be charged for the visit.

WIRING UP A BRITISH TELECOM NTE 5 MASTER SOCKET (LINEBOX)

The NTE 5 master socket (see paragraph 16) or Linebox looks different from earlier types of master socket because the front cover is split into two parts (see figure 6a). You can remove the lower part of this front cover to obtain access to the special wiring tags for connecting extension wiring shown in figure 6b. You do not have access to the rest of the NTE 5 as this forms part of the public network.

Figure 6(a)
British Telecom's NTE 5 (or Linebox) master socket



It is not necessary to use a plug or plug-in adaptor to connect your extension wiring to the NTE 5, although you can do so as there is a suitable socket on the NTE 5. Whether you use a plug, an adaptor or the hard-wiring facility of the NTE 5, the wiring and wiring components must be approved and used in accordance with the instructions supplied with them.

If you wish to hard wire your own extension wiring to the NTE 5, you will need:

approved wiring and components
a screwdriver
wirecutters
a special wiring tool (like the one shown opposite)

The special wiring tool can be purchased at shops specialising in telephone apparatus and other electrical suppliers.

Carry out all your installation work on your extension wiring and sockets before you connect into the NTE 5.

A typical wiring tool

When your system is finished, loosen the two visible screws on the outside front cover of the NTE 5. Do not remove the retaining screws underneath. Under the front cover you will find a cable tie – keep it as you will need it later.

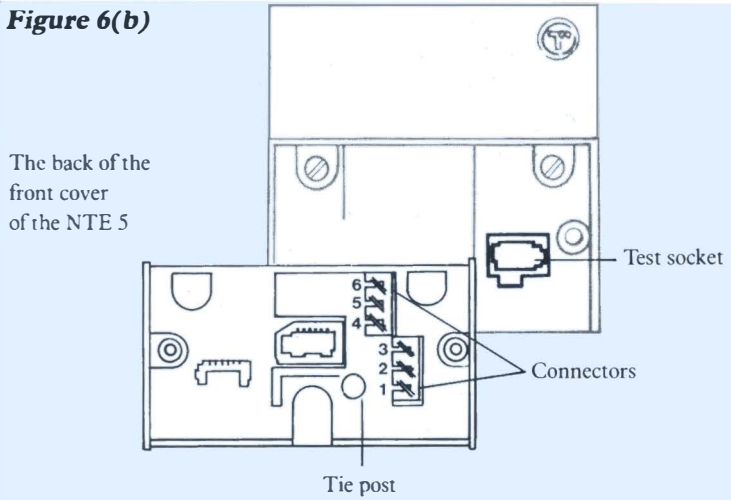
British Telecom may have installed the NTE 5 surface mounted or flush mounted.

If your NTE 5 is surface mounted, you have a choice of two entry points (see figure 6a) through which to feed your extension wiring. You will find these on the side of the box. Do not use the other entry points you can see. Remove the plastic tag covering your chosen entry point by pushing it out from the inside. Feed through enough wiring (at least 75 mm) for the connections to be made easily. Having enough wiring through might help you at a later date if you want to rearrange it or if you want to remove an item of apparatus for maintenance or repair.

If your NTE 5 is flush mounted you will find there is a groove in the centre of the lower edge (see figure 6a) which will accommodate your extension wiring when you replace the cover.

Next separate the coloured wires and use the special tool to connect each of the wires to the correct terminal on the back of the front cover.

Figure 6(b)



The wires should be connected as follows:

Green wire with **white rings** to connector **no 1**
Blue wire with **white rings** to connector **no 2**
Orange wire with **white rings** to connector **no 3**
White wire with **orange rings** to connector **no 4**
White wire with **blue rings** to connector **no 5**
White wire with **green rings** to connector **no 6**

If your cable does not have any green coded wires, do not use connectors 1 and 6.

Connection of the wiring to the terminals is made using **the insulation displacement technique**. Do **not** remove the insulation round the wire. Lay the wire across the terminal and place the tool over the wire (so that the end of the tool lies along the wire and across the terminal) then push the tool and wire firmly into the terminal. The insulation around the joint is displaced automatically during the process of inserting the wire in the terminal.

Trim off any excess wire. Secure the wiring to the tie post (see figure 6b) using the tie provided which you put to one side earlier.

You should pass the tie through the hole at the base of the post, then loop it round the wiring leaving the buckle at the top and do it up. Cut off the excess length of the tie.

If you have a surface-mounted NTE 5, coil the spare wiring carefully into the recess, then replace the front cover and tighten up the two screws on the outside.

If you have a flush-mounted NTE 5, make sure the wiring fits into the groove in the middle of the lower edge of the socket and is coiled carefully into the recess. Then replace the front cover and tighten up the two screws on the outside.

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