AMSTRAD
COMMUNICATIONS
FOR CPC & PCW RANGES

MIKE JAMES & S M GEE

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ARGUS BOOKS

Contents

Preface

This book is about using the Amstrad personal computers, the CPC464, CPC664, CPC6128, PCW8256 and PCW8512, and a telephone line, to gain access to the public information services such as Prestel and messaging services such as Telecom Gold. It also deals with the wider principles and practice of computer communications including the direct connection of different machines for file transfer.

If you own an Amstrad computer then you are well on the way to 'getting online' but working out exactly what extras you need can be a daunting prospect. Even if you solve the problem of what extra hardware would be best for you, there is still the difficult choice of which information services to subscribe to. To make an informed decision it is important to know what is offered and how much it is likely to cost. Answers to questions about both aspects — the choice of hardware and the type and cost of services offered — are covered in the early chapters along with helpful hints and tips on becoming an expert communications user.

The middle chapters are a detailed exploration of Prestel, Micronet 800, Telecom Gold, One-To-One and other important services, illustrated with lots of examples of actual online sessions.

The final chapters cover more technical topics such as how to connect different computers together for file transfer and how the phone system works. This includes an inside look at the mysteries of RS232, modems, how Prestel works, and the Packet SwitchStream service.

If you are thinking about joining in the communications revolution but aren't entirely convinced that it is worth the extra expense then it has to be said that using your phone line to connect your computer with others is as powerful a change as the introduction of television. In the case of television, information (in its broadest sense) is brought right into the home, but it is only a one-way transaction. Online access of information over a telephone line is a two-way process and this brings with it a sense of excitement and immediacy. If you need information, entertainment, to order goods or services or to send messages then it is time to bring your computer and your telephone closer together.

Why online? 1

It is difficult to explain to anyone who has not experienced it the attraction of connecting a personal computer to a distant computer. By making a phone call you can be 'online' to a wide range of information concerning almost every activity. If you want an up-to-date weather forecast, train timetable, flight availability, share prices, etc., then your online personal computer can provide them. However, this 'static' provision of information is only part of the story. The real strength of an online information provider is that it is interactive. You can read what it has to say to you and by using your keyboard you can respond. At its most limited this response is nothing more than selecting another 'frame' of information, but it can be as sophisticated as filling in the details of a 'response frame' to order goods or services or simply to make your feelings known! Using this sort of interaction you can book theatre seats, order books or manage your bank account via 'telebanking'.

Another aspect of interaction is 'electronic mail'. Using one of the many electronic mail services you can exchange letter frames with anyone else using the same (or a connected) service. Electronic mail has many advantages over the old-fashioned paper post — it is cheaper and quicker, for example — but its one disadvantage is that you can only communicate directly with other 'online' people. Of course, this problem is becoming less important all the time as more and more people discover electronic mail, but one immediate solution is to use the extensive telex system. Many companies have telex machines, which were in many ways the forerunners of the online systems we use today. Until now, sending a telex involved investing in one of these very expensive machines but today you can send and receive telexes using the same equipment needed for electronic mail. Indeed, one of the main advantages of connecting your Amstrad to electronic mail is cheap telex! Some electronic mail services will even print your message out and pop it in the usual postal system as a first class letter. If this isn't fast enough for you then a special courier is used to ensure a delivery within two hours to any major city.

The trouble is that a description of what online computer use offers very rapidly becomes a catalogue of services currently on offer. While this might serve to convince you that a particular service that you

needed existed and was an economic proposition it can never manage to convey the excitement and stimulation of using an online system. There is something about its immediacy that is rather like watching television for the first time, but the ability to respond adds an extra dimension. It is rather like owning a personal computer. You might buy a computer for a particular purpose — education, to play games, word processing, etc. — but once you have one you cannot fail to become engrossed by it and so find more and more applications, most of which you would never have dreamed of beforehand.

The computer communicator

Ten years ago the only way that you could use a computer from the comfort of your home was to make a connection with it over a telephone line. In those days computers were expensive pieces of equipment and the cost of using a machine in this way was so high that it was only worth considering for very 'serious' applications. Today everything is different; computers are cheap, so cheap that they can be used for playing games! The microcomputer revolution of the 1970s and early 1980s brought us the personal computer and the idea of connecting to a distant computer via a telephone line was all but forgotten. After all, it was a slow and expensive method of getting things done and it wasn't capable of anything approaching the colour graphics that we had come to expect. What this attitude misses is that computers are good at communications as well as working things out. Indeed, the modern System X telephone exchanges are nothing more than very specialised computers using the very technology that is embodied in every personal computer.

It took some time for the cost of the basic electronic components to fall low enough for the telecommunication phase of the personal computer revolution to begin. In the UK the first sign of anything happening was the launch of the Prestel service in 1980 by the GPO before it was split to produce British Telecom. This was an innovation in that it offered a nationwide information service aimed at business and the home user. At this early stage the personal computer revolution hadn't really reached its full potential and as a result some of the present characteristics of Prestel are not ideal, but it is still the most important and popular information service in the UK. So much so that it is true to say that if you are interested in telecommunications you are interested in Prestel!

The computer communications revolution is far from complete and each month brings some new development. New information services are starting all the time and it will not be long before telecommunications will be supplied as a standard on all personal computers. As with many fields of new technology, much of our communications future can be seen by observing the current state of the art in the USA. In this case, however, it has to be remembered that we had an early start with Prestel and have a different policy concerning telephone pricing and innovation. After all, it's not too long since British

Telecom enforced a total ban on using anything other than its own phones, let alone sophisticated gadgets such as computers. With increasing liberalisation of the rules and regulations concerning the use of the telephone network and the introduction of newer systems, the future for computer communications looks very bright indeed.

Who's who

Before launching into a discussion of the type of equipment needed to get online (the subject of Chapter 2), it is worth outlining the type of services that are available along with some idea of their costs. The two best known public online computer systems — Prestel and Telecom Gold — are both run by British Telecom. The simplest way to categorise these two services is that Prestel is for general/home use and Telecom Gold is for business use, but in many ways this is rather too simple. Telecom Gold started life as primarily an electronic mail system but it has now developed to the point where it offers many of the services that Prestel does.

One of the points of confusion is that both Telecom Gold and Prestel act as hosts to a number of other services called Closed User Groups (CUGs). These CUGs often advertise themselves as if they were alternative services rather than part of Prestel or Telecom Gold. For example, Micronet 800 is a service for microcomputer users organised as a CUG on Prestel but it offers so many extras that you might make the mistake of thinking that it was a completely separate online service. A second aspect of a CUG is that you usually have to pay extra to gain access to its information and sometimes you also have to belong to a specific group of people. So, the charge to use Micronet 800 is higher than the basic subscription to Prestel and to access some of the travel information frames you have to belong to ABTA, the travel agents' organisation. It is important to realise that a single online service may be composed of a large number of CUGs, each with its own separate identity.

As well as Prestel and Telecom Gold there are a number of other online services essentially concerned with sending messages of various kinds. These provide electronic mail, telex, notice boards and radio paging but not the general information frames typical of Prestel. The best known of these services are One-To-One, Monodata, Easylink and Comet. Each of these services offers something special to attract a particular type of customer but there is a tendency for them all to develop in the same way and offer a complete range of Prestel-like facilities.

In addition to all of the services described above there are an incredible number of private services called bulletin boards. The bulletin board phenomenon has been likened to the CB craze of the 1970s. Anyone can set up a bulletin board service using very little extra equipment over and above that needed to use Prestel, say. Most bulletin boards contain little information of value and although they are free you

can run up a large telephone bill finding this out. On the other hand, bulletin boards are part of the current computer communications culture and it is worth looking at one or two before giving them up.

The ability to order goods from electronic catalogues — that is, 'teleshopping' — is a service available under Prestel but many small specialist shops have set up their own computer shopping service completely independently. At the moment this trend seems to be confined to electronics and computer shops but as the general interest in teleshopping grows it might spread to other specialist fields. This sort of independent teleshopping system is no more complicated or expensive than a privately run bulletin board. Best known of these private teleshopping services are Maptel (run by Maplin Electronics) and Technoline (run by Technomatics) both of which are mainly concerned with electronics.

The range of online services is summarised in table 1.1. Notice that the existence of CUGs can make the larger online services look like a number of separate entities.

Table 1.1 Online services by category

General	A general online service including features of all the others, i.e. all types of message services, information, teleshopping, etc. The best known examples are Prestel and Telecom Gold although One-To-One is moving into this area
Messaging	Specialist messaging services such as electronic mail, telex, radio paging, notice boards, etc. the best known examples are Monodata, Comet, Easylink and One-To-One
Bulletin boards	Privately run services mainly offering electronic notice-board facilities
Private teleshopping	Privately run online systems offering specialist teleshopping facilities

Information services

The range of information services currently available is enormous; but then so is the range of information that could be provided. If you have no specific information needs then it might be difficult to justify subscribing to a general service such as Prestel. On the other hand, if you often need a particular kind of information and Prestel or some other service provides it, this alone can often justify the expense. For example, if you need the times and costs of trains to any part of the country then BR's Prestel pages will not only supply this information but also allow you to book a seat on the train of your choice. There are

similar services provided by Sealink for ferries and British Airways for flights. Of course, you can get the same information over the phone by speaking to someone so why bother to involve a computer? If you have ever tried to find out which train to catch by phoning you local station you'll know the problems. First there is the difficulty of getting through to the enquiry office and even when you get connected to the extremely helpful staff there, it is difficult for them to present the possibilities contained in a timetable by speech alone. No, it is much easier to phone Prestel and display the relevant part of the timetable, consider the possibilities, ask for more information, say about pricing, and then book your ticket. The same kinds of argument hold for almost any type of information that is preferable to browse through, such as booking theatre tickets, hotel accommodation, holidays, etc.

As well as the general information services, including news and weather, there are very specialised services, offered mainly as CUGs. For example, there is Micronet 800 for microcomputer users, Farmlink for farmers and CitiService for investors. The Micronet 800 service is mainly for enjoyment although some of the special offers can save you money. On the other hand, CitiService can actually make money! CitiService supplies share prices, financial news and the facility to buy and sell shares. It is not expensive to take advantage of CitiService and it is very suitable for the small private investor. If you have ever wanted to play the stock market then CitiService is a good place to start. Your general financial management can also be carried out through Prestel via Homelink. This allows you to examine and control accounts with the Nottingham Building Society and the Royal Bank of Scotland. Using this service, you can transfer funds and pay bills seven days a week and at almost any time of day. The only drawback with the service is that it is linked to a specific building society and bank — but this is likely to change as other financial institutions see the sense of online financial management.

As a microcomputer user, the special microcomputer CUGs are bound to be of interest. The best known is Micronet 800, on Prestel, which offers general information about microcomputing, special offers, telesoftware and, most of all, the opportunity to contact other microcomputing enthusiasts. Telesoftware is simply the name given to the transfer of programs over telephone lines. There is a certain amount of free telesoftware for the Amstrad available on Micronet but the best software has to be paid for! The advantage of this sort of teleshopping is that you can read some reviews, sometimes even see a demonstration and then not only order but also collect your purchase. Other important CUGs on Telecom Gold are Microlink and Online, both of which offer some database services and a limited range of teleshopping. They also give full access to all the services of Telecom Gold while being cheaper to subscribe to.

Most online users initially subscribe to a service because it offers some type of information that they know they need. However, the pleasure of just browsing through a service like Prestel is difficult to describe. Trying out features and looking at frames is slightly addictive and I

guarantee that for every facility that you plan to use there will be many more that you actually use. Many of the services are covered in more detail later in the book.

Messaging services

The electronic message-handling services offered by Prestel, Telecom Gold, One-To-One, etc., are far more than just an updated version of the traditional letter. Electronic mail, for instance, can be used to send the same message to a group of people automatically or can supply a template for a message (greetings, get well soon, order forms, invoices, etc.). Electronic message services fall into one of five categories: electronic mail, telex, notice boards, radio paging and offline mail services.

Electronic mail is becoming increasingly important to large companies and other organisations as a way of avoiding the movement of large quantities of paper between different departments. In a situation where everyone you want to communicate with uses electronic mail it is fast and economical. However, until we all, or at least a good percentage of us, use electronic mail there will always be the need to resort to the traditional postal services. From the home user's point of view, electronic mail is one of the many Prestel services and as such it is useful for contacting other Prestel users. It is, however, not usually the main reason for wanting to subscribe to Prestel. Electronic mail is delivered to an electronic mailbox that is assigned to each user. Each mailbox has a unique reference number which is used as its address. When you log on to a message system you are informed of the number of letters waiting for you and you can then find out whom they are from and read them in any order you choose by listing them on your terminal.

Long before personal computers existed, a sort of electronic mail system — telex — was in use. This was based on electromechanical printers and keyboards and as a result was very slow — five characters per second. However, the telex system was very successful and as a result all but the very smallest companies installed telex machines. Now, with the rise of online computer messaging, telex has received a new lease of life. Most message systems allow the user both to send and to receive telexes and because of the vast number of existing telex users this is extremely useful. Sending a telex is generally just a matter of composing the text and then asking for it to be submitted to the telex system. Incoming telexes are simply directed to the standard electronic mailbox and then treated like other items of electronic mail. There are a number of disadvantages to telex, for example, messages are restricted in the range of characters that can be used, but you can send a telex to any part of the world and even to a ship at sea. Costs are reasonable (50p for a UK telex using Prestel) and you are only charged if your telex is successfully delivered. From the point of view of a small business, an Amstrad computer is far cheaper than a telex machine and equally

valuable. For the home user telex is a real bonus and is potentially more useful than electronic mail.

Notice boards are a form of broadcast communication. Anyone can read a message stored in a notice board and anyone can leave one. In this sense an electronic notice board is the exact equivalent of a traditional notice board except that the electronic variety can include some clever tricks such as a subject index and response frames. Typical uses of notice boards are advertising, lonely hearts, information about meetings and other events.

Radio paging is a very limited form of communication which serves to let someone know that they are wanted. The person in question carries a small radio receiver with them at all times and when they are needed a signal is transmitted that makes the receiver bleep. Online services allow the user to page someone with a BT radio pager simply by typing in the receiver's code number. Telecom Gold can even page someone when a particularly important message arrives in their electronic mail box.

Offline mail services are one way round the problem of sending electronic mail to people not connected to an electronic mail system. The idea is simply to use the existing postal services, or a special courier where this isn't fast enough, to take a printed copy of the message to the recipient. This may sound like nothing more than an expensive way of sending a letter but it does have its advantages if there isn't a convenient post office or if you want to send a number of copies of a letter to a mixture of people using and not using electronic mail. The courier service can also deliver your message within two hours because it can be sent by electronic mail to the destination city and then delivered by a local service.

A summary of the message services offered by the major online systems is given in table 1.2.

Table 1.2 Message services

	Prestel	Gold	One-To-One	Easylink	Monodata	Comet
Electron mail	Yes	Yes	Yes	Yes	Yes	Yes
Telex: send	Yes	Yes	Yes	Yes	Yes	Yes
: receive	Yes	Yes	Yes	Yes	Yes	Yes
Notice board	Yes	Yes	Yes	No	No	Yes
Radio paging	No	Yes	Yes	No	Yes	No
Post	No	No	Yes	No	No	No
Courier	No	No	Yes	No	No	Yes

Choosing a messaging system

As you can see from table 1.2, there are a number of messaging systems and this raises the question of which one to subscribe to. Of course, the answer to such a question depends on very many interacting factors and

it is not possible to name a single best system. However, there are a number of important details that are not apparent from a simple consideration of the features listed in table 1.2. For example, the speed at which characters can be transmitted over the telephone line and the size and type of the display both affect the ease of use of the system and its cost.

Speed of transmission affects the ease of use and cost because of the difference in time it takes to list a letter. At 30 characters per second it takes about a minute to list a letter that would fill an A4 sheet, but at 120 characters per second this only takes 15 seconds. The shorter time is more convenient because you are not kept waiting around while the screen fills with new information and it is also a little cheaper because it uses less telephone time. (There is the argument that a greater percentage of telephone time is spent in reading mail rather than waiting for it to be displayed!) Some systems send characters to your display screen faster than they allow you to send characters to them. For example, Prestel and Prestel-like systems send characters to your display at 120 per second but only allow you to send characters to them at around 7 per second. The reason for this is that in normal use Prestel sends you far more information than you send it, but if you are going to use a lot of electronic mail facilities then 7 characters per second is a slow way to type in a character. If you can't type faster than 7 characters per second this argument is still relevant to you, because you can prepare electronic mail using a wordprocessor while not connected to an electronic mail service and then send it as fast as possible later on.

The size and type of display is an important factor because it governs how much of a letter you can see at one go and what (if any) graphics are possible. For example, the standard Prestel screen is only 40 characters by 24 lines and this is far short of the size of screen offered by most wordprocessors. However, Prestel does support limited graphics in 8 colours and this means that it is possible to send messages in the form of an illustrated greetings card. Other services such as Telecom Gold and One-To-One allow the use of the normal 80 character by 24 line wordprocessing style display but they don't offer any graphics facilities.

It is not too far from the truth to say that Prestel is primarily an information service that offers enough messaging services to keep the occasional user happy. If you want to make a lot of use of electronic mail

Table 1.3 Speed and display characteristics

Speed (cps)	Prestel	Gold	One-To-One	Easylink	Monodata	Comet
7.5/120	Yes	Yes	Yes	Yes	No	Yes
30/30	No	Yes	Yes	Yes	Yes	Yes
120/120	No	Yes	Yes	No	No	Yes
80×24 screen	No	Yes	Yes	Yes	Yes	Yes
Graphics	Yes	No	No	No	No	No

and other messaging services then it is worth looking at Telecom Gold or One-To-One. Table 1.3 summarises the operational characteristics of the major services.

Getting online — what it costs

After all this discussion of what online services offer, you should be keen to learn how to use them. Assuming that you already have an Amstrad computer all you need is some extra hardware, some software that normally is included with the hardware, and permission to use one of the services. The choice of the type of extra hardware and software that you need is discussed in the next chapter but you can buy everything you need for between £30 and £100. Also the cost of the hardware and software is a one-time cost that is very easy to find out. The cost of using a service is much more difficult to quantify because it involves a number of different components. For example, in using Prestel there are four components to the cost:

1 A quarterly standing charge of £6.50 (£18 for business users).
2 The cost of using the telephone: by the end of 1986 all subscribers will be able to phone Prestel at local call rates.
3 The cost of being connected to the Prestel computer, which is 6p per minute between 8am and 6pm Monday to Friday, 8am and 1pm on Saturday and free at all other times and on public holidays.
4 A charge for each frame viewed. Most Prestel frames are free and many of those that do cost money are only a few pence (1p, 2p or 5p, say) but there are exceptions — long-range weather forecasts can cost 50p.

In addition you have to take into account any subscriptions to CUGs that you might have to pay. For example, to use Micronet 800 the quarterly standing charge goes up to £16.50 (£28 for business users) and there are extra charges for services such as sending a telex. To give you some idea of the sort of bills you can expect from using Prestel consider two-typical users, the frugal home user and the impatient business user. The frugal home user might dial Prestel for an average of 3 hours a week at the cheapest time, that is in the evening, Saturday afternoon or Sunday. His bill per quarter would be:

Quarterly standing charge	£6.50
Connect time charge	£0.00
Local phone calls (39 hours at 5p for 8 mins)	£14.63
	————
Total	£21.13

plus any page charges. Belonging to a CUG such as Micronet 800 would add an extra £10 per quarter. If these figures seem high to you, notice that using Prestel for 3 hours a week every week represents a very high use of the service. One hour of Prestel time is enough to look at about

100 information frames. So the cost of using Prestel at cheap rate for one hour (45p plus any page charges) is really very reasonable. In case you are worried that the phrase 'plus any page charges' is hiding a big extra cost it is worth saying again that most pages are free and most of those that aren't only cost 1p or 2p. Unless you are using some special information pages with a high page charge, for example the long range weather forecast at 50p, on a regular basis it is unlikely that you would get a bill above a few pounds.

The bill for our impatient business user dialling in to Prestel at peak rate for the same 3 hours a week is a lot higher:

Quarterly standing charge	£18.00
Connect time charge (39 hours at 6p per min)	£140.40
Local phone calls (39 hours at 5p for 1.5 mins)	£78.00
Total	£236.40

plus any page charges. You can see that such a business user pays about

Table 1.4 The cost of message services

	Prestel	Gold	One-To-One	Easylink	Monodata	Comet
UK electronic mail:						
Charge per item	Free	Free	Free	50 free then 15p	Free	500 free then 5p
Mailbox reg.	Free	£40	£50	£40	£40	Free
Extra mailbox	N/A	£40	£10	£10	£10	Free
Mailbox rent p.a.	£26	None	None	£155.40	£60	£360
Connect time	6p	11p	10p	10p	Free	Free
Off-peak	Free	3.5p	10p	10p	Free	Free
UK telex:						
Send 400 characters	50p	22p	20p	25p	35p	14p
Receive	Free	50p	Free	Free	45p	Free
Radio paging (per month)	N/A	Free	£5.50	N/A	N/A	N/A
Post	N/A	N/A	58p	N/A	N/A	N/A
Courier (per consignment)	N/A	N/A	£12.00	N/A	N/A	N/A
Minimum charge	None	£10	£5	£12	None	£30

ten times more for the same Prestel service than the home user. However, as the major component of this bill is connect time charges and peak rate phone calls the home user's bill could be similarly increased by making use of Prestel at the wrong times. The moral of this story is that Prestel is cheap, but telephone time and connect time charges mount up quickly. Use Prestel in the evening and at weekends, and spend as little time as possible browsing through pages and your bills will be low.

The cost of using messaging services is even more complicated than Prestel. Messaging services generally make a charge for each mailbox that you use, made up of a one-time registration fee plus a quarterly rental. Some services charge for the time you are connected to the machine, some have a minimum monthly invoice and other have a range of different charges depending on the 'membership' that you take out. Table 1.4 summarises the charges for electronic mail, UK telexes and other services (overseas telexes are covered in Chapter 4).

As you can see, Prestel compares very well in terms of cost with the other messaging services but you have to take into account its shortcomings of speed and display format. But if you only intend to use electronic mail/telex now and again, Prestel is a good choice. Once you move away from Prestel and start to consider other services then there are factors apart from basic cost to take into account: these are discussed in Chapter 4.

2 Getting started

If you are convinced that you want to use one of the online services described in Chapter 1 the next step is to get the necessary extra equipment and a subscription. On the equipment side this means choosing and buying a modem of some sort, and this can be fraught with technical difficulties. This chapter sets out to explain as simply as possible the meaning of the jargon and technical terms to help you make a sensible choice of equipment. A fuller explanation of the principles of computer communications will be found in Chapters 5, 6 and 7. As well as a general description of what you need, short reviews of some of the products available are included at the end of the chapter.

The hardware

Assuming that you already have your Amstrad personal computer and a phone line then the only extra pieces of hardware that you require are a serial interface and a modem. Although these are two separate devices they are sometimes sold together in one box as a combined serial interface and modem. In fact there are a number of manufacturers offering complete serial interface plus modem software packages for a reasonable price. However, for the purpose of explaining the technicalities it is better to deal first with each unit separately.

Serial interfaces
A serial interface is essentially a device that allows you to connect other pieces of equipment to your Amstrad. This is very much like the printer or parallel interface found on all Amstrads, used to send data from the computer to a printer. A serial interface is a little more sophisticated than this in that it allows data to be transferred to both directions if necessary. That is, a piece of equipment connected to your Amstrad via a serial interface can receive data that originates in the computer and send data to the computer. You should be able to see from this simple description that this is all that is needed for communications — a method of sending and receiving data.

Although a serial interface is nothing more than a way of connecting other equipment to your computer, using a serial interface is a little more

complicated than just plugging in. The familiar parallel printer interface is simple in this respect because there is only one standard — the Centronics printer interface — and in most cases all you have to do is plug in and start printing. There are standards for serial interfaces, but the trouble is that manufacturers tend to elaborate or leave things out with the result that it can be quite difficult to coax your computer to talk to another piece of equipment via a serial interface. In most cases it is possible to buy a purpose-made cable that will correctly connect your Amstrad to any given piece of equipment and, although the cost of such cables may seem high, they are well worth the price to avoid the trouble of DIY. (If you are tempted to try making your own cables then see Chapters 5 and 6.)

The standard for serial interfaces is called RS232C, or in the UK V24, and a serial interface is sometimes called an RS232 interface or, less commonly, a V24 interface. Although not part of the standard, a particular type of plug and socket, known as a 25-pin D-type, is almost universally used (see figure 2.1). The only trouble is that no one can
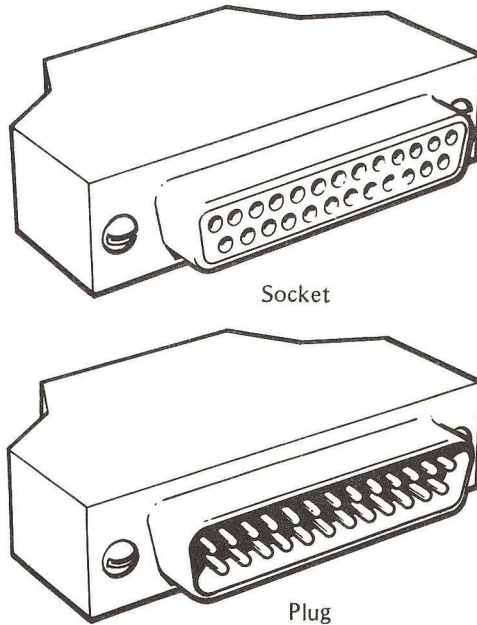
Socket

Plug

Figure 2.1 The 25 pin, D-type plug

agree on whether a female socket or a male plug should be mounted on equipment and this adds yet another complication to making up connecting cables.

The standard RS232 interface uses +12V and −12V as signalling voltages but there are a number of variations on this theme. In particular, it is cheaper to avoid the use of 12V and employ +5V and 0V as the two signalling voltages because most microcomputers have a +5V

supply but often lack a +12V or −12V supply. A serial interface that uses +5 V and 0 V as non-standard signalling voltages is referred to as a TTL interface. (The name TTL comes from the chips that are used to build computers, transistor-transistor logic, and work off a +5 V supply.) If you use a TTL serial interface then you have to make sure that the equipment you are going to connect to also works as a TTL serial interface. In general this is not a problem as TTL serial interfaces are usually sold in conjunction with a suitable modem, but you may have difficulty using one to connect any other equipment, such as a printer with a standard RS232 interface.

Once your computer is correctly connected to another piece of equipment there is still no guarantee that data can be exchanged correctly. As well as the physical connection being right both parties to the communication have to agree to use the same data format. The first requirement is that data is transmitted at a speed that the recipient is expecting and can handle. Data rates are measured in an unlikely sounding unit − the baud − but humans understand data rates best in terms of the number of characters transmitted every second. Unfortunately there is no easy exact conversion between baud rate and characters per second. A rough and ready conversion rule that gives nearly the right answer is to take 10 baud to be 1 character per second. Thus, using this rule, a baud rate of 300 baud is equivalent to 30 characters per second, 1200 baud is 120 characters per second, and so on. (If you want to know the exact meaning of baud rate then see Chapter 5.) There are a large number of standard baud rates, from as slow as 50 baud (5 characters/sec) up to 19 200 baud (1920 characters/ sec) but the only ones in common use are 75 baud, 300 baud and 1200 baud, and any serial interface should be capable of working at these speeds. There is one last complication in that it is sometimes necessary to send data from the computer at a different rate from that used to send data to it. This is known as split-speed working. For example, Prestel transmits to your computer at 1200 baud but expects your computer to transmit back to it at the much slower rate of 75 baud.

As well as speed of transmission, three other features of the format used to transmit data over a serial interface need to be taken into account. They are type of parity; number of data bits; and number of stop bits. Type of parity refers to the sort of error checking used. This can be odd, even or none, and all serial interfaces include the facility to set the data format to one of these. The number of data bits simply refers to the number of possible characters that can be transmitted; it can be thought of as setting the range of the 'alphabet' used. For example, five data bits allow you to transmit messages composed from an alphabet of only 32 different characters, six data bits give you 64 different characters, and so on. There are two common numbers of data bits in use, seven and eight. Seven data bits allow you to use an alphabet with 128 different characters and this is enough for the international standard character set known as ASCII (sometimes called international alphabet No. 5) and for the character set used by Prestel for its text and graphics. Eight data bits allow the use of an alphabet with 256 characters and this

is usually more than enough for anyone. Finally, the number of stop bits governs the amount of time left between the transmission of each character. In the old days of mechanical teletype machines it took time for the printer to be ready to print the next character and so a short gap was left between each character transmitted. Today's personal computers don't need nearly so long after printing a character before they are ready for the next. Most serial interfaces give you the choice of 1, 1.5 or 2 stop bits.

Once you have sorted out the electrical connection between the serial interface and the modem (or other piece of equipment), you still have to get the data format right before the serial link will work. Setting the data format is usually a matter for software, but in general for a serial link to transmit and receive data successfully you have to set:

Transmission speed: Usually one of 75, 300 or 1200 baud
Reception speed: Usually one of 300 or 1200 baud
Parity: Odd, even or none
Number of data bits: Usually either 7 or 8 bits
Number of stop bits: Usually either 1 or 2 bits

Even if you feel that you don't understand all the details of parity, stop bits, etc. you can still set a serial interface to work with a given service by following a 'recipe' of settings. For example, the Prestel recipe is:

Transmission speed: 75 baud
Reception speed: 1200 baud
Parity: Odd
Number of data bits: 7
Number of stop bits: 1

It is important to realise that if you don't set the data format correctly then the chances are that your serial link will not work.

Modems

The second piece of hardware that you need is a modem. Two computers directly connected by a serial link can, as long as they are correctly connected and using the same data formats, exchange information without the use of a modem: see Figure 2.2.

However, this direct connection implies that it is possible to run a suitable RS232 cable between the two computers, and unless they are in the same room this is usually expensive if not impossible. The obvious solution is to use the standard telephone network — often called the PSTN, standing for Public Switched Telephone Network, in

Figure 2.2 Direct serial connection

communications circles. The only trouble with this idea is that the normal telephone lines cannot carry the voltages used by serial interfaces to signal. All a telephone line can do is to carry sounds in the range of the human voice. The solution is to convert the data into coded audio tones. This is the same principle used to store computer data on audio cassettes and if your Amstrad has a tape interference you can hear the audio tones used by saving a program and then playing the recording. The device used that converts data into audio tones and audio tones back into data is called a modem — a name derived from the two words MOdulator/DEModulator. Now our serial link using the telephone line is as shown in Figure 2.3.
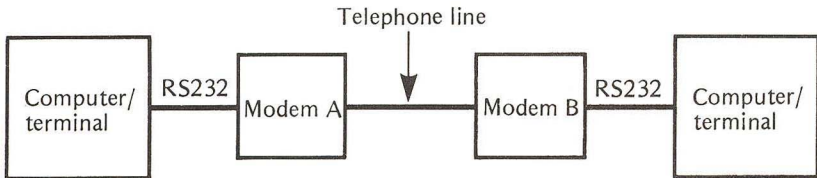

Figure 2.3 Serial link using public telephone lines

A modem has to be used at both ends of the telephone line, although in practice only the modem at your end of the line is your problem. In fact most information services have a large number of modems and telephone lines all responding to the same number.

In practice, things are just a little more complicated than Figure 2.3 would have us believe. To make two-way communications possible the modems at each end of the telephone line have to use a different range of audio tones. The best way to understand this is to imagine the difficulty of listening to two people talking on a telephone line at the same time. If their voices are identical then it is difficult, if not impossible, to listen to just one of them; but if one has a high-pitched voice and the other a low-pitched voice then you have a much better chance of picking out just one of them. As it is with people so it is with modems, and for two-way communications the modem at one end must use a different set of audio tones from the one at the other end. There are of course standards for which type of modem should be used at which end; the rule is that the end that makes the call has to use an 'originate' modem and the end that answers the call has to use an 'answer' modem: see Figure 2.4.

If you are interested only in phoning information services such as Prestel, Telecom Gold or One-To-One then obviously you only need an originate modem. However, if you want to start your own information service or bulletin board then you will need an answer modem or a modem that can be switched from originate to answer. At a slightly less ambitious level, if you want to exchange data with another microcomputer owner over the telephone lines then one of you must have an originate modem and one of you must have an answer modem. My best advice is that, if you are certain that you will only want to dial up other services, an originate modem will be sufficient; but if there is
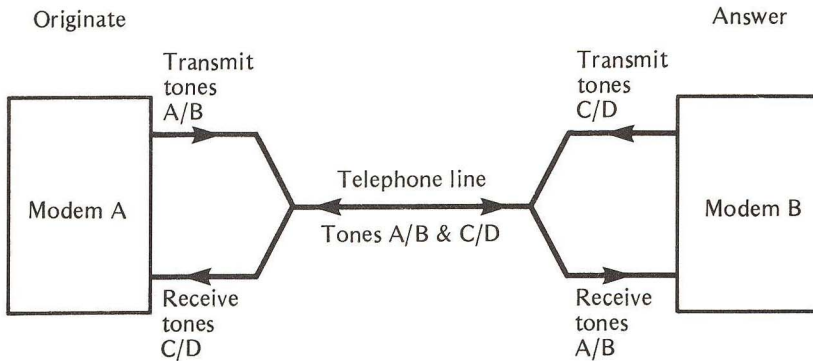
Originate

Answer

Figure 2.4 Originate and answer modems

any possibility that you might want to act as an information source or swap data with any other microcomputers using the telephone lines then pay the extra and buy a switchable originate/answer modem.

As well as the difference between originate and answer modems there are also a number of different standards relating to the exact audio tones used. These standards are usually associated with different data rates and, in general, a given modem can usually be used only at a few predetermined transmission and reception rates. The most commonly encountered standards are:

Standard	Transmit/receive rates	Typical uses
V21	300/300 baud	Electronic mail, bulletin boards
V22	1200/1200 baud	High speed electronic mail
V23	1200/75 baud	Prestel

(you will notice that these standards are known as V21, V22 and so on. Communications experts always seem to be talking about V numbers; they are nothing more than reference numbers given to specification and recommendation documents produced by the CCITT, the European communications authority.) As the V22 modem seems to be able to cope with a transmission rate of 120 characters in both directions you might be wondering why we don't all use this standard. The answer is mainly cost, but it is also working at the limits of what can be managed using a standard telephone line. Currently the most commonly used and cheapest type of modem, for the obvious reason that it is produced in the greatest quantities, is the V23 or Prestel modem. It is so common that nearly all the electronic messaging services can be used via a Prestel modem. However, before you rush out and buy a Prestel-only V23 modem it is worth pointing out that many bulletin boards, private teleshopping services and some of the older online computer services only work with V21 at 300 baud. So if you only have a Prestel modem there are certain to be some less important services that you will not be

able to use. There is also the consideration that, while it is sensible to have Prestel send you data at 120 characters per second for the sacrifice of limiting to 7 characters per second the speed at which you can send characters to Prestel, this low speed can make electronic mail inefficient. If you are considering using electronic mail facilities extensively then a modem that includes a V21 300/300 baud setting is worth considering.

There are a number of other advanced modems and modem features that the Amstrad user cannot take advantage of at the moment. In particular, there are originate modems that will automatically dial a phone number — autodial modems — and there are answer modems that will detect a ringing telephone and answer it — autoanswer modems. However, at the time of writing most of the lower cost modems with these facilities are specially designed for older micros, such as the BBC Micro, or for business machines, such as the IBM PC. This situation is bound to change so look out for low cost Amstrad-compatible autoanswer/autodial modems. If cost is no object then you can already buy such modems that need no special connection to the personal computer they serve. These are generally referred to as smart modems. There is no standard laid down for smart modems but there is a generally accepted standard in the form of the types of command that modems manufactured by Hayes in the USA accept — so best of all is a Hayes-compatible smart modem. There are also modems that work even faster than the 1200 baud V22 modem. The V22bis standard defines a modem that works at twice this speed, that is 2400 baud, but currently such modems are expensive and as yet not many services support this speed.

When looking at modems there are a number of other features that you might come across, which, while not important for using any of the information services described in this book, might confuse or distract you from the important details. For example, all of the modems described so far have been for full duplex operation. This simply means that they can transmit data in both directions at the same time. However, if you only transmit in one direction along a telephone line it is possible to send data at twice the duplex speed. Hence some modems support a half duplex mode of working, in which only the modem at one end of the telephone line can transmit at any given time. In general, half duplex working is only likely to be of interest to you if you are planning to exchange data with a friend using a similar modem. There are also modems that work to USA or Bell standards. The V21, V22 and V23 standards apply only to Europe. In the USA all modems work to a different set of standards, introduced by the Bell Telephone Company. The two most commonly encountered of these standards are BELL 103 at 300 baud and BELL 202 at 1200 baud. Some modems provide these standards as extras but it is important to note that their use is illegal in the UK as the tones they use are said to interfere with the way that the PSTN works.

To summarise: if you only want to use Prestel or are happy to use the other services — Telecom Gold, One-To-One, Easylink, etc. — at Prestel speeds then you need a V23 (1200/75 baud) originate modem. If you

want to use bulletin boards and some private teleshopping services, or if you intend making a lot of use of electronic mail to send letters, then you will need a V22 (300/300 baud) originate modem. If you want to run your own information service or exchange data with a friend's computer then you will need an answer version of either of the above modems.

Acoustic couplers and BT approval

The types of modem that were described in the previous section all made connection with the telephone line directly. That is, they were plugged in via the same type of socket used for a standard telephone handset. To connect any equipment directly to the telephone lines it is necessary to take precautions to make sure that no damage can be caused to any part of the network and to minimise interference with other people's use of the telephone. This means that a sizeable portion of the cost of a modem goes toward protection devices and to applying for the approval of BT. All equipment that is intended for direct connection to a telephone line has to have BT approval and this is indicated by a sticker showing a green circle and the words 'APPROVED for use with telecommunications systems run by British Telecommunications . . .'. A sticker showing a red triangle with the words 'PROHIBITED from direct or indirect connection to any telecommunication systems run by British Telecommunications. Action may be taken against anyone so connecting the apparatus' denotes non-BT approved equipment. If you connect and use such a device then you run the risk of disconnection. However, there is nothing against selling such devices and a few modem companies have, for various reasons, not bothered about getting BT approval or have started selling modems before their BT approval was granted. These modems are usually perfectly safe and meet BT standards; however, it is always comforting to know that you are using an approved modem. One little-known feature of BT approval is that it only applies to a modem as long as no modifications are made to it by its user, and this means that most add-on or plug-in cards to give a modem extra features such as autodial are likely to invalidate a modem's approval.

As computer communication over the telephone lines is conducted using audio tones, one way round the need to connect directly to the telephone lines is to use a loudspeaker to 'inject' the audio tones into a standard telephone handset and a microphone to listen to the ones produced by the earpiece: see Figure 2.5.

An acoustic coupler is, however, a little more complicated than Figure 2.5 shows. In particular, there are rubber cups to make a good connection with the handset and often a lot of sound insulation around the microphone and loudspeaker: see Figure 2.6. Acoustic couplers are generally cheaper than direct connection modems even though they too have to receive BT approval. Their main disadvantage is that they are not as efficient as a direct connection at transferring audio tones from and to the phone line. In particular, if the sound insulation isn't very good they can pick up sounds in the room which appear as random
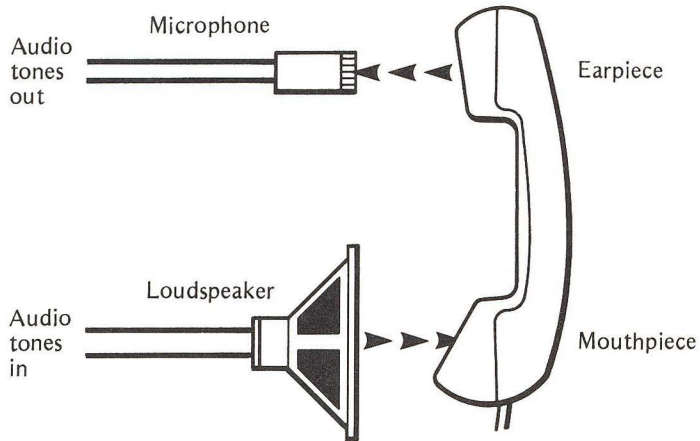
Figure 2.5 The principle of an acoustic coupler

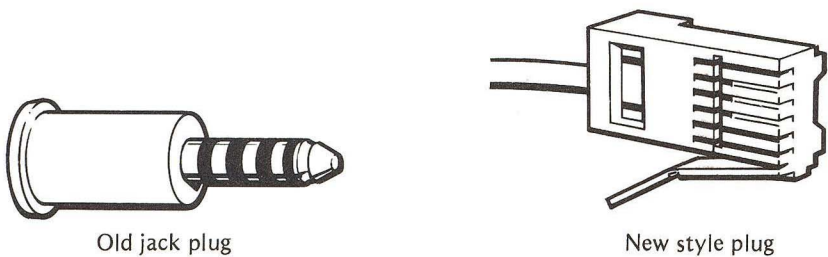Old jack plug   New style plug

Figure 2.6 Telecom Jack plugs

characters on the screen. On a poor quality line a direct connection modem is very likely to work better than an acoustic coupler. However, as well as being cheap, acoustic couplers are very convenient if you are on the move or don't have access to a standard BT telephone socket (see next section).

Telephone connections
The usual way to connect a modem is via one of BT's new Type 600 jack socket and plug. If your telephone is currently permanently attached or connected via a large round jack plug that looks like a giant version of the type of jack plug used to connect headphones to a walkman or a portable radio then you will need to get BT to install new sockets. The cost of this service is about £40 for one socket and an additional £18 per socket thereafter. There is no quarterly rental charge for these new sockets. While you are having your phone installation updated it is worth buying a new BT approved telephone that includes the facility to autodial prestored numbers. An autodial phone plus a modem is almost, but not quite, as easy to use as an autodial modem!

You can also buy a range of useful Type 600 plugs, sockets, adaptors and extension cables from electronics shops such as Tandy. In particular, you can buy a handy two-way adaptor that allows you to plug two phones, a phone and an answering machine, or a phone and a modem

into one socket. The adaptors and extension cables are generally BT approved but, be warned, wiring up you own extension sockets isn't! See Chapter 7 for more details of how the phone system works.

Software

Once you have bought your extra hardware, serial interface and modem and connected it correctly to your Amstrad and to the telephone line there is still one last component before you can get online — software. Traditionally, a modem was used to connect a VDU (Visual Display Unit) or a terminal to a distant computer. A terminal is a very simple sort of computer that has only one job in life: to receive data from the modem and display it on its screen and to send anything that you type on the keyboard to the modem. For you to be able to communicate with a distant computer this is exactly what your Amstrad has to do, and the software that makes it do it is called a terminal emulator or a comms program. There are many standard terminal emulator programs you can buy that will run on any CP/M machine, such as the Amstrad CPC664, 6128 and the PCW range, but you can also buy terminal emulators specially written for the Amstrad. These are often included in ROM as part of the serial interface but they can be supplied separately on cassette or disk.

A good terminal emulator will allow you to set the data format used by the serial interface from a menu (or perhaps by some additional commands). It also has to ensure that your Amstrad can display the necessary range of symbols. For services such as electronic mail this is not difficult because the standard range of displayed characters will do. But for Prestel and Prestel-like services the terminal emulator has to create a full set of Prestel graphics characters in eight colours. A terminal emulator that also provides Prestel graphics is sometimes called a Prestel emulator. Unfortunately, the Amstrad CPC range cannot manage a Prestel display in eight colours and so either fewer colours have to be used, with special hatching or stipple patterns to show the remainder, or a smaller size of character has to be used. This is not a real problem, however, as all of the Prestel displays I have seen on the Amstrad are reasonable, and certainly readable. The PCW range has a problem in displaying Prestel graphics in that it doesn't have colour at all. Fortunately, there are Prestel emulators for the PCW range that will give you the full range of graphics without the colour.

In addition to these necessary functions there are a few extras that are nice to have. For example, a good terminal emulator should include facilities to transfer files, to save and load screen displays, to download telesoftware and to print screen displays. Terminal emulators are becoming more sophisticated all the time and even if you get one with the hardware that you buy you may still want to invest in something better later on.

Some real products

In the following sections some serial interfaces, modems, terminal emulation software and complete communications packages are

described. The trouble with any sort of attempt at giving a picture of the current state of the communications market is that new products are appearing all the time (at the time of writing this is particularly true in the case of the PCW range.) However, a collection of potted reviews can at least serve to give you an idea of where to start and provide something with which to compare new products. All prices quoted *exclude* VAT unless otherwise stated. Although they are correct at the time of writing they are intended only as a guide and are liable to change. Addresses and telephone numbers for all the manufactures can be found in Appendix 2.

The Amstrad serial interface for the CPC range — £49.95 (including VAT)

Amstrad's own serial interface for the CPC range must have the best claim to being *the* standard serial interface for the CPC464, the CPC664 and the CPC6128 (but there are others). It comes in the form of a small black box that connects to the Amstrad via a ribbon cable to the expansion port. It provides a full range of send and receive baud rates and data formats on a single RS232 connection. It also includes a ROM that adds a number of commands to BASIC to allow you to run printers, transfer files, etc. The ROM also contains a terminal emulator and a Prestel emulator. This is a good full-function serial interface that only requires a modem adding to it to get online to almost any service, including Prestel. However, when added to the cost of a modem it is not the cheapest way to get online, and the software supplied with it doesn't really amount to a complete communications pack. For example, you have to do some programming to implement a printer dump or save to disk (see Chapter 5) and there is no provision for downloading telesoftware.

The Amstrad serial/parallel interface for the PCW (the CPS8256) — £59.95 (including VAT)

The Amstrad serial/parallel interface for the PCW range of machines is simpler that the serial interface for the CPC range because it doesn't come with any software in ROM. Instead, both the serial and parallel interfaces can be used directly from CP/M as printer interfaces and for special purpose file transmission.

There is also a terminal emulator, called MAIL232, included on Disk One of the standard system disks supplied with the PCW range. This allows the PCW to be used to transfer files, using the same method as that used in the CPC serial interface, and as a standard terminal. It is important to notice that the terminal emulation software supplied for use with the PCW interface will not support Prestel graphics; that is, it is not a Prestel emulator. If you want to use the PCW as a Prestel terminal then you will have to buy some additional communications software, such as Chit-Chat's Viewdata version (see below).

Amstrad V1/V23 Modem — £99.95 including VAT

The official Amstrad modem is in fact made by Pace. The modem is capable of working at 300/300 baud and 75/1200 baud in originate and

answer modes. The price of £99.95 is very reasonable and includes a free first quarter's subscription to Prestel and Micronet 800 and all the cables that you need but you will have to buy a serial interface and possibly extra comms software if you are using a PCW.

Cirkit serial interface HS-S1 — £29.95
There are a number of very basic serial interfaces for the Amstrad CPC range, some of them even available in kit form. The Cirkit serial interface is ready built, but it comes as an uncased PCB. It is unusual in being a dual serial interface, which may be useful if you want to run a serial printer and a modem at the same time. It is hardware compatible with the Amstrad serial interface so it can be used from CP/M as if it were the Amstrad interface, but because it comes without software on ROM its use from BASIC is different. If you want to use it from BASIC the necessary extra software is available on cassette (£6.00), disk (£10.00) and ROM (£10.00). This provides a range of commands very similar, but not identical, to those used by the Amstrad serial interface, including a simple terminal emulator command but not a Prestel emulator. Cirkit say that a Prestel emulator will be available soon but this will of course cost extra.

The Miracle Modem WS2000 — £108.70
Miracle Technology make a number of different modems, many of them very sophisticated and hence expensive, but the WS2000 is within the price bracket that makes it worth considering for use with any of the Amstrads. For its price it offers a very wide range of features — V21 300 baud, V23 600 baud half duplex, V23 75/1200 Prestel-compatible originate, V23 1200/75 Prestel-compatible answer and the two Bell standards, 103 (300 baud) and 202 (1200 baud half duplex). Of these the average user is only likely to need the V23 75/1200 baud mode for Prestel and the V21 300 baud mode for bulletin boards, etc. Indeed, the Bell standards cannot be used because of a stop placed on the travel of the selection switch (although this is easy to remove). The modem is controlled by switches on the front panel but it can also be controlled via software over a user port. The only trouble is that at the time of writing this hasn't been configured for use with the Amstrad and no software support is available. There are also autodial and autoanswer add-on boards but once again at the time of writing there is no Amstrad support for these. It is a good flexible modem at a reasonable price, but remember that to use it you have to buy a serial interface and possibly a terminal emulator if it isn't included with the serial interface.

Dual RS232 interface from Timatic Systems — £89.00
The dual RS232 interface from Timatic is fully Amstrad-compatible and can be used with any of the CPC range. As well as two serial interfaces it also comes with two parallel ports and sockets for two 16K sideways ROMs. If you just want the serial interfaces then a version without parallel ports and sideways ROMs is available for £59. Simple software for driving the RS232 interface is provided on cassette although Timatic say that it is also available on ROM. A Prestel emulator is available as a ROM for £19.95.

Communicator from KDS Electronics for PCW256 — £153.00
The Communicator is not just a modem but a complete communications system — serial interface, software and modem — for the Amstrad CPC range, packaged into a single box. (A model for the PCW range is promised for the near future.) The unit connects to the Amstrad's expansion port via a ribbon cable and it is completely software controlled, i.e, no messy switches or buttons. The modem supports 300/300 baud and 1200/75 baud in both originate and answer modes, and 1200 baud and 600 baud half duplex, all in both CCITT and Bell standards. If this wasn't enough, the basic modem is also autodial/autoanswer! The software includes all the facilities that you would expect from a complete communications package — Prestel emulator with printer dump, disk save and load, telesoftware downloading, autodial, autolog-on, etc. It also adds an incredible number of extra commands to BASIC. The only drawbacks of this system are that its manual is poor and it isn't BT approved.

Mini Office II (including communications pack) — £14.95 cassette, £19.95 disk (including VAT)
Mini Office II is a complete business package, including a wordprocessor, spreadsheet, graphics, label printer and a communications module. This communications module is fairly basic and only provides a terminal emulator with simple text file transfer options. There is no Prestel emulator but the complete package is good value if all you want to do is use Telecom Gold, etc. Of course, to make it work you do need an Amstrad-compatible serial interface and a modem.

Chit-chat communications pack by Sagesoft: E-Mail £69.99; Viewdata £69.99; and Combo £99.99 (including VAT)
Chit-chat is probably the most complete and professional communications pack and it is available for the CPC and PCW ranges. The E-Mail version of the program will allow you to make the best use of the electronic messaging services such as Telecom Gold; if you want to use Prestel then you will need the Viewdata version; and if you want to use all of the services you will need the Combo version. You will also need a serial interface and a modem but Sagesoft do sell a complete package of Combo plus serial interface plus modem for £239.99. The program itself is completely menu driven and includes all the facilities that you would expect of a comprehensive communications package — autodial, autolog-on, frame dumps to printer and disk, file transfer, etc. It also includes a text editor, which can be used to prepare messages ready for transmission, and a command language that can be used to run your system unattended. For example, if you use an autodial modem you can write a task that will automatically phone a messaging service at a specific time of day (or night) and retrieve any mail waiting for you.

Modem House — Voyager 7 communications package for the CPC £159.95. Voyager 11 communications package for the PCW £199.95
Modem House can supply a complete communications system for the

PCW or for the CPC range. The Voyager modem (model 7 or 11) is a dual standard 300/300 baud or 1200/75 baud (originate and answer) that is suitable for use with all of the messaging services and Prestel. The PCW serial board is Amstrad-compatible and includes a parallel printer interface. You can of course use the Voyager modem with any serial interface on any Amstrad machine but the communications program COMM+ expects an Amstrad-compatible serial interface on a PCW or CPC128 machine. The PCW communication package includes COMM+ on disk. COMM+ is a sophisticated communications program that will allow you to use the standard messaging services and Prestel. It also includes a command language that can be used to create batch files for automatic operation. The CPC serial interface comes with terminal emulation software in ROM that includes a Prestel emulator with telesoftware downloading and printer/file dump facilities.

Cirkit Prestel Link — acoustic coupler, TTL serial interface and terminal emulator, £35.99
The latter is a complete package of hardware and software suitable for using Prestel and other services operating at 75/1200 baud. The modem part of the interface takes the form of an acoustic coupler but this works very well indeed. The serial interface is capable of working at all the standard baud rates and data formats but its output isn't at RS232 levels but at TTL levels (see earlier). This may make it unsuitable for any purpose other than for connecting the supplied acoustic coupler. The terminal emulator is supplied on tape or disk and it includes a general terminal emulator suitable for BT Gold, One-To-One, etc. and a Prestel emulator. The software supports the full range of baud rates and data formats but the acoustic coupler will only work at 75/1200 baud and at 1200 baud half duplex. The terminal emulator is very easy to use and fully menu driven and will save and load screens to disk. A printer dump program is an optional extra and a telesoftware downloading program is promised for the near future. If all you want to do is use Prestel and perhaps some of the other messaging services then this package of hardware and software is very difficult to beat for value and quality.

Pace Nightingale modem, Commstar and serial interface — £150.00
Pace make a number of complete communications packages for different micros. At the moment the only Amstrads they cover are the CPC range. However, they do provide a complete, no-problems package comprising a Nightingale modem, an Amstrad-compatible serial interface and the Commstar communications software. The Nightingale modem is capable of working at 300/300 baud originate and 75/1200 baud originate and answer. You can purchase the modem by itself for £119. The serial interface is Amstrad compatible and so it can be used with the same CP/M commands. The Commstar communications software includes a full terminal and Prestel emulator which includes the facility to download telesoftware. The serial interface with Commstar costs £89.

3 Information and Prestel

Although there are a number of specialist information providers the best known and most established general information service is Prestel. In this chapter we look in detail at what Prestel offers and how to use it. The extensive messaging services offered by Prestel are covered in the next chapter, where they can be compared more easily with the other messaging services. So if you want the full Prestel picture you need to read this chapter and at least some of Chapter 4.

Getting started on Prestel

To use Prestel you need a modem or acoustic coupler capable of working at 1200/75 baud, a serial interface and a Prestel emulator: see Chapter 2 for more explanation and suggestions for suitable equipment. (It is possible to use Prestel at 300/300 baud and 1200/1200: see Chapter 4.) As well as this you will also need to take out a subscription to Prestel. To get the form necessary to do this, phone the operator (on 100) and ask for Freephone Prestel Sales.

When your Prestel subscription comes through you will be supplied with four important numbers:

a Prestel account number,
the telephone number of your nearest Prestel computer,
your customer identity, and
an initial password

Your Prestel account number is for billing purposes and has to be quoted whenever you want to talk to (or otherwise communicate with) a human about any aspect of your Prestel subscription. The telephone number of your nearest computer is the number that you dial to get online to Prestel. There are a number of different Prestel computers around the country and which one you use depends on where you live. Each Prestel computer is given a name so, for example, you may find that you are using the Dickens or Derwent computer. It is important to realise that you are only registered with specific Prestel computers and if you move or want to use a different computer then you have to inform Prestel

Services so that you can be registered to use it. Your customer identity is a ten-digit number, which identifies you to the computer that you are registered to use, and the password is a four-digit code that you can use to restrict unauthorised access. While you are waiting for your Prestel registration to come through you can test out your equipment using a demonstration customer identity, 4444444444 (10 fours), and password, 4444 (4 fours). This gives you access to a limited number of Prestel pages, but more than enough to show that everything is working. You can find out the telephone number of your local Prestel computer from Prestel Sales, but within London Prestel can be accessed on 618 and from any part of the country on 01 681 2541 (this last number is in fact the international contact number for Prestel). Once you are connected to the Prestel demonstration database you can use it to find your local access number.

To get online to Prestel you first have to make sure that your serial interface is set to the following data format:

Transmission speed: 75 baud
Reception speed: 1200 baud
Parity: Odd
Number of data bits: 7
Number of stop bits: 1

and that you are running a Prestel emulator. How exactly you achieve this depends on the exact hardware that your are using. For the Amstrad serial interface used with a 1200/75 baud V23 modem this is simply a matter of typing

I SETSIO,75,1200,0,7,1,0
I PRESTEL

(see Chapter 5). If you are using the Cirkit modem or Chit-Chat then simply select the correct option from the starting menus. Then dial the number and wait for the soon to be familiar whistle of the Prestel computer answering the call. At this point either switch your modem to on-line or plug the handset into your acoustic coupler. This causes your modem to whistle back at the Prestel computer to let it know that you are there. In a moment or two the first data from Prestel should start appearing on the screen. This first page asks for your customer identity, see Figure 3.1, and you should type it in without making a mistake. If you do make a mistake type ** and this will delete the entire line so that you can start entering your customer number again. (*Note:* Prestel emulators usually redefine the numeric keyboard to give the two special Prestel characters # and * so that the Enter key gives # and the decimal point key gives *.) After you have entered your customer identity a new page appears and asks for your password. If you enter this correctly you will be rewarded with your first real Prestel page in the form of a menu giving you a choice of services. Which page you see at this stage depends on whether you have chosen to subscribe directly to Prestel or to one of the many CUGs (closed user groups) such as Micronet 800. If you have subscribed to Prestel then you will see the Prestel main menu

Figure 3.1 Sign on page

Figure 3.2 Prestel main menu

(Figure 3.2); if you have subscribed via a CUG then you will see its main menu page.

If for some reason you fail to get this far then consult Appendix 1 to see if you can trace the fault and try again. If you are sure that there is nothing wrong with your equipment (including your telephone) but still cannot get online to Prestel then contact the Prestel Centre (dial 100 and ask for Freephone Prestel Service).
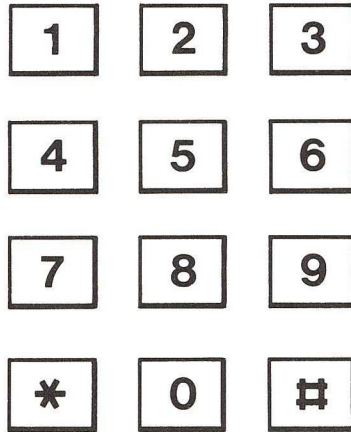

Figure 3.3 A standard Prestel keyboard

The # and * keys

The Prestel service is organised so that any page can be accessed using nothing but a numeric keypad and the two special keys # and *. The standard Prestel keypad layout can be seen in Figure 3.3 and most Prestel emulators arrange for the Amstrad's numeric keypad, or the usual top row numbers, to be Prestel keys 0 to 9, the decimal point key to be the Prestel * and the ENTER key to be the Prestel # key. (Some, for example COMM+, define the * key to be the * and the underscore — key to be the #.)

The * key is generally used to gain Prestel's attention. For example, it is used to start a command to go to a particular page number or to delete what you have entered. The # key is generally used in the same way as the RETURN key in other areas of computing, to mean 'I have finished typing'. For example, to go directly to a particular page number you type *page number# and you usually have to type # to end any line that you type in response to a question.

Getting around — frames and pages

Once you have logged on to Prestel there are two ways to use it — automatic page selection and direct page selection.

Before going on to explain these methods it is worth making the distinction between a Prestel frame and a Prestel page. A frame is a
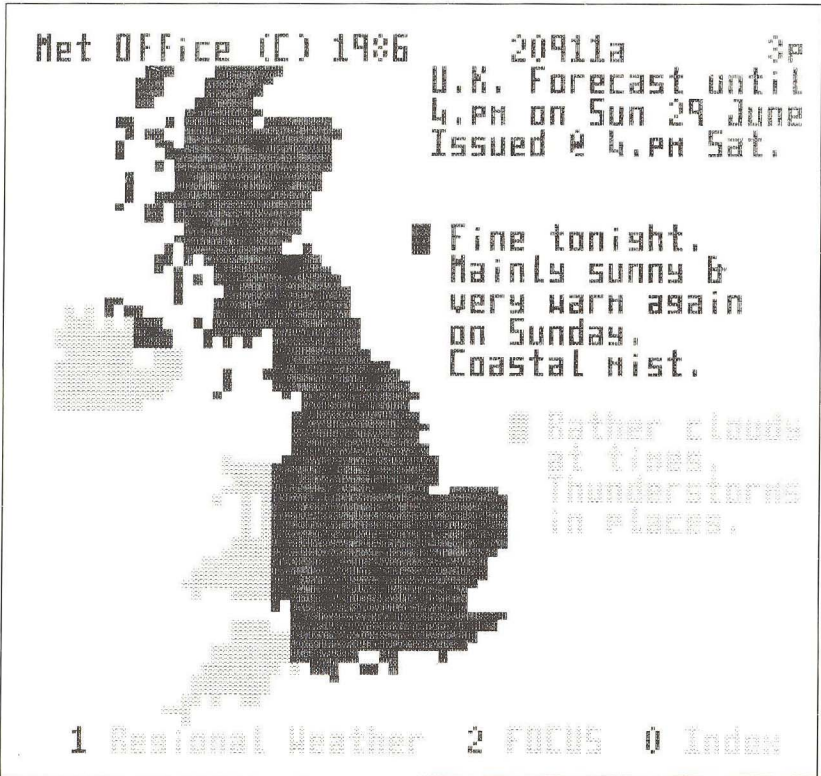
Figure 3.4 Weather forecast

single screenful of data but a page may be composed of a number of frames displayed one after the other. This use of multiframe pages means that a particular piece of information can be stored in a single page even though it is too big to fit into a single screen's worth of data. Each page is given a page number and the frames that make it up are then called a,b,c, etc. So, for example, the computer ads page on Micronet 800 is page number 80011271 but this is made up of frames 80011271a, 80011271b, etc. Once your are at a particular page you can move through its component frames by pressing #. That is, if you are looking at 80011271a, then pressing # will move you on to 80011271b and so on.

When you are first using Prestel, or when you are exploring its facilities, the easiest way to find out what is available is to use the extensive menu and automatic page selection. Each page that is displayed has the ability to route you automatically to any one of a number of other pages of your choice. For example, the main menu page of Prestel (see Figure 3.2) offers you a choice of a number of subjects that you might be interested in and by pressing the appropriate number key you will be sent to a page about that subject. This page is again usually a menu that allows you a finer choice of subject and so on until you arrive
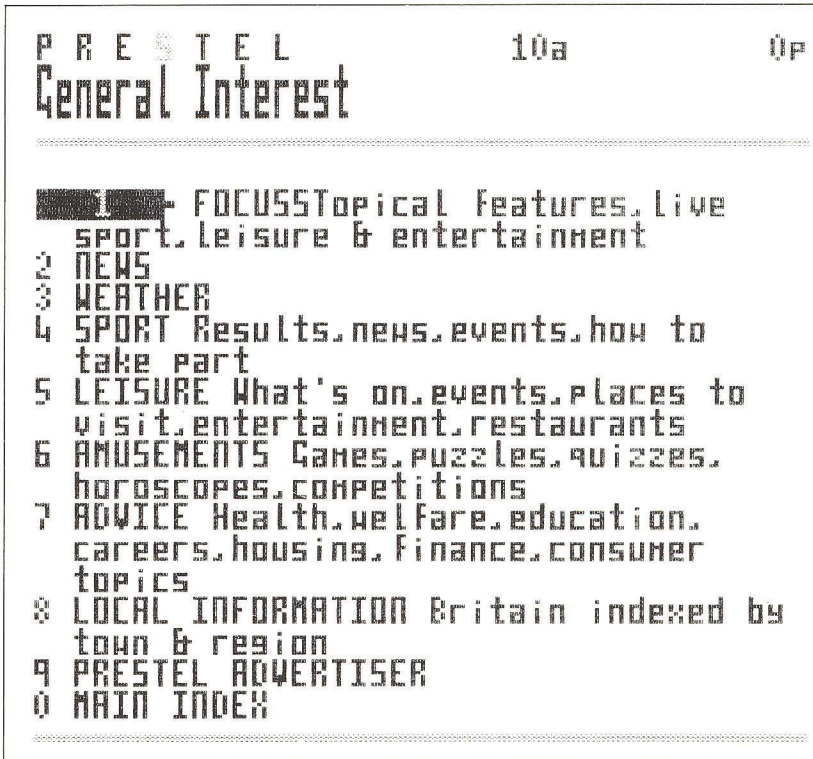
```
P R E S T E L                    10a              0p
General Interest
```

```
█████▌ FOCUS Topical features. live
      sport. leisure & entertainment
2 NEWS
3 WEATHER
4 SPORT Results. news. events. how to
  take part
5 LEISURE What's on. events. places to
  visit. entertainment. restaurants
6 AMUSEMENTS Games. puzzles. quizzes.
  horoscopes. competitions
7 ADVICE Health. welfare. education.
  careers. housing. finance. consumer
  topics
8 LOCAL INFORMATION Britain indexed by
  town & region
9 PRESTEL ADVERTISER
0 MAIN INDEX
```

Figure 3.5 General interest menu

at a page that contains the information you want. This automatic page selection is easy in that you can get to a page without having to type in or even know its page number, but it can be a slow way of getting to the same pages repeatedly.

Direct page access involves knowing the number of the page that you want and going straight to it. To go to page number x simply type $*x\#$. For example, to go to BR's news for InterCity to Euston services on page 221 395 2 you would type $*221$ 395 $2\#$. Direct access is much faster and hence cheaper than being guided to the page you need by Prestel's extensive menus.

Finding pages — the top line

Direct page access is all very well, but how do you find out the number of the page that you want to look at? There are three main ways of finding page numbers: the Prestel directory, the online directory, and previous encounters with the page during automatic page selection. The Prestel directory is a magazine sent to every Prestel user once a quarter. This contains a complete listing of Prestel services by subject and by information provider as well as a number of interesting articles. You can
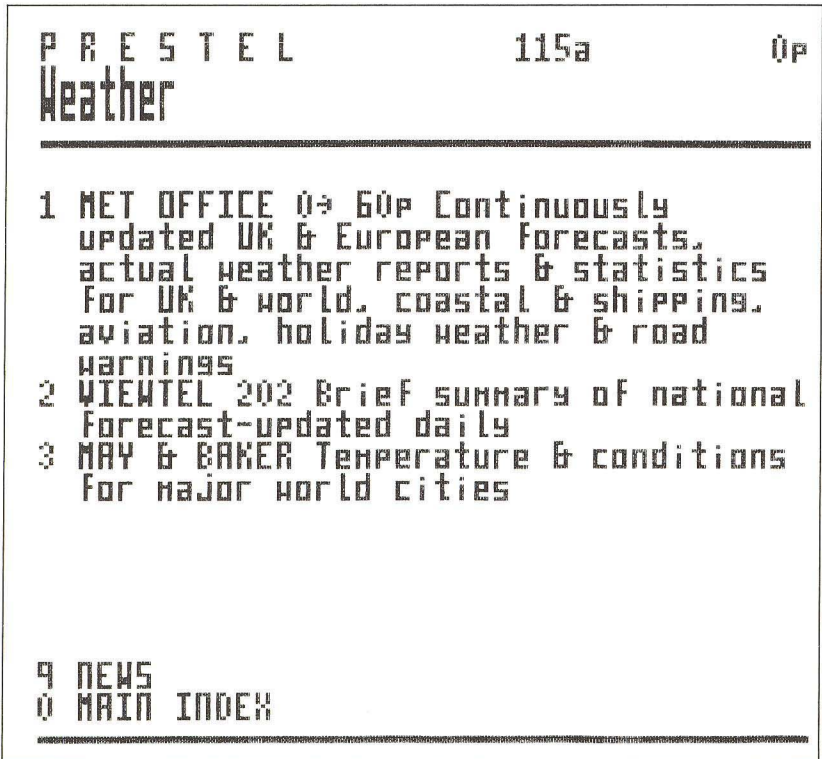
```
P R E S T E L              115a           0p
Weather
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━

1 MET OFFICE 0→ 60p Continuously
  updated UK & European forecasts,
  actual weather reports & statistics
  for UK & world, coastal & shipping,
  aviation, holiday weather & road
  warnings
2 VIEWTEL 202 Brief summary of national
  forecast-updated daily
3 MAY & BAKER Temperature & conditions
  for major world cities




9 NEWS
0 MAIN INDEX
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━
```

Figure 3.6 General weather menu

read the Prestel directory while you are not actually using Prestel and make a list of page numbers that you would like to look at next time you are online. In fact the Prestel directory is so useful it is worth asking for a copy before you subscribe to Prestel, to see the range of services on offer.

There is also a daily-updated index to subjects and information providers starting at page 199 (or option 7 from the main index). You can use this to look up any subject or information provider while you are online. All you have to do is find the correct position in an alphabetical list of subjects or information providers by selecting the correct options from a number of menus. Eventually you will reach a page that shows the part of the alphabetical list where the information you seek should be. (Notice that at the moment Prestel doesn't give you the facility to type in a name that you want to find in the index and have it automatically searched for. The best that Prestel can do is to lead you to the correct place in the index by asking a series of questions along the lines of what is the first letter, what is the second letter, and so on.)

The final way of finding out page numbers is simply to note them down the first time you use them. To this end it is worth keeping a book of Prestel page numbers in much the same way you might keep a personal name, address and telephone number book. The top line of any

page that you examine will tell you, reading from left to right, the name of the information provider, the page number and frame letter, and the cost of the page. For example, Figure 3.4 shows a page from the weather forecast; the top line tells us that the information provider is the Met Office, the page number is 20911, this is frame a, and that the page costs 3p.

It is sometimes helpful to know a little about how Prestel page numbers are organised. Each information provider is allocated a group of numbers that starts with the same three digits. For example, nearly all Micronet 800 pages start with 800 (that's why the service is called Micronet 800!). So if you find a page interesting it might be worth examining pages that start with the same three digits. Also, most information providers group the type of information in their pages according to page number. For example, all of BR's pages start with 221, their travel centre index is on page 221 22 and the actual information on their travel centres is on pages 221 222 0 to 221 222 5, and 221 223 1 to 221 223 8.

Hints and tips — auto log-on

There are number of keypresses and page numbers that it is worth knowing about from the first day that you use Prestel:

Command	Use
Go to page x	$^*x$#
Back a page	*#
Delete entry	**
Retransmit page	*00
Update page	*09
Quit Prestel	*90#

The use of most of these keypresses is obvious but notice the difference between Retransmit page *00, which will just send you the same page without recharging you so that you can have a second attempt at correcting any transmission errors, and Update page *09, which sends the page again along with any changes that have been made since you last looked at it and repeats the page charge if any. Some useful Prestel page numbers are:

Page no.	Item
*102#	Your account number
*199#	Prestel index
*92#	Your bill to date

*5#	Business information
*5830#	Customer relations
*1#	Main menu
*3#	Local information
*920#	Change password
*583#	How to use Prestel
*6#	Guide to response frames
*170#	What's new
*7#	Send a message to another Prestel user
*487#	Mailbox directory
*930#	Check for any messages
*8#	Telex
*10#	General interest menu
*456#	Microcomputing main menu
*800#	Micronet main menu
*25864#	Amsnet main menu

Some of these pages are described later in this chapter and others are left for you to try out. Notice, however, that *92# gives you your bill not including telephone charges and any charges for the current session. Also, you should use *920# to change your password at regular intervals but don't make the mistake of changing it and then forgetting it! If you do you will have to wait until the Prestel centre writes to tell you what it is; they, quite rightly, won't tell you over the telephone.

If you are getting tired of typing in your customer identity number and password then there is a very simple way of programming your Amstrad to type them in for you. using the KEY and KEY DEF BASIC command you can set any key on the keyboard to return a string of characters when you press it. To log on automatically to Prestel all you have to do is define one key to return your customer identity number followed by your password. You can choose any key for this purpose but, for example, to set the CLR key to the customer number 1234567890 and password 4341 you would use:

```
KEY 158,"12345678904341"
KEY DEF 68,1,158
```

The first instruction sets 'expansion token 158' to the required string of digits and the second instruction then assigns key 68, the CLR key, to this expansion token. These lines can be saved as a BASIC program and run before your Prestel terminal emulator, or then can be included as part of your Prestel terminal emulator program. For example, for the Amstrad serial interface you would use:

```
10 MODE 0
20 | SETSIO,75,1200,1,7,1,0
30 KEY 158,"12345678904341"
40 KEY DEF 68,1,158
50 | PRESTEL
```

All you have to do to make use of this is to dial Prestel and, when you

see the first frame start to appear, press the CLR key. This will cause your Amstrad to transmit your customer identity number and password and Prestel will jump directly to its welcome page.

It is also worth knowing that you can type in a direct page reference, i.e. *number#*, at any time while a frame is being transmitted and Prestel will stop sending that frame and start sending the frame you have requested. Used correctly this can save you a lot of time.

Gateways

A term that you will come across occasionally while using Prestel is 'gateway'. A gateway is simply a connection to another computer that is not part of the Prestel system. From the user's point of view, a service provided by a gateway is often exactly like using the rest of Prestel. For example, the HOBS service (see later) is actually provided by the Royal Bank of Scotland's computer rather than Prestel's. The only thing that you might notice in using a gateway is a slight delay, caused by the Prestel computer taking time to contact the gateway computer, before
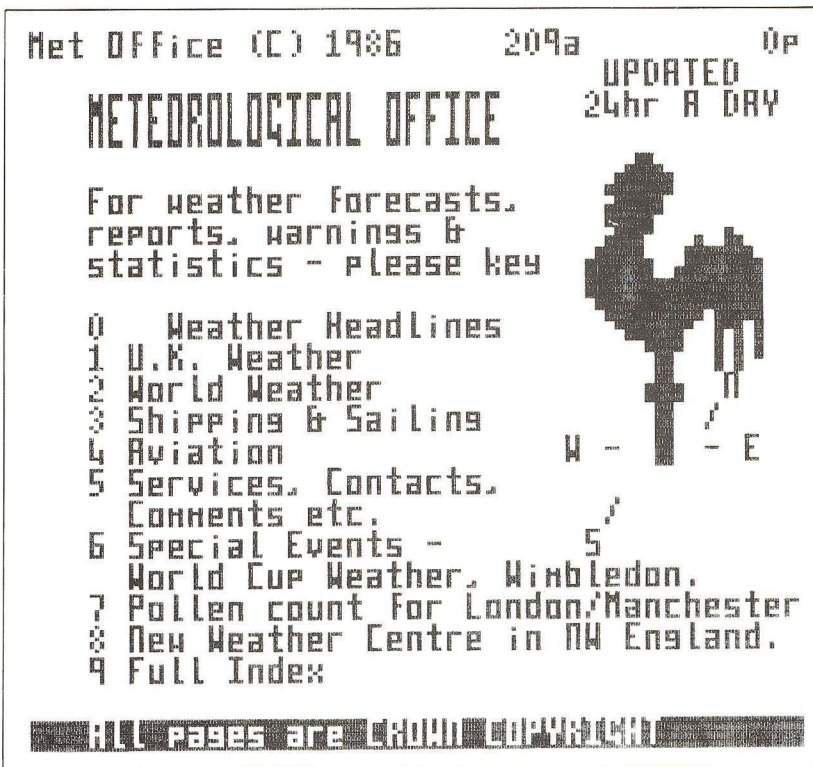

Figure 3.7 Met office main menu

the service's main menu appears. You can see a list of gateways on page *19056#.

Getting a weather forecast

As a simple example of using Prestel, let's see how easy it is to get a weather forecast for the first time. Starting from Prestel's main menu on page *1# (see Figure 3.2) you can see that weather is mentioned in option 6. Pressing key 6 then automatically takes us to the Prestel general interest menu on page *10# (see Figure 3.5). A brief examination

```
Met Office (C) 1986      20904a        0p
               UK WEATHER INDEX

         National              Regional

      11 F/c Chart 3p      3 Detailed 24hr
                               & 5 day F/c


      12 F/c Text 3p       4 Road warnings


      13 3-day F/c         5 Actual reports


      14 7-day F/c         6 Aviation


       2 Shipping &        7 Statistics
         sailing F/c
                             (F/c = Forecast)

      8 FOCUS 9 World Weather 0 Main index
```

Figure 3.8 UK weather index

indicates that weather is option 3. Pressing key 3 then takes us automatically to page *115#, the weather menu (see Figure 3.6). This is the first point at which we have really had a choice to make about what type of weather forecast is needed. If we suppose that a medium-range weather forecast is required then nothing but the Met Office will do! Selecting option 1 by pressing key 1 takes us to page *209#, the Meteorological Office's main menu page (see Figure 3.7). From this you

Figure 3.9 Medium term weather forecast a

can see that the range of services offered is more than you can get from a daily paper or from the television forecast. Selecting option 1 by pressing key 1 then takes us to page *20904#, the UK weather index (see Figure 3.8). You will notice that some of the options on this menu lead to pages that have an associated charge — so read menus carefully! Selecting option 13, by pressing key 1 immediately followed by key 3, leads to the first frame of page *20913# (Figure 3.9), which warns that to look at the remaining frames costs 40p. The Met Office have some of the highest page charges in all of Prestel because of the unique value of the information that they provide. To move on to the remaining frames of the page and incur the frame charge all that is necessary is to press the # key, which results in the information in Figures 3.10 and 3.11.

Getting a medium-range weather forecast in this way was easy; all that was necessary was to read menus and press the correct keys, but we had to look at quite a few unnecessary pages before arriving at the desired information. Now compare this with looking up 'weather' in the Prestel directory, which immediately gives page *20904#, that is Figure 3.11, as the UK menu and only one selection away from the desired information. Better still, if you are a regular user of medium-range

```
Met Office (C) 1986      20913b         40p
┌──────────────────────────────────────────┐
│┌──┐ MEDIUM RANGE UK FORECAST for ┌──┐│
││0 │ Sun 29 June - Tue  1 July     │0 ││
│└──┘ issued at 9.00am Saturday:    └──┘│
└──────────────────────────────────────────┘
SUNDAY: E'ern districts will be dry
with sunny periods. Elsewhere it will
be rather cloudy with thundery rain or
showers but over W'ern Scotland & NW
districts of England it will gradually
become brighter & drier. Temperatures
will range from hot or very hot inland
to near normal or rather cool in
coastal regions.more especially in the
east. Some sea fog patches are also
expected.
MONDAY: Most E'ern & N'ern districts
will continue dry with sunny periods
but with thundery showers over SW &
some W'ern areas.edging N & E during
the day. Please key # to continue....0p
   1 Other Forecasts   0 Main Ind
```

Figure 3.10 Medium term weather forecast b

weather forecasts why not note down page number *20913# and go
straight there?

Micronet 800

No matter what your main interest in using Prestel, as a microcomputer
owner you are very likely to find something of interest in Prestel's
microcomputing service, and specifically Micronet 800. It is important to
realise that Micronet 800 is a CUG and as such you will not be able to
gain access to all of its pages unless you take out an additioal
subscription to Micronet. A joint Prestel/Micronet 800 subscription is
only £16.50 a quarter, which seems very reasonable for the range of
facilities on offer.

The Micronet 800 main menu, page *800#, can be seen in Figure 3.12.
Most of the Micronet 800 services are, at the moment, centred around
the Spectrum, Commodore 64 and BBC Micro, but there is a rapidly
growing Amstrad section run in conjunction with Viewfax 258 (more of
which later). However, there are a number of general services of use to
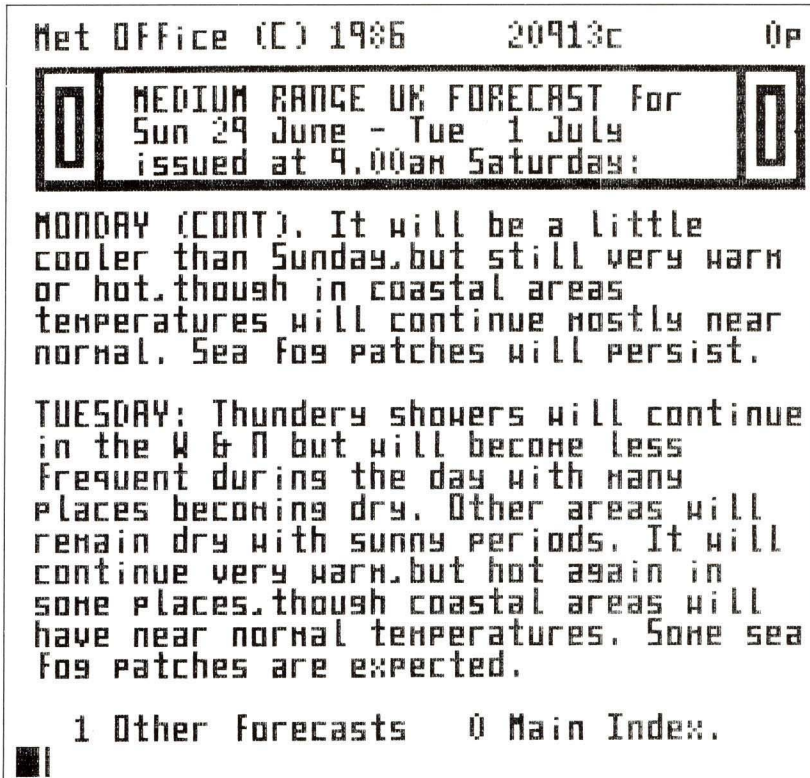the Amstrad owner. Chatline, page *811#, allows you to 'talk' to other

```
Met Office (C) 1986      20913c          0p
 ┌───┐ ┌──────────────────────────┐ ┌───┐
 │ 0 │ │ MEDIUM RANGE UK FORECAST For │ 0 │
 │   │ │ Sun 29 June - Tue  1 July    │   │
 └───┘ │ issued at 9.00am Saturday:   └───┘
       └──────────────────────────┘
```

MONDAY (CONT). It will be a little
cooler than Sunday.but still very warm
or hot.though in coastal areas
temperatures will continue mostly near
normal. Sea fog patches will persist.

TUESDAY: Thundery showers will continue
in the W & N but will become less
frequent during the day with many
places becoming dry. Other areas will
remain dry with sunny periods. It will
continue very warm.but hot again in
some places.though coastal areas will
have near normal temperatures. Some sea
fog patches are expected.

    1 Other forecasts   0 Main Index.

Figure 3.11 Medium term weather forecast c

Micronet subscribers and Celebrity Chatline page *585# allows you to interview well-known personalities from the microcomputer world! Computer and software reviews, special offers and technical help are all available. If you like playing games then Round Britain Race, page *70000# (see Figure 3.13), and Starnet, page *80030# (see Figure 3.14), are different from the type of games that you can play on any microcomputer in that they involve interaction with other users. On the more serious side, you can find yourself a new job, page *8005111#, or take a programming course, page *800605#. There is also Bizznet, the Micronet 800 area for business information. Bizznet is comprised of some 500 pages of information on money management — law, insurance, taxation, mortgages and starting your own business.

As well as Micronet 800 there are a number of other Prestel microcomputing services, some of which are free but all of which are accessible to Micronet subscribers. The Prestel microcomputing menu, page *456#, can be seen in Figure 3.15. From the Amstrad user's point of view the most important is the Amsnet service on Viewfax 258, starting on page *25864#. This is a service run jointly by Micronet 800 and Viewfax 258. If you're looking for Amstrad-specific reviews, special offers, news, etc., then this is where to start. At the time of writing,

Figure 3.12 Micronet 800 main menu

Amsnet was a relatively new but rapidly expanding service. You can see the Amsnet menu page in Figure 3.16. It is currently divided into four sections, Amsnet news (a sample of which can be seen in Figure 3.17), Techdesk — technical hints and tips (see Figure 3.18), Amsnet reviews and telesoftware.

If you are specifically interested in downloading programs for your Amstrad there is a telesoftware section starting at page *258649#. To date, this is a relatively modest collection of around 20 free programs. At the time of writing the programs on offer were:

1	INDEX	CP/M catalogue utility
2	ROLAND TAKES A RUNNING JUMP	Nine level arcade game
3	MONSTERS	Arcade game
4	DOG	Machine code catalogue utility
5	AMGRAPH	Graphics package
6	EVASIVE	Game
7	CRAZY LEGS	BASIC game
8	LOGIC	Game
9	HERBERT	Game
10	UNERASE	Restore a deleted file

Figure 3.13 Round Britain race

11	BALLON	Game
12	TEMPLE	Quiz
13	CHARGEN	Character generator
14	LANDER	Game
15	GLAXIAN REVENGE	Arcade game
16	CRALL	Adventure game
17	3D FOUR	Game
18	NSWP205	CP/M utility
19	ROBOT RON	Arcade game
20	MISSILE COMMAND	Arcade game
21	PATRIOT	Game
22	YAHTZEE	Game
23	WHIRLY	Game

(Note that this list will change with time and is only intended to give the prospective user an idea of the type of software available.)

There is also a large range of chargeable telesoftware from Amsoft, Digital Research, Hisoft, etc., (see Figure 3.19) which can be immediately downloaded and charged to your Prestel account. The full range of telesoftware is easy to download as long as your terminal emulator has a telesoftware facility; the trouble is that at the moment most of them don't.
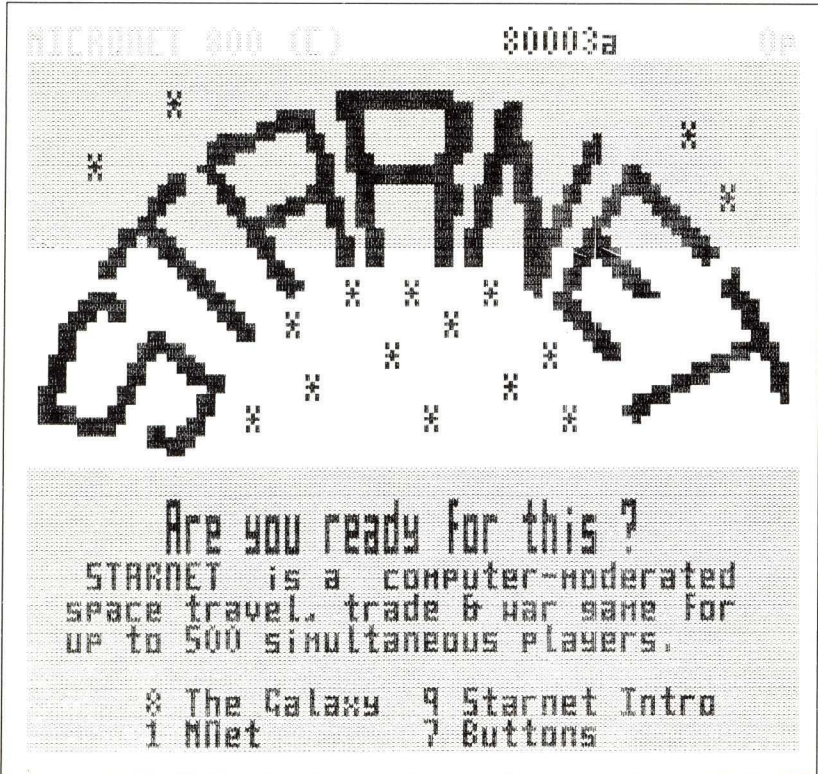
Figure 3.14 Starnet

Although telesoftware is often put forward as one of the main reasons for subscribing to Prestel, and to Micronet 800 in particular, in my opinion it is only one of the many useful facilities available. If you subscribe to Micronet 800 then free telesoftware and the ability to download commercial programs is a bonus.

Some useful microcomputing page numbers are:

*800#   Micronet front page
*456#   Prestel microcomputing menu
*25864#   Amsnet
*2586471#   Amstrad hints and tips
*258649#   Amstrad telesoftware

Financial services

The three most important financial services offered by Prestel are:

Home and Office Banking (HOBS) A telebanking service run by the Royal
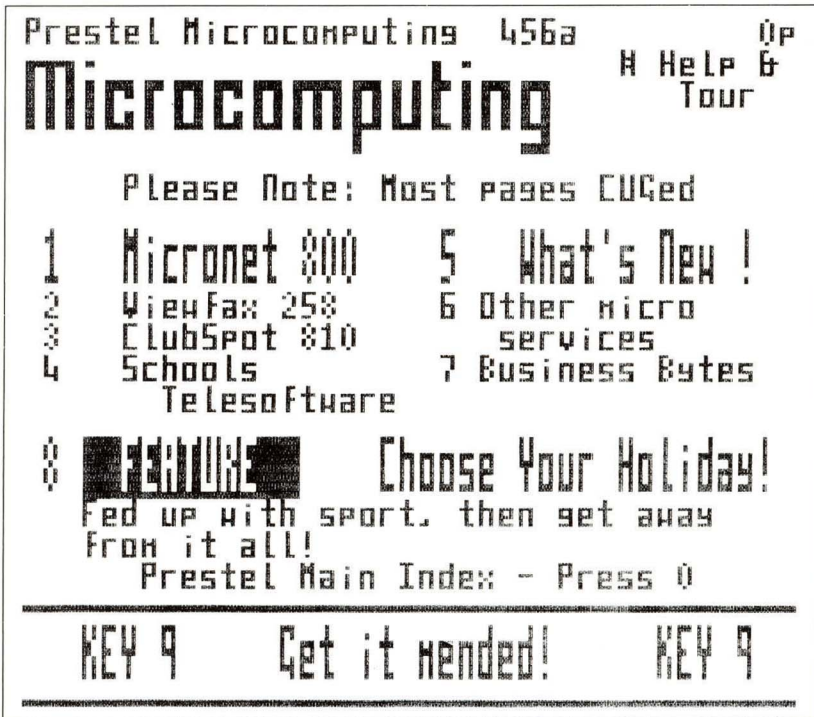Bank of Scotland

Figure 3.15 Prestel microcomputing main menu

Homelink: A service run by the Nottingham Building Society

CitiService: A general investment and financial service

For the private user the most interesting of these services are HOBS and Homelink. Using these services it is possible to examine balances, transfer funds between accounts and pay bills. However, both services suffer from the disadvantage of requiring the user to open accounts — with the Royal Bank of Scotland (in the case of HOBS) and the Nottingham Building Society (in the case of Homelink). Changing your bank or building society or just adding to the number of accounts that you have may not appeal to you, but until the rest of the high street banks and building societies catch up there is no choice! There are also limitations to telebanking simply because not everyone uses it. For example, you can pay bills automatically on a given date but only after arranging it in advance with the payee. There is a monthly subscription to HOBS of £2.50 (£5.00 for business users) per month and paying a bill costs 16p (20p for business users) per transaction. Transfers between HOBS accounts (except money market cheque accounts) are free. HOBS can be found at page *3951# and Homelink at page *444#: see Figures

Figure 3.16 Amsnet main menu

3.20 and 3.21. Other banks and building societies have Prestel pages but at the time of writing none of them offers telebanking services.

CitiService is a collection of services offered by a range of information providers. The CitiService main menu is on page *8818#: see Figure 3.22. You can find out share prices (see Figure 3.23), exchange rates, commodities and futures. You can, if you subscribe to a telebroking service, also buy and sell shares. There are three levels of service for stock exchange prices: Level 1 shows the share price of 200 companies updated five times a day. There is no membership fee but pages cost 7p each. To use Level 2 you have to pay a subscription of £18 per quarter and 7p per page, but for this you have access to information on 1500 securities including gilts, equities, the unlisted securities market, overseas securities listed in London and the Rule 163(3) market — all updated five times a day. Level 3 provides the same information as Level 2 but in this case it is updated continuously. The subscription for Level 3 is £90 per quarter but the page access charge is still 7p.

A number of stockbrokers have now started to offer Prestel services, ranging from advice to full telebroking. For example, Hoare Govett (page *88170#) clients can place orders via Prestel to buy or sell shares, day or night. If you want stock market information then Stockmarket

Figure 3.17 Sample amsnet news

Confidential provides news and advice updated twice a week on page *881312#.

The full range of financial services available on Prestel is too great to go into any further; suffice to say that it is considered essential by a large proportion of the financial community. One of the more disheartening aspects of CitiService, at the time of writing, is that it is still doesn't really provide an easy route to dealing in shares for the first-time buyer. Most brokers still regard telebroking as a service for existing investors rather than as a way of enticing new investors into the foreign world of the stock market. As the deregulation of the City approaches, this attitude may change very rapidly.

Some useful financial page numbers are:

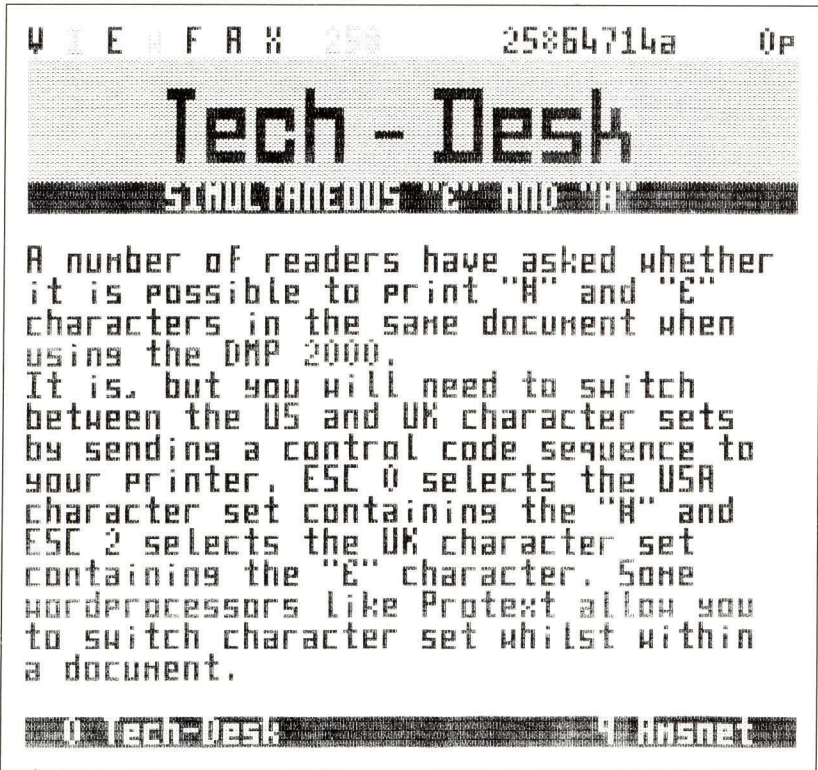|	
*3951#	HOBs
*444#	Homelink
*8818#	CitiService main menu
*48107	Charts
*48186#	News
*781#	Stockmarket prices
*7818#	Index

Figure 3.18 Sample techdesk

*881881#	To contact CitiService
*48165#	System status

Teleshopping

There are a large number of firms offering teleshopping facilities and it is very difficult to give an idea of the range of goods that can be order via Prestel because many of them are very specialised. The most obvious teleshopping outlets are three of the well-known mail order firms — Littlewoods, Great Universal and Kays. Teleshopping is an obvious extension to the way a mail order firm does business and so it is likely that more of them will join the list as time goes on. The teleshopping main menu can be found on page *55#.

The styles used by teleshopping services vary from just being able to order items found in a conventional catalogue to new Prestel-inspired ways of selling things. For example, Great Universal runs weekly 'your bid' special offers, which is essentially a 'tele-auction'. There are catalogues available from each of the main teleshopping services and

Figure 3.19 Commercial software

Littlewoods goes so far as to produce a special Shop TV catalogue — all can be ordered via Prestel, of course! Most teleshopping outlets use credit cards for payment but the mail order companies also run their own credit acccount and agency services. If you are already an agent for one of these companies then there are very definite advantages to using their teleshopping services. The Telestores main menu can be found on page *1452#: see Figure 3.24.

As well as the 'general store' type of teleshopping outlet there are also a great many smaller specialist outlets. For example, if you want to order a book then try Haigh and Hochland books on *28844#. If you want to rent a car then you will find all of the national car rental firms on Prestel. You can order flowers from Datamatch (page *24787#) or wine from Techtel (*245324#).

Some useful teleshopping page numbers are:

*55#   Teleshopping main menu
*3630#   Littlewoods Shop TV
*201#   Great Universal
*2022311#   Kays
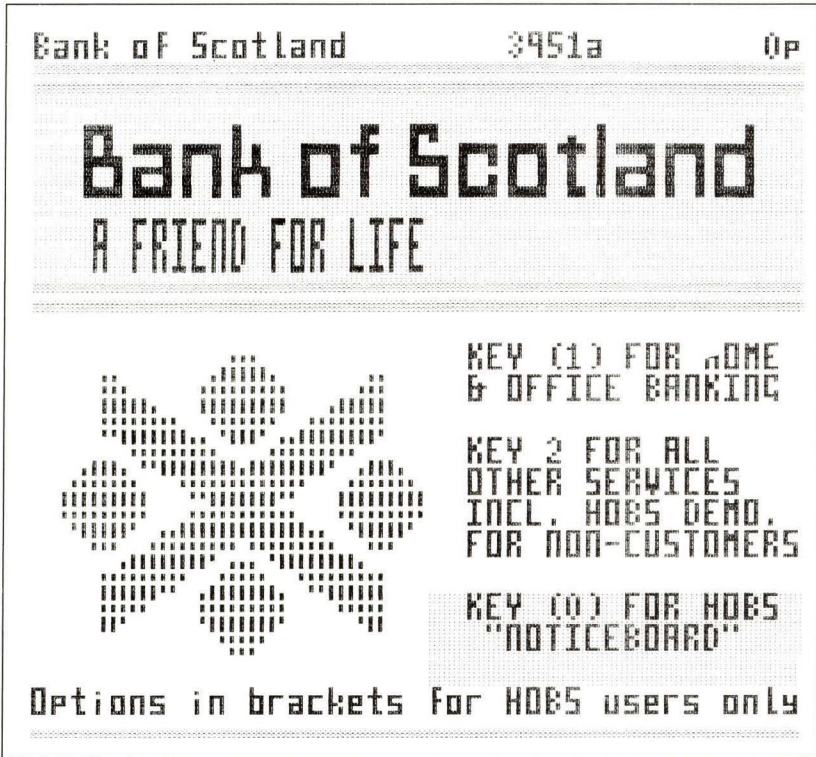*28844#   Haigh and Hochland Books
*24500#   Techtel main menu

Figure 3.20 HOBS introduction page

Prestel Travel

No description of Prestel would be complete without inclusion of the Prestel travel service. Right from the word go the travel community have been using Prestel as a CUG for their own internal purposes and as a way of advertising and selling holidays and flights to the general (Prestel-using) public. There are two main travel areas: Prestel Travel on page *470# is for ABTA travel agents only, and Prestel Travel Service on page *747# (see Figure 3.25) is open to all Prestel users. However, much of the travel information appears on both services and so the general user shouldn't feel too left out. You can examine details of holidays (many late booking bargain holidays are included) and order brochures, but as yet you cannot book directly using Prestel — this is the preserve of travel agents. As well as the Prestel Travel Service there are also many individual travel agents running their own Prestel pages and offering a wide range of holidays. For examples, see Figure 3.26.

As well as holiday details you can also find airline information — times and prices for all the major airlines — on Skyguide page *2691#; for example see Figure 3.27. Some even allow the private user to book tickets via Prestel. You can book hotel rooms with the large hotel chains,

Figure 3.21 Homelink main menu

get road information from the AA, obtain train times prices and seat booking from BR, learn ferry times and prices from Sealink, and find out times and prices and book a ticket to ride from the National Bus Company . . . the list is almost endless. If you are moderately interested in travel, foreign or domestic, you cannot help but be intrigued by Prestel's travel section!

Some useful travel page numbers are:

*747#	Prestel Travel
*2691#	Skyguide
*545#	Sealink
*142#	Holiday main index
*221#	BR
*34011#	National Bus main index

Prestel Education

Prestel Education is a special service for schools, universities and polytechnics. It provides information on courses, educational equipment
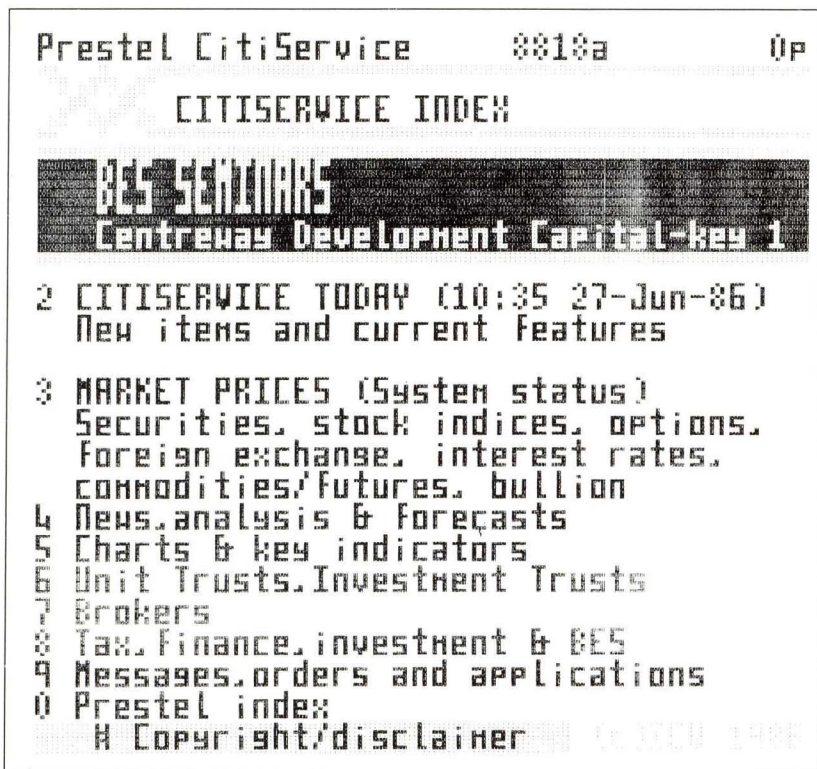
Figure 3.22 Citiservice main menu

and careers. There are also two magazines called 'School Link' and 'Pieces of Eight' and a schools' tablesoftware section. Perhaps the most important aspect of Prestel Education is that schools and other educational establishments can subscribe to it, and the rest of Prestel, at reduced rates. The charge is £20 per quarter, which includes the Prestel standing charge and a subscription to Micronet 800, and a discount of one-third on connect time charges, i.e. you would pay 4p per minute instead of 6p at peak rate.

    Some useful education page numbers are:

*165#	Prestel Education main menu
*887#	Schools Link front page
*88888#	Pieces of Eight front page
*270270#	Careers Service
*880#	Schools' telesoftware
*211#	Council for Educational Technology CET

Other Prestel services

Some of the more important services that have not been described are:

```
ICV-STOCK EXCHANGE          781401a
GILTS & SECURITIE
  Last changed at  16:35 27-JUN-1986

                   o/night latest high    low

Ex.12% 13/17       128/10  128/06  28>    28/06
War 3h%             39/10
Tr.2%I/L.88        122/02  121/06  21/14  21/06
Tr.2h%IL2003       105<    104<    04>    04<
Tr.2h%IL2016        99<    98/06   98/14  98/06
AB Food            a316    316     16     16
AB Electrnc.       385
AB Ports           293
U-Acorn Comp        50
AE PLC             250     247     48     47


Key 43 Wall St opening report 16:25

  1 Explanation      7 back  4 forward
  5 Company news     0 Main sector index
```

Figure 3.23 Share prices

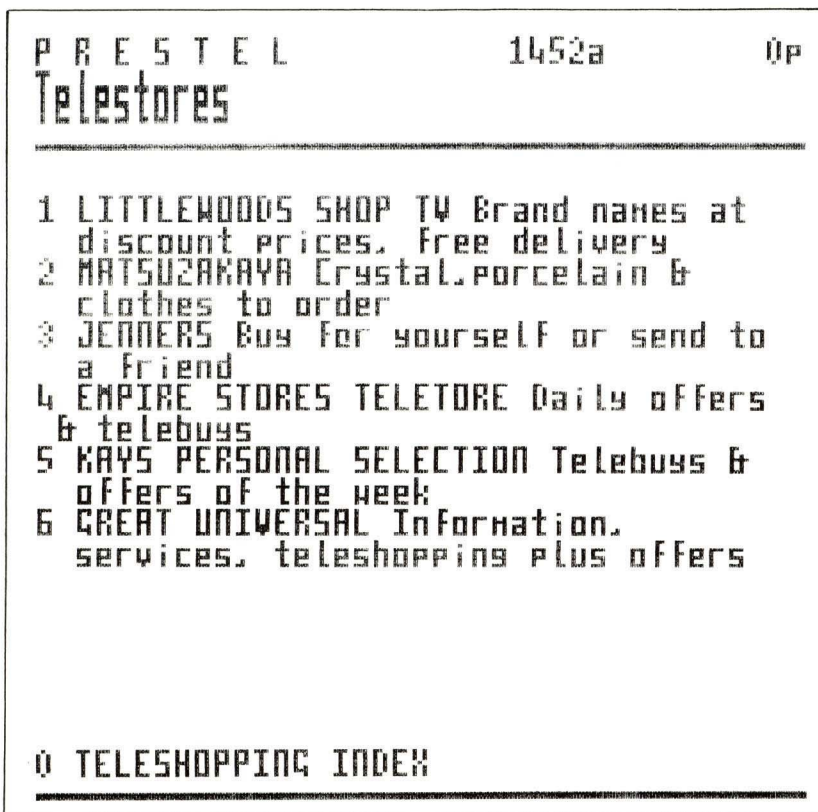|	
Farmlink:	A service for farmers, including advice from ADAS, MCL, the Met Office, etc. and market prices, etc. Page number *801#. See also MAFF on page *203# and the NFU on *325#.
British Library:	Information on the British Library and how to use it, page *505#. The British Library run their own information service called BLAISE but this is not accessible via Prestel and it seems expensive unless you have a serious need for bibliographic data.
Telebetting:	A service run by Ladbrokes allowing the placing of bets via Prestel. Page number *5600#.
Government information:	Information from a range of Government departments — COI, DOE, DTI. Main menu on page *58#.
Medicine:	A range of services for the medical profession. Main menu on page *491#.
Theatre:	Theatre reviews, availability and booking. Main menu on page *1312#.

Figure 3.24 Telestores main menu

This chapter has tried to give you some idea of the services offered by Prestel. Because everyone will have their own particular interests it is inevitable that something of importance to you that Prestel provides will have been left out. The only sure way to find out what Prestel offers is a careful study of the Prestel directory. Even before you take the plunge and subscribe to the service, it is worth getting hold of a copy to discover the full range of facilities and information on offer. Phone the Prestel Sales Department and request a copy or consult one in your local library.

Prestel as an information service

Prestel certainly does provide a great deal of information and as such it is unique and invaluable. If this is added to its messaging facilities (described in the next chapter) then there is no doubt that it is worth its subscription fee even if you don't have a specific application in mind for it. However, this is not to say that it is without faults. One of the most irritating features of Prestel is the way that you can go round in circles without actually getting the information you want. Each menu you

```
PRESTEL TRAVEL SERVICE  747a              0p

        M A I N   I N D E X     27 JUN

    Tranquility Travel ... new database

              for more details see 1

TRANSPORT .......1    A-Z INFORMATION.6
Air            11    Expanded index
Land           12    covering all
Sea            13    travel topics

ACCOMMODATION....2    RESERVATIONS....7

HOLIDAYS.........3    NEWS...........8
Late Avail'bty  31    Travel News +
                      'What's New'

MESSAGING.......4
TRAVEL MAILBOX..41
                     Prestel Main index 0
    WIMBLEDON '86...follow the scores &
                   results...Key 9
```

Figure 3.25 747 travel main menu

encounter promises to take you closer to the information, but sometimes when you get there the information is inappropriate or inadequate. A particularly annoying feature is the way that you can arrive at the same page from many different points. This can be an advantage, but if you think you are about to receive some new information only to be routed to a familiar page it is a waste of time. For example, a number of general information providers offer a weather forecast simply by routeing you to the Met Office pages while others provide their own short forecast. Clearly, where there is more than one source of information it makes sense to choose the cheapest and most suitable, but in the early days of using Prestel you are bound to see the same pages very often as you explore what is on offer. Another thing to beware of are high cost pages offering advice that is little more than common sense, or time-critical information (news items or weather forecasts) that can be gained more cheaply from other sources (newspapers, TV and radio). In both of these cases the only way to find out if what is on offer is useful or reasonable is to examine the pages and pay the page charge. However, as well as a list of useful Prestel page numbers it is also a good ideal to keep a 'blacklist' of numbers and information providers that have proved to be a waste of time.

```
standby 321                 321230703a      Op
  DIAL A DATE               THU July 03

Destination/Board  Depart  Nts  EE  From

TRAVELINES: 01-370 6131
Warsaw        FO       LHR   6-30days   179
QEST TRAVEL: 0904-764477
Arrecife (1125/1640)FO  MAN 7.14 159/159
SUNAIR: 01-629 1123/0532-433303
Malaga        FO       LGW MAN 7.14  89/ 89
Malaga        APT      LGW MAN 7.14 139/179
APOLLO TOURS: 01-951 3533
Greece and Turkey Sailing Holidays
  (daily deps ex LHR)
CARIBBEAN CONNECTION: 0244-41131/
                      01-930 8271
Barbados      SC       LHR     6.13 475/550
CAROUSEL: 021-236 1414
Costa d.Sol   SC       BHX     7.14 179/209
  For more availability........Key H
   Next day  1 Previous day   3
   Next week 2 Previous week 4 Standby 9
```

Figure 3.26 Sample holidays

```
AMERICAN EXPRESS            2691a         Op

   2 HEATHROW          11 NEWCASTLE
   3 GATWICK           12 STANSTED
   4 MANCHESTER        13 EAST MIDLANDS
   5 LUTON             14 WHAT IS
   6 BIRMINGHAM           SKYGUIDE?
   7 GLASGOW           15 B.A.A.
   8 EDINBURGH            INFORMATION
   9 PRESTWICK
  10 ABERDEEN

             Sky Guide

        KEY 0 Amex Contents
```

Figure 3.27 Skyguide main menu

Even with the minor reservations described above, Prestel is both useful and fun and I would recommend any Amstrad owner to take out at least a trial subscription to Prestel and to the CUG that is closest to their main interests — which in most cases is likely to be Micronet 800.

4 Messaging services

There are two reasons for wanting to get online: to gain access to the information services, and to use electronic messaging. In the previous chapter the archetypal information provider, Prestel, was described; and in a sense, although the technology may be different, all general information services will tend to look like Prestel in the range and type of information they offer. The same is more or less true of the messaging services except that there is no clear overall best service and competition for customers has forced them to innovate and offer additional features and competitive prices. In this chapter we examine the messaging services and their costs. Some of the messaging services also carry quite extensive databases and these are also described where appropriate.

The major alternatives

Using the messaging services is in many ways simpler than using Prestel. First, you can generally get away with using a 1200/75 baud, 300/300 baud or 1200/1200 baud modem, and secondly you can use a much simpler terminal emulator than a Prestel emulator because of the absence of graphics characters. On the other hand, if you want to make extensive use of a messaging service then a 1200/1200 baud modem is an advantage even though it is expensive.

The main messaging services, apart from Prestel, are Telecom Gold, One-To-One, Easylink, Comet and Monodata.

All of these are best considered as general messaging services, apart from Easylink which is really a telex facility. Also, both Telecom Gold and One-To-One are becoming more and more like Prestel without graphics. That is, they are both accumulating information services at a steady rate. Information provided by the messaging services is at a disadvantage in not having Prestel graphics to liven it up but it has the advantage of a full 80 by 24 screen for a reasonable amount of text. In some ways Prestel's graphics are something of a liability; they are fun when you first see them but after a while there is a tendency to think that it would be nice to have fewer introductory graphics frames and rather more information.

Local access — the PSS

You can dial Prestel at local rates from most parts of the country because Telecom has installed what amounts to a special communications network just to link you to the Prestel computers around the country — see Chapter 7 for more details on the technicalities of Prestel. Obviously the other messaging services cannot afford to install special communications networks so that you can dial them too at local rates. The solution to this problem is provided by a special digital telephone network called PSS, standing for Packet SwitchStream. This is rather like a telephone network, specially constructed to enable computers to communicate with each other. The important fact about PSS as far as the microcomputer user is concerned is that PSS doesn't charge for the distance that data is transmitted, only the total amount of data transmitted. This means that if you can connect your Amstrad plus terminal emulator and modem to the PSS you can communicate with a messaging service's computer at a cost that doesn't depend on how far you are away from it. In practice this cost tends to work out a little more expensive than a local phone call but it is still very much better than the cost of the alternative long distance call. Thus, there are two distinct ways of getting online to most messaging computers: dial direct to the computer, or use the PSS to connect you.

If you live close enough to the computer that you want to use to be able to dial it at local rates then you can ignore the following description of how to use the PSS. However, you may find that it comes in useful to know how to dial the computer from other UK locations.

Using the PSS

Connecting to the PSS is quite simple because there are a number of special Packet Switching Exchanges, PSEs, sited all round the country and each one offers a range of telephone numbers that can be used to connect to PSS. At the moment, PSS supports three standards:

V21 — 300/300 baud or less,
V23 — 1200/75 baud, and
V22 — 1200/1200 baud

and there will be a different telephone number for each, at each exchange. For example, for the Newcastle exchange you have to dial 0632 314171 for a V21 connection, 0632 314181 for a V23 connection and 0632 314161 for a V22 connection to the PSS. You pay for the call to the PSE that you choose to use at standard BT public telephone rates, so it is important that you dial a local PSE if there is one. For example, if you live in Newcastle there is nothing to stop you dialling the PSE at Liverpool at long distance telephone rates to connect you to a computer in London, but it is a lot cheaper to phone the PSE in Newcastle at local rates! A list of PSEs is available from the PSS Customer Services group and one is usually included in any instruction manuals that come with a subscription to a messaging service.

Once you have picked your local PSE exchange from the list all you have to do is dial the number that corresponds to the type of modem you are using, i.e. 1200/75 baud, 300/300 baud or 1200/1200 baud, and wait for the usual high-pitched whistle that lets you know that a computer has answered the call. Notice that it doesn't matter what data rate is used by the computer you are trying to connect to because the PSS will automatically convert your data to the appropriate rate when it is 'delivered'. The other details of data format should be set according to the following table:

Transmission speed:	300 baud
Reception speed:	300 baud
Parity:	Even
Number of data bits:	7
Number of stop bits:	1
Transmission speed:	75 baud
Reception speed:	1200 baud
Parity:	Even
Number of data bits:	8
Number of stop bits:	1

The changing of data rates is a very useful facility in that it means that you can access any type of computer or messaging service with a single modem. For example, it is possible to connect to Prestel using the PSS and this allows you to use a 300/300 baud or a 1200/1200 baud modem rather than a special 1200/75 baud V23 modem. At the time of writing this facility was limited to the Derwent and Enterprise computers. The Network User Addresses (NUAs) — the use of which is explained later —for this service are:

A11002002018 (without graphics)

and

A21920102517 (with graphics)

Once you are online to the PSS — that is, after receiving the answering tone — and you switch your modem to 'online' or plug your acoustic coupler in, the result is absolutely nothing! The PSS is one of the few computer systems that doesn't immediately transmit a banner headline telling you who it is. Instead it just sits and whistles at you, otherwise playing dead! To wake up the PSS you have to type two RETURNS and then type in a code that informs the PSS of the kind of VDU (or, in the case of the Amstrad, VDU emulator) you are using. The PSS is a remarkably intelligent kind of telephone network because not only will it convert the data standard that you are using to one that the computer you are dialing uses, but it will also make allowances for the sort of VDU you are using. The most useful PSS terminal codes are (for a more complete list see Appendix 3):

PSS code	Type
A2	80 column teletype terminal
D1	80 column VDU

Once you get beyond this point you will be rewarded with your first message from PSS: all it says is 'NUI?'. This rather terse message is a request for you to type in your Network User Identity. This is a rather long code that identifies you to the PSS for billing and other purposes. If you want to use the PSS for general computer communication then you will first have to register with your local PSE and be issued with a personal NUI. This costs £6.25 a quarter — and generally it isn't necessary, because when you subscribe to a messaging service they let you use their own NUI and this is included in the cost. After typing in your (or the messaging service's) NUI the PSS system asks 'ADD?' which is another terse message asking for the Network User Address (NUA) of the computer you are trying to connect to. The NUA is rather like the PSS equivalent of a telephone number in that it identifies the computer on the network to which you would like to be connected. If you enter the NUA correctly then you will finally be placed online to the computer of your choice and your interaction with the PSS is at an end. From this point on you are talking to the message service computer and what happens is up to it; there usually follows a log-on procedure that asks you to type in a user number and a password. This is exactly like making a normal telephone call, in that initially you have to dial a number and generally interact with the public telephone network, but once your call is put through you can forget how it was made and get on with the conversation. The PSS makes the connection and then, from the user's point of view, keeps out of the way.

If you think that using the PSS is a complicated procedure then I would agree with you, and there are moves afoot to simplify it, but for now NUIs and NUAs are necessary. As an example of using the PSS consider the log-on sequence to Telecom Gold:

1 Dial the local PSE and wait for the answering tone, then place your modem/acoustic coupler online.
2 Enter two RETURNS followed by D1 RETURN indicating that you are using a VDU.
3 In response to the prompt NUI? type NTLGOLD901TYM RETURN. This is Telecom Gold's network user identity.
4 In response to the prompt ADD? type A219201004xx RETURN where xx is the number of the particular Telecom Gold computer that your mailbox is registered on.

Following step 4 you should be online to Telecom Gold and you should see its banner headline and the request for you to sign on. If not then you probably typed in the wrong NUI or NUA and the solution is to try again.

If you want to use PSS as a registered user in your own right then it will cost £6.25 a quarter as a standing charge and about £1 per hour of use, plus about 15p per 64 000 characters exchanged. However, as already mentioned, it is not likely that you will want to subscribe directly to PSS because its use will be included in any subscription to a messaging service that you take out. Most messaging services charge you for PSS use at a simple time rate. For example, Telecom Gold charges 2.5p per minute for a 300 baud PSS connection and 3p per minute for a 1200 baud connection, One-To-One charges 3p per minute for all baud rates. Notice that these charges are in addition to any normal telephone costs or connect time charges.

Dialling direct

Most of the message service computers are sited in London, as is most of the computer-using population, and if you live there you will be able to dial direct rather than use the PSS. If this is the case all you need do is set your data format correctly and use an appropriate data rate and modem. In some cases you will have a choice of telephone numbers, each providing a different data rate. For example, One-To-One provides six different telephone numbers, for different rates from 300 baud to 1200 baud, and it is up to you to choose which one to use. Telecom Gold provides three telephone numbers — for 300/300 baud, 1200/75 baud and 1200/1200 baud.

The data format for nearly all messaging services is:

Transmission speed:	Depends on the phone number you use
Reception speed:	Depends on the phone number you use
Parity:	Even
Number of data bits:	7
Number of stop bits:	1

The procedure for getting online by direct dialling varies slightly from service to service but essentially all you have to do is phone the correct number, wait for the answering tone, then switch your modem or acoustic coupler online and enter your user number and password.

Electronic mail

Electronic mail is a very simple idea and it is the basic service that all messaging systems offer. Each user is assigned an electronic mailbox which is referred to by a mailbox id number. Any other user of the system can send a message to your mailbox and you can send a message to any other user whose mailbox id you know. When you log on to the system it will automatically report how many messages are waiting for you; usually you can choose to read these in any order and then either delete them or save them for later reference.

All this is straightforward enough and easy to understand but what makes one electronic mail system better than another is the ease of sending a letter and the range of extra facilities offered. One of the surprising facts about electronic mail systems is that, although they are all intended for use by complete beginners, none of them is particularly user-friendly. In particular, if your typing isn't perfect and you make mistakes then you will have to use an editor of some kind to correct your mistakes before the letter is sent. If you are familiar with any sort of word processing software — Wordstar, Tasword or Locoscript — then the kind of editor provided by the messaging services will come as something of a shock. Nearly all text editors/processors for microcomputers are 'screen based'; that is, editing is simply a matter of changing what is displayed on the screen using a combination of the cursor keys, delete and copy keys. However, editing facilities provided by a distant computer are generally not screen-based because of the time it would take continually to retransmit entire screensful of data. Instead, line and command editors are used to locate and change individual characters or words. For example, to change the word 'HELLA' to 'HELLO' using the Telecom Gold editor you have to type c/HELLA/ HELLO/. That is, the general rule is to type c/*oldword*/*newword*/. (Strangely, the one exception to this is Prestel where you can often use a screen editor based on the usual cursor keys.) Once you get used to command-based editors they are not so bad, but you can't help feeling that there must be a better way to do things. If you are a casual electonic mail user then it is probably best to put up with the situation; that is, enter your message using the editor and when it is correct send it.

One way of minimising the need to use the messaging service's primitive editor is to prepare your messages offline using your own familiar and well-loved wordprocessor. Of course, the terminal emulation (comms) software that you are using must provide the facility to send data stored in a file to the messaging service as if you had typed it. Most do, but there can be problems associated with the format of the file you are trying to transmit. Some wordprocessors store their data using an internal coded format either to save space or to indicate text layout. Generally speaking, files suitable for transmission to a messaging service should be text files. Most wordprocessors will produce files of this type if requested; to check that the file you are planning to transmit is of this kind you can try listing it on the screen using the command TYPE *filename* while in CP/M. If the file lists on the screen without any storage characters appearing or any strange behaviour then it is a text file and is suitable for transmission. If you can create text files and your terminal emulator will transmit them, then, all you have to do is get online to your messaging service and proceed to send a letter in the usual way, but when the time comes for you to type in your message use the terminal emulator to send the text stored in the appropriate file instead. You might think that offline text preparation and transmission would save you from ever having to use the messaging service's text editor. This would be the case if there were no such thing as transmission errors. Unless your messaging service and your terminal

emulator support a mutual automatic error correction facility (and at the time of writing most don't) then you will always have to be prepared to edit the text after transmission to correct any errors that might have been introduced by noisy telephone lines, etc.

Rather than continuing with an abstract description of the features of electronic mail it is more useful to concentrate on real services. In the following sections you will find examples of sending electronic mail using Prestel, Telecom Gold and One-To-One as three representative services.

Electronic mail on Prestel

Electronic mail on Prestel is unique because it is the only service that offers graphics that can be incorporated into your own letters. To make this easy, Prestel provides a large collection of pre-prepared graphics frames that contain space for your message. This is really the electronic mail equivalent of the greetings card.

To send a message all you have to do is select the message service menu on page *777# and select mailbox, or go directly to the mailbox menu on page *7# (see Figure 4.1). You can then select one of the many standard message pages, with or without graphics, by selecting option 2. This takes you to page *7777# where you can select one of the categories

Figure 4.1 Mailbox menu

Figure 4.2 Seasonal cards main menu

of frames and then on to choose a particular page of graphics. For example, if you want to send a seasonal greetings card you will eventually reach page *777738# (see Figure 4.2). Selecting a Christmas card (option 11) produces a further menu of cards and if you select 11 ('steaming great puddin'), you will see Figure 4.3 appear on your screen, all ready for your message. The only problem is that to send a message you need to type the recipient's mailbox number following the 'To' prompt in the standard page. If you don't know this number then you can use the mailbox directory starting on page *486# to try to find it. Prestel users are invited to place their name (personal or business) into the mailbox directory but not everyone does, so if you can't find the person you are looking for it doesn't mean that they don't have a Prestel mailbox, just that they haven't entered it in the directory. Once you have completed your message you can either send it or scrap it — it's as easy as that!

To find out if you have any messages waiting for you all you have to do is look at page *930#. (You can discover if there are any messages waiting for you when you leave Prestel by keying *90#.) You can save messages to look at them again or delete them after reading. Prestel's messaging facilities are not sophisticated but they are very easy to use,

Figure 4.3 Steaming great puddin

and most of the other messaging services could learn something from the way Prestel does things.

Electronic mail on Telecom Gold

The Telecom Gold electronic mail system is the largest and most extensive in the UK. It is also part of the worldwide DIALCOM network and so it is possible to send international electronic mail via Telecom Gold. Although it is the largest system it is not always the most innovative, and you will find a wide range of extra features offered by other systems but not by Telecom Gold.

You can get online to Telecom Gold either by using the PSS (see earlier) or by dialling direct. Whichever method you use you can select telephone numbers that will provide 1200/75 baud, 300/300 baud and 1200/1200 baud access. If you are mainly reading mail then 1200/75 baud is more efficient, but if you are going to transmit much data then 300/300 baud is better; and, of course, 1200/1200 baud has the best of both worlds but its cost currently puts it outside the reach of most personal computer users. Telecom Gold runs a number of computers and your mailbox will reside on just one of them so a full mailbox address consists of *computer number:id*. For example, our Telecom Gold identity number is JNL134 and our mailbox resides on computer system 83 so our full

mailbox address is 83:JNL134. To send mail to a mailbox on the same computer the computer number is optional but it is essential when sending a message to a different computer. To send or read mail all you need do after logging on is type the command MAIL. To send a message you then type SEND followed by the mailbox numbers of the people you want your message sent to and then the text of your message. There are various command options you can include as part of your message: for example, .AR requests an automatic acknowledgement that the message has been received; .RR requests a response from the recipient; .CC sends a carbon copy to someone else, etc. If you make a mistake in your message then you have to save your text and use the Telecom Gold editor to correct it. None of these procedures is particularly complicated but none of them is particularly user-friendly either. You can see a sample of a Telecom Gold session in Figure 4.4.

Telecom Gold Network: For assistance type 'HELP LOGIN' at the prompt 'PAD>'.

This is Dial-up Pad 4. line 3 speed 1200
PAD>call 83
***Call connected
Welcome to Telecom Gold's System 83
Please Sign On
>id jn1134
Password:*****
TELECOM GOLD Automated Office Services 18.4T1(83)
On At 17:18 24/05/86 BST
Last On At 10:30 24/05/86 BST

Type >GOLDNEWS for the latest on-line newsletter from Telecom Gold
>mail
Send, Read or Scan:send
To:80:BTG120
Subject:Thanks for help
Text:
Dear Karen

Thanks for all your help with information on Telecom Gold. Everything is fine now!

Best Wishes

Mike

.ar
.send

K. Davis — Sent

Send, Read or Scan:quit
>Off

Figure 4.4 Sending a telecom gold message

If you need to find a Telecom Gold mailbox number you can use GOLD.USER which is an electronic directory that will look up a company name, a contact's name or the owner of a known mailbox number. Reading your electronic mail is also very easy and you are told when you first log on how many items are waiting for you.

The important difference between the service offered by Telecom Gold and Prestel is that Telecom Gold is far more sophisticated. For example, the same message can be sent to more than one person; you can set up a personal directory that allows you to mail messages to people by name rather than mailbox number; you can set up files of commands that will carry out mailings automatically; you can check the spelling of your message before you send it; you can set up and use standard forms of message such as order forms, etc. You can do all this but, unlike Prestel mail users, you can't send a Christmas card!

Electronic mail — other services

Just about every messaging service offers some form of electronic mail that is more or less like that offered by Telecom Gold. Prestel tends to do things differently because of its graphics, the way that it uses frames as the basic unit of data transfer and its standard set of control codes. This makes Prestel easier to use but less powerful than the rest. Apart from the Prestel versus the rest distinction, the remaining services, Telecom Gold, One-To-One, Comet, Monodata and Easylink differ from one another mainly in pricing and in the range of additional messaging services that they offer.

Telex

One of the main restrictions of electonic mail is that you can only send messages to other electronic mail users. One of the main ways round this problem is to use the electronic mail services to send messages using the existing telex system. The telex system may be based on old-fashioned technology but the fact that it is old means that there are over 100 000 UK telex users and 1.6 million users worldwide. Of course, telex is essentially a system for business to business communication and this rules it out as a potential system for personal communications. However, if you want to send orders, queries, confirmations, etc. then the telex is an excellent and reasonably low cost system. If you are considering using electronic messaging as part of a business operation then another important fact in favour of telex is that at the moment only a telex message (with a correct answerback code, see later) has the status of a legal document. The status of electronic mail is still in doubt and will remain so until someone brings a test case.

A conventional telex machine costs around £2000 and the rent of a telex line is £88 per quarter (plus £88 connection charge) which is not cheap. However, telex time charges are only 3.25p per minute for UK telex. With these costs in mind, using an Amstrad PCW or CPC computer for telex looks like a very reasonable proposition. You can

send and receive telexes via all of the messaging services (including Prestel) and the only major difference between them is their pricing structure. Depending on the amount that you intend to use telex, different services will prove more economical. One comment worth making is that although Prestel looks very cheap for telex you have to keep in mind that typing in a telex at 7.5 characters per second can be frustrating! On the other hand, if you only want to send an occasional telex then Prestel is as useful as the rest.

Being an older technology, telex has a few limitations on the form of message that can be sent. The most obvious limitation is that a telex is limited to upper case letters. That is, all your messages must be in capitals. There are also very few additional symbols other than letters and digits. For example, you cannot use an exclamation mark and there are very definitely no graphic symbols. A telex cannot contain lines longer than 68 characters but this is not a serious restriction. Most messaging services either provide some way of enforcing these restrictions as you type in the text of your telex message or provide commands to reformat your text correctly.

There are a number of problems to be aware of in using messaging services as a substitute for a traditional telex system. The first is that traditional telex machines include the facility to send a code back to identify themselves — answerback, see later — but all the users of a messaging service have the same answerback code. The second is that a traditional telex machine will receive a telex at any time and print it out for you to read but to receive a telex via an electronic messaging service you have to be logged onto the system. This is not to say that you might miss a telex because you are not online at the time the telex is sent; all telexes are automatically stored in your mailbox along with any other electronic mail you may have, it's just that there may be a considerable time lapse between the telex being stored in your mailbox and you logging on and reading it. Some services (Telecom Gold and One-To-One) get round this problem by offering a radio paging service; that is, they will bleep your pager when a telex arrives. Monodata offers a facility whereby for an additional charge of 20p they will phone you when a telex arrives so that you can log on and read it.

To send a telex to someone you must know their telex number. Telex numbers are usually quoted on people's letter heading and often as part of their entry in Yellow Pages. A telex number is composed of two parts, a number (e.g. 894001 for Telecom Gold) and an answerback code (e.g. TLGOLD). The numeric part of a telex number is sufficient to identify a particular telex machine and it's all that is really necessary to send a telex. The answerback code is a short sequence of characters that a telex machine will send back to the caller to acknowledge that a correct connection has been made. Were you to use a conventional telex machine, the sequence of operations is that you would dial the telex number and, when you got through to the distant telex machine, it would respond with its answerback code as a check that you had dialled the correct machine. When you are using a messaging service the dialling of the telex number and the checking of the answerback is done

by the messaging service's computer — all you have to do is quote them as part of the preparation of the telex. All telex numbers in the UK can be contacted by dialling but some other countries use a 'dial and key' procedure which requires the telex operator to dial a telex exchange and then key in the remainder of the telex number. Messaging services use different methods of specifying a dial and key telex number but all will allow you to send an international telex. As well as international telex you can also send a telex to a ship at sea using the INMARSAT satellite, but this is likely to be of minority interest!

To deliver a telex the messaging service's computer has to dial the remote telex machine successfully. That is, the telex machine has to be switched on and not already in the process of receiving a telex. Most messaging services will try to send a telex a number of times. For example, Prestel tries four times at ten-minute intervals; if they fail after that a message is sent to your mailbox to report the failure. You can of course re-send the telex as many times as you like until you either succeed or give up. Most messaging services will also report the successful delivery of a telex to your mailbox.

Incoming telexes pose something of a problem in that every user of a messaging system has the same telex number and answerback code. For
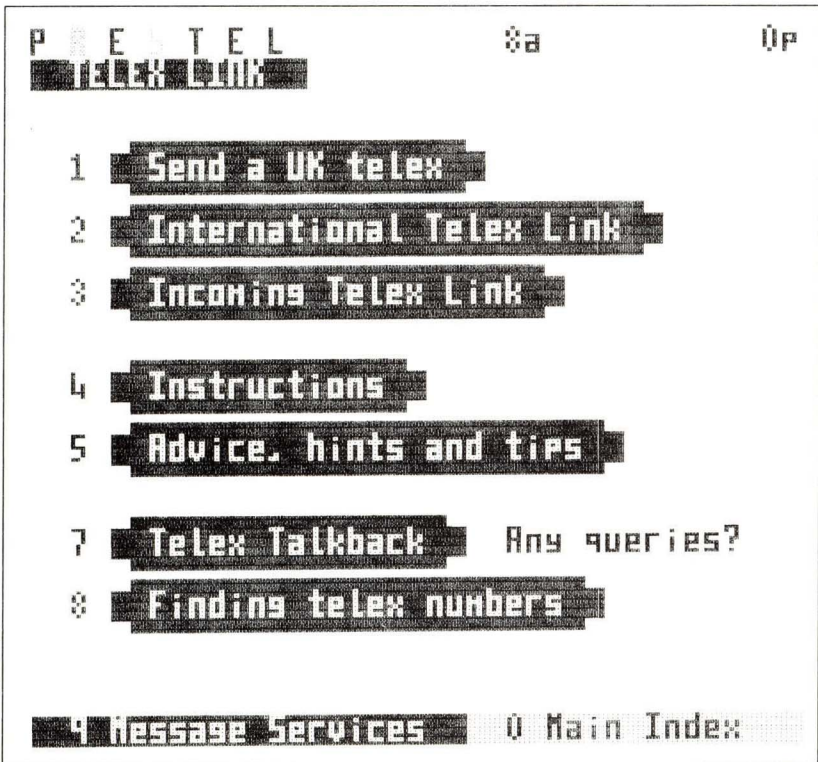
Figure 4.5 Telex link menu

example, the telex number of any Prestel user is 295141 and the answerback is TXLINK G. To be delivered to the correct user of the messaging service incoming telexes have to contain the mailbox number of the recipient. For example, all incoming Prestel telexes have to start MBX *mailbox number*; if they don't, the sender is automatically telexed a message to the effect that they should try again but this time quoting the mailbox number.
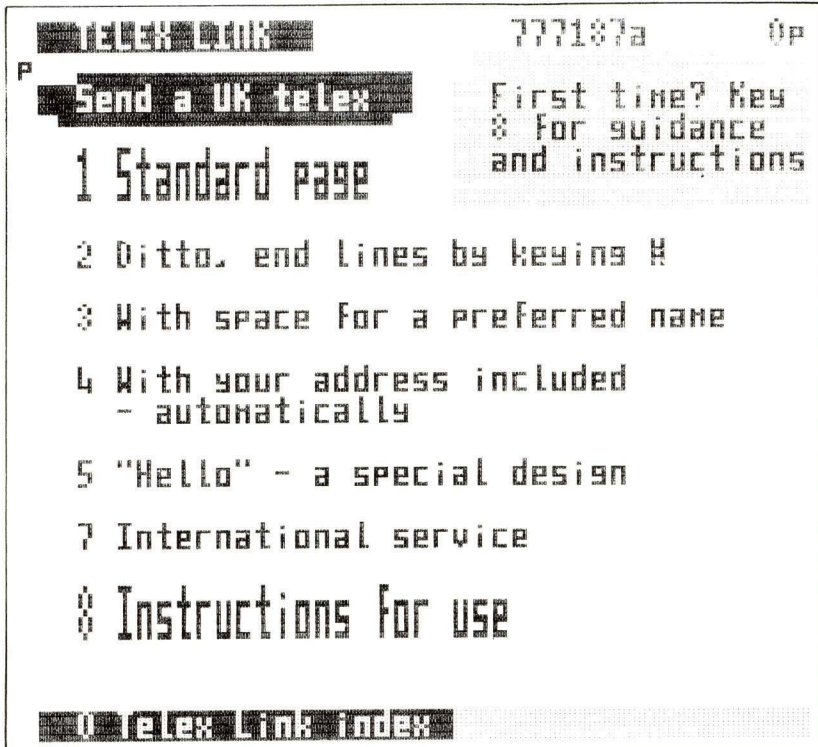
Figure 4.6 UK Telex menu

Finally, messaging services do not provide telex directories. However, if you use telex a lot then it is worth phoning your local telephone area office (the number is quoted at the top of your telephone bill, or contact them via the operator) to request a telex directory. This is the telex equivalent of a phone directory and it is invaluable if you use telex. It costs £1.50 in a stiff back version and £1 in paperback. (Buy the stiff back version, it's a bargain!). At the time of writing an ordering service via Prestel is promised. There are also classified telex directories, the telex equivalent of the Yellow Pages. These are generally more expensive and the quality of the information they contain varies greatly. It is worth looking in your local public library for classified directories before you buy any.

Prestel telex link

Sending or receiving a telex via Prestel is simplicity itself. In fact Prestel provides the easiest, but not the cheapest, telex facility of an messaging service. The telex link menu can be found on page *8# (see Figure 4.5) and from this you can select options to send a UK telex, to send an international telex or to check for an incoming telex. If you opt to send a UK telex you are presented with page *777187#, which offers a range of blank standard telex frames (see Figure 4.6). These telex frames are rather like the standard letter frames used to send electronic mail on Prestel, but without the graphics options of course. Once you have selected an appropriate blank telex frame all you need do is fill in the telex number and optionally the answerback code (or just the first part of it if there insn't enough room) and then enter your text. Prestel automatically changes any lower case letters you type to upper case and refuses to accept any illegal telex characters even if you try to enter them. While you are entering the text you can edit it using the cursor keys and when you have finished you can check it by asking for the page to be retransmitted (i.e. *00) and edit any mistakes using the cursor keys. (This is a very simple editing system and it is to be hoped that it is

```
M  I   B O X              7770306        0p



To (telex)  261040           H

Message



JUST A NOTE TO SAY THAT EVERYTHING
IS GOING WELL. SHOULD BE FINISHED IN
A DAY OR TWO. SEE YOU SOON.




                                              H


Date  SAT 28 JUN 1986 20:34
KEY 1 TO SEND. KEY 2 NOT TO SEND
```

Figure 4.7 Sample Telex

Figure 4.8 Sent telex message

introduced for Prestel electronic mail as well as telex in the near future.) When everything is correct (see Figure 4.7) the telex can be sent by keying 1. Prestel will try to send the telex four times and will report its success or failure by sending a message to your mailbox (see Figure 4.8).

Sending an international telex is just as easy; the only difference is that Prestel provides a blank telex frame for each country. This means that you don't have to look up the telex country code and it takes care of any dial and key complications without troubling you. In fact all you have to do is select the correct country and then enter the recipient's telex number, as in the case of a UK telex.

Receiving an incoming telex is even easier as it is sent to your mailbox as a standard item of electronic mail. The only complication is that the person sending the telex has to remember to include your mailbox number at the start of the telex in the form MBX *mailbox number* to make sure that it is delivered to you. (All telexes to Prestel are sent to the same telex number — 295141 TXLINK G.)

Prestel telex is very easy to use but it is not cheap. A UK telex costs 50p per frame to send (a frame is about 450–500 characters) but incoming telexes are free. Costs for international telex are summarised

as part of Table 4.1. If you would like to use telex occasionally then Prestel is ideal, and the other messaging services could learn a lot from the way Prestel runs its Telexlink.

One-To-One telex

As an example of sending a telex by a service other than Prestel, One-To-One is fairly typical. All you need do is type SEND TELEX and then enter the telex number complete with answerback code and network code. The network code simply specifies which country the telex is for. The network code for all UK telexes is G and you can find other network codes by using the HELP CODES command. You can specify more than one destination for the same telex message by simply typing in more telex numbers and answerback codes. Once you have finished typing telex numbers you can type the text of the message (NNNN to end and CONTROL P to abandon). The first line of the text has to be '8950511 ONEONE G', which is One-To-One's telex number and answerback code, and the second line 'PLEASE QUOTE xxxxx IN REPLY' where xxxxx is your user number. That's all there is to it!

Other telex services

Telecom Gold's telex service is a little more complicated that it need be in that you have to specify international telex numbers as dial and key where necessary and you have to use the command CHECK for illegal characters and line lengths. Any illegal characters or line lengths that CHECK finds have to be altered using the editor. You can limit line lengths to 68 by using the UNWRAP command before entering the text of your telex. Telecom Gold provides facilities to set up a directory of telex numbers so that a telex can be sent just by giving a name rather than a telex number and there are extensive commands for monitoring the progress of a telex.

Monodata provides the usual telex services but will also accept dictated telexes, send a single telex to more than one destination and will arrange 'telexshots', the telex equivalent of a mailshot. They also offer a unique service called 'early warning' whereby they will phone you to tell you that a telex has been received.

Easylink is essentially a telex bureau offering low cost telex to the larger customer. One special service that they do offer is USA Mailgram — telex type messages to any USA postal address with a ZIP code — with next day delivery for £5 for the first page of 2500 characters and £2 for subsequent pages.

Telex costs

A guide to UK telex prices was given in Chapter 1. Table 4.1 is a complete summary of prices for UK, international and Inmarsat telex.
From this table you can see that Prestel is very expensive when compared to the other services but for the occasional telex it is still useful.

Table 4.1 The cost of message services

	Prestel	Gold	One-To-One	Easylink	Monodata	Comet
Mailbox reg.	None	£40	£50	£40	£40	None
Extra mailbox	N/A	£40	£10	£10	£10	None
Mail box rent p.a.	£26 (business user £72)	None	None	£155.40	£60	£480
Connect time	6p	11p	10p	10p	Free	Free
Off peak	Free	3.5p	10p	10p	Free	Free
Telex to: (Send 400 char.)						
UK	50p	22p	20p	25p	35p	14p
Europe	100p	48p	40p	100p	50p	76p
USA	200p	72p	70p	72p	80p	61p
Rest of world	300p	125p	130p	150p	125p	102p
Inmarsat	400p	275p	—	275p	—	—
Incoming telex	Free	50p	Free	Free	45p	Free
Minimum charge	None	£10	£5	£12	None	£30

Post and courier services

One of the biggest problems of electronic mail is how to get a message to someone not connected to the same service and not on a telex. So far the only service to offer a solution to this problem is One-To-One. Using this service you can send a 'Priority letter' — your message is printed out, put in an envelope and put into first class post — or a 'courier letter' — your message is printed out and delivered by courier within two or four hours. Of course, both of these services are expensive, at 58p for the first 1000 words of a priority letter and £12.00 for a courier letter, but they are convenient. Telecom Gold used to provide the facility to send a Telemessage at £1.25 for 350 words. At the time of writing this service has been withdrawn but it is still available from Microlink (see next section).

Information services

Telecom Gold and One-To-One both offer a certain amount of information as well as messaging services and they both promise more in the near future. At the present time neither of them offers the range of information on Prestel but there are one or two important databases that can only be accessed via Telecom Gold or One-To-One. Also worth mentioning are the two new information services on Telecom Gold —

Microlink and Online. These provide all the facilities of Telecom Gold, and one or two extra ones, at a lower cost.

Information services on Telecom Gold

Telecom Gold provides a vast range of programs that can be run for business, engineering and scientific calculations. However, their value is limited to anyone with a personal computer such as the Amstrad, which could run such simple programs directly and more cheaply than the Telecom Gold main computer. The most important databases available are:

1 Lotus, a service for the users of Lotus software — 123, Symphony and Jazz — the cost is 5p per minute extra.
2 OAG, the Official Airline Guides, a USA database of airline schedules and fares; the cost is 56.5p per minute extra.
3 IDB, the VNU Informatics daily bulletin on computers etc.; the cost is 56.2p per minute extra.
4 WR, World Reporter, the complete text of a range of news services — the *Financial Times, Washington Post, Guardian, New Scientist,* etc. — the user can search for keywords or headlines and read the news items on the screen; the cost is 115p per minute extra.

Microlink

Microlink is a CUG (Closed User Group) on Telecom Gold run by Database Publications. What is surprising is that it provides access to all of the facilities of Telecom Gold for a registration fee of £5 and a monthly charge of £3. (Telex registration is £10 extra.) At the moment its database is limited when compared to Prestel but it is well organised and growing. There is plenty of news and information about microcomputing but at the moment the range of other information providers is limited. You can order flowers from Interflora, look at timetables and book tickets from BR, and book theatre tickets. Unlike Telecom Gold itself you can send a Telemessage using Microlink for £1.25 for 350 words. One unique service is Weatherlink, which provides high resolution satellite pictures to download — you have to have the necessary downloading software but Microlink say that they do have it for both the CPC and PCW range. While Microlink's database is not extensive it does seem to make sense to subscribe to Microlink if you want to use Telecom Gold.

Online

The Online service is a Telecom Gold CUG run by Personal Computer World (PCW the monthly magazine). At the time of writing this is a fairly new service composed of four main areas:

PCW database	A selection of reviews, news, benchtests, etc. of interest to the microcomputer user.
PCW software	A selection of downloadable software.
PCW exchange	A general noticeboard for ideas, news, and comment.
PCW mail	All of Telecom Gold's messaging services.

The monthly charge is £4.00 per mailbox (with a minimum monthly charge of £7.00) and the connect time and other charges are as for Telecom Gold.

Information services on One-To-One

One-To-One's information service takes the form of a notice board called 121WORLD. This is organised as a range of menus and submenus, finally leading to a collection of notices on a particular topic. The top level menu is:

TOP

1 = NEWS	:121 NEWS SERVICE
2 = TUTOR	:121 TUTORIAL
3 = SERVE	:121 SERVICES AVAILABLE
4 = OPEN	:PUBLIC NOTICE BOARDS
5 = HELP	:BEGINNERS START HERE!
X = OFF	:RETURN TO 121 MESSAGE SERVICE

To select an option from the menu you simply type in the appropriate number or symbol. Once you reach a level where there are notices about a particular subject you are interested in you can select from the command menu:

COMMANDS

1 = LIST ALL	:SUMMARY OF ALL NOTICES IN TOPIC
2 = LIST NEW	:SUMMARY ONLY OF NOTICES ENTERED SINCE YOU :LAST LOGGED ON
3 = READ	:DISPLAY AN INDIVIDUAL NOTICE BY SPECIFYING :THE NOTICE NO.
4 = READ ALL	:DISPLAY ALL NOTICES IN TOPIC
5 = READ NEW	:DISPLAY ONLY NOTICES ENTERED SINCE YOU LAST :LOGGED ON
6 = ENTER	:ENTER A NOTICE FOR INCLUSION IN TOPIC
7 = LIST SUBJECT	:DISPLAY A LIST OF NOTICE SUBJECTS IN TOPIC

All this is very reasonable and easy to use but currently there is very little information and the quality varies greatly because it is a public notice board. It provides a useful adjunct to other One-To-One services but it is not a rival to Prestel.

Bulletin boards

Most messaging services offer bulletin or notice boards which are simply
a collection of messages that anyone can read. Prestel runs a number of
bulletin boards: Simpatico, Viewfax Sales and Wants, Micronet 800
Sales and Wants, Midnight Micronetters, Croydon Box User Groups,
Timeframe's Letterbox and Pan Am's Noticeboard. The largest and most
general of these is Simpatico on page *787871#, see Figure 4.9. Other
services offer bulletin boards of a similar nature — see 121WORLD
above.
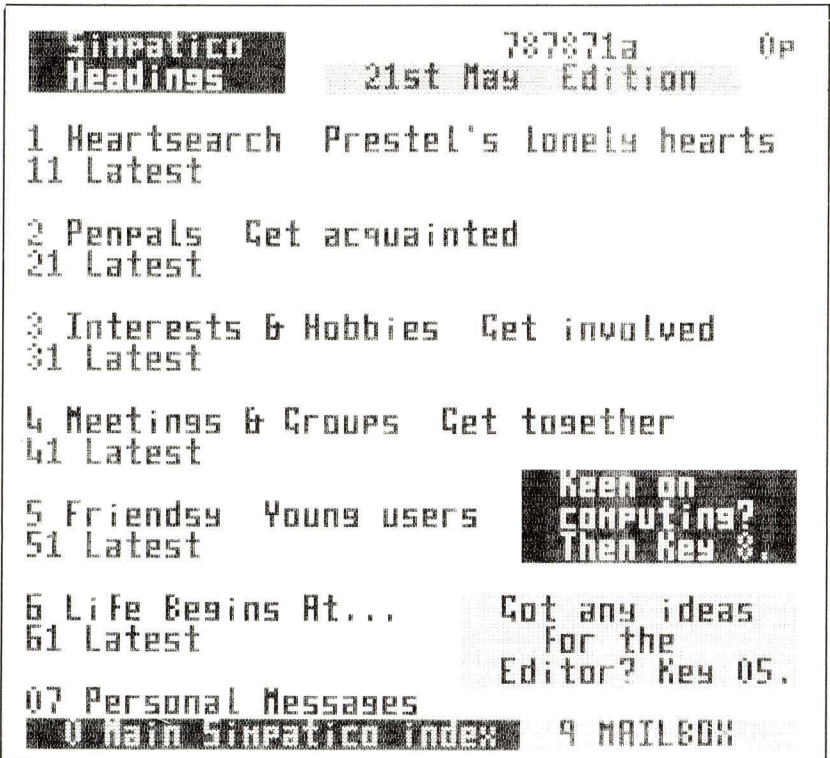
Figure 4.9 Prestel Noticeboard

A slightly different sort of bulletin board is provided by the hundreds
of private systems around the country. The growth of private bulletin
boards is rather like the craze for citizens' band radio a few years ago.
Many of these bulletin boards come and go overnight and the best way
to find an up-to-date list is to buy a copy of one of the computing
magazines that list them (PCW for instance). Most of these services are
initially amusing but in our opinion they rapidly prove to be a waste of
time unless they are used by a special interest group that you belong to.
One important point is that many of these services use the 300/300 baud

V21 standards, although Prestel graphics and the 1200/75 baud V23 standard is beginning to catch on. Also, using some private free bulletin boards is likely to work out very expensive because of the long distance calls involved — you can't use the PSS to phone a private bulletin board. The main attraction of using a private bulletin board system is that, as it is not controlled by a large company, many clandestine pieces of information turn up on them — the sorts of thing of interest to hackers, etc. However, you have to spend a lot of time sifting through the dross to find a single nugget of gold and this can produce very high telephone bills, so beware.

Which service — incompatibility

The six main messaging services — Prestel, Telecom Gold, One-To-One, Comet, Easylink and Monodata — are all incompatible in the sense that you cannot send a message from one service to the other except by using telex. That is, electronic mail can only pass between users of the same system. There are various proposals for a universal standard that will make inter-system electronic mail possible. Until this time the choice of which system you should use will largely be governed by which system the people you want to exchange electronic mail with already use. At the time of writing Telecom Gold has 70 per cent of the market with One-To-One in second place with 20 per cent (these figures do ignore Prestel as not all Prestel users engage in much electronic mail) and so these two must be high on any list of contenders. Overall, One-To-One is easier to use than Telecom Gold and it offers a wider range of messaging services but form the point of view of electronic mail alone there is little to choose between them.

5 How it works

The idea of sending a message using a sequence of codes takes us all the way back to smoke signals, semaphore flags and, more recently, the morse code. This simple technique is the basis of all modern serial communication and in many ways it is only the jargon of the computer that makes it seem more complicated. In practice there are one or two difficult points that can at times make a fool out of the best expert. It is a fact of communications that everything has to be exactly right for anything to work, and the difference between a working and a non-working system can be irritatingly small. In this chapter the principles of serial communications in general are described with a view to solving the types of problem that arise and to suggest possible new uses. The examples given refer to the Amstrad serial interfaces for the CPC and PCW range.

Sending a pulse — synchronous and asynchronous signalling

Digital communication is based on transmitting voltage pulses along a wire. Normally two predefined voltage levels are used and these are referred to by a number of names — high and low, zero and one, mark and space, etc. To send a message each letter of the alphabet and each digit is assigned a code in terms of sequences of high and low voltage pulses. For example, the standard code for A is low, high, high, high, high, high, low — see Figure 5.1.

| Low | High | High | High | High | High | Low |
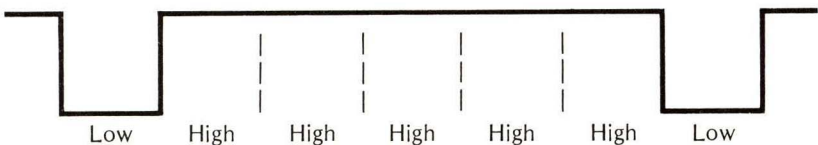
Figure 5.1 The letter A

The only difficulty with this method is that to determine how many pulses of the same type have been transmitted you have to know for how long each pulse lasts. For example, to find out that there are five

high pulses between the two low pulses in Figure 5.1 you have to know the width of each pulse. When serial communication is used between two pieces of equipment it is important for the receiver to know for how long any pulse will last. This can be achieved in one of two ways. Either the transmitter, using an additional connection, can transmit a synchronising sequence of pulses called a clock, or the receiver can try to generate its own sequence of synchronising pulses from the data pulses.

There are many advantages to having the transmitter send a separate stream of clock pulses to the receiver. In particular, the extreme accuracy of the method allows very much shorter pulses to be used and so more information can be transmitted in a given time. On the other hand, the need for a separate connection to carry the clock pulses is a considerable disadvantage of this method. As a result, synchronous transmission, as it is called, is reserved for high speed permanent links that cost rather more than a personal computer user would find reasonable!

The alternative method of having the receiver generate its own clock pulses, or asynchronous communication as it is known, is slower and slightly more complicated, but the advantage of needing only a single connection is so great that it is virtually the only form of serial communication used by personal computers. To generate the clock pulses the receiver needs to know two things: the time each data pulse lasts, and when it can expect a new pulse to start. The time each data pulse lasts is usually agreed before the communication begins and is reported as the number of pulses or bits transmitted per second. That is, for correct operation of an asynchronous communication channel both the transmitter and the receiver have to be set to the same data rate, i.e. the transmitter must send the data pulses at the rate that the receiver expects. Given that the transmitter and the receiver have clocks that run at the same rate, the task of determining whether the next pulse is a high or a low is simply a matter of having the receiver examine the voltage on the line at the start of each clock pulse: see Figure 5.2.
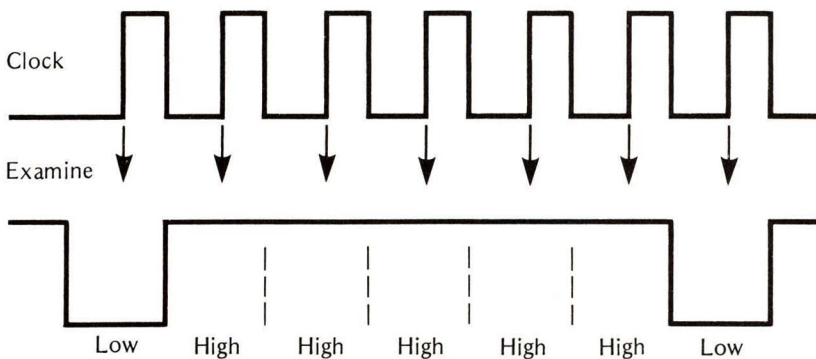
Figure 5.2 Data and clock pulses

Simple though this scheme is, it is not practical because of the impossibility of creating two clocks that run at exactly the same speed.

Imagine for the moment that the clock pulse generated by the receiver runs slightly faster than the clock used by the transmitter to send the data pulses. The receiver's clock pulse initially occurs so that it examines the line voltage in roughly the middle of a data pulse, see Figure 5.2. As the receiver's clock is running fast the clock pulse occurs a little earlier in the data pulse each time, until it eventually 'slips' one whole pulse, see Figure 5.3.
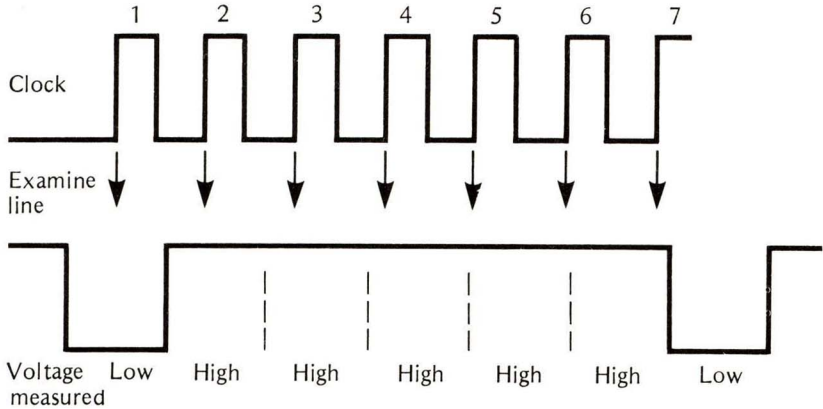
Figure 5.3 The effect of fast clock pulses

In Figure 5.3 the first five clock pulses cause the receiver to examine the voltage on the line within five different data pulses, but the sixth clock pulse occurs just within the same pulse as the fifth, and the seventh occurs before the final low data pulse, so the receiver thinks that the sequence of pulses is low, high, high, high, high, high, high instead of low, high, high, high, high, high, low. It doesn't matter how small the difference between the receiver and transmitter clocks is because any mismatch will eventually cause the receiver to miss a data pulse. The solution to this problem is to provide a special synchronising pulse at the start and end of every sequence of data pulses. These start and stop bits, as they are usually referred to, are used by the receiver to set its clock so that the following clock pulse is more or less in the centre of the first data pulse. As the clock is set at the start of every group of data pulses it only has to be accurate enough so as not to slip by a whole pulse before the start of the next group of data pulses, and this is fairly easy to achieve.

The use of extra start and stop bits to 'package' the data bits that carry the real information is one of the disadvantages of asynchronous communication. From the point of view of speed of transmission it would be better to use the start and stop bits to carry information, but for all but the most demanding applications asynchronous communication is the norm.

RS232

To make it possible for one piece of equipment to communicate via an asynchronous link with another they have to use the same voltage levels, data rate and data code. There are a number of international standards for asynchronous communication but the most commonly used is the RS232 standard. This is the communications standard used by the Amstrad serial interface and by nearly every other personal computer.

The voltage levels specified by RS232 are typically +12V for high and −12V for low, and when no pulses are being transmitted the line is left at +12V. (In fact the RS232 standard allows a voltage of between +3 and +25V to be used as high and a matching negative voltage to be used as low, but most systems use 12 volts.) Each group of data pulses is preceded by a single −12V start pulse and ends with one or two −12V stop pulses. There is also a standard code, ASCII (American Standard Code for Information Interchange), for representing all the common alphanumeric characters. Neither the RS232 standard nor the ASCII code is particularly up to date, for example the ASCII code doesn't specify the codes to be assigned to any graphics characters or symbols, but they are both so widely used that they are unlikely to be replaced for many years to come. Using RS232 and the ASCII code, the voltage variation representing a single character (the letter A) can be seen in Figure 5.4.

one too many ! ?

Start
bit
←————————Seven data bits————————→
Stop
bit

Low High High High High High High Low
 1   0   0   0   0   0   0   1
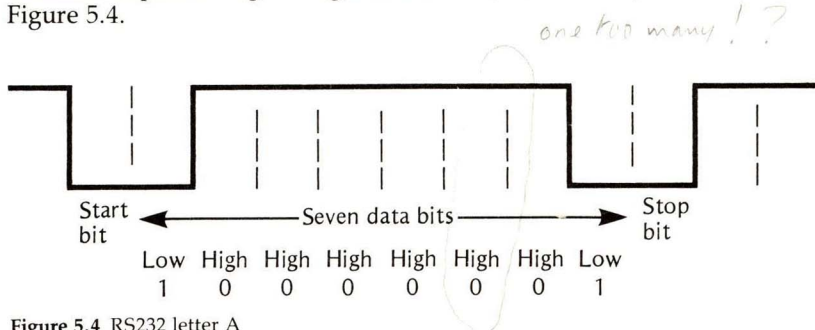
Figure 5.4 RS232 letter A

The data format

The RS232 standard really only specifies the electrical characteristics of the serial connection between two pieces of equipment, and many of the important details of the format of the transmitted information is left undefined to be selected by the user. For example, there is no specification in the RS232 standard for the speed at which data should be sent. There are a number of conventionally accepted data rates but it is still up to the user of a serial connection to determine the data rate and ensure that both the transmitter and the receiver are working at that rate. The data rate is usually expressed as the number of pulses or bits transmitted per second, i.e. bits/sec. In honour of the French communications pioneer Baudot the unit of data rate is called baud; that is, 1 baud is 1 bit/sec. As some of the bits sent over a serial link are not

used to represent data there isn't a simple relationship between baud rate and number of characters sent per second. For example, using one start bit, seven data bits and two stop bits, a baud rate of 300 results in 30 characters per second because each character takes 10 bits to send, but if you only use one stop bit the same baud rate results in roughly 33 characters per second because each character is now represented by only nine bits. You can see the standard baud rates supported by the Amstrad (and most other) serial interface in Table 5.1. Only a few of these rates are in common use by other equipment. For example, 110 baud is the old 10 character per second teletype standard, 300 baud is the 30 character per second standard used to communicate with mainframes over a telephone line, while most other equipment and communications links are fast enough to work at 1200 baud or 9600 baud. The highest baud rate in use is 19 200 and this is normally too fast either for the equipment or for the quality of communication line use to connect it. In two-way communication there is no need for the same baud rate to be used in both directions. For example, Prestel transmits data at 1200 baud but terminals and computers connected to it use 75 baud.

Table 5.1 Standard baud rates

50	300	2400
75	600	3600
110	1200	4800
150	1800	9600
200	2000	19200

As well as the baud rate and the number of stop bits, the user can also select the number of bits used to represent the data. Strictly speaking, the ASCII code only requires seven bits to represent all of its 128 characters but it is often necessary to use an extended character set. Then sending eight data bits increases the number of characters that can be represented to 256. Although the most common choice of the number of data bits is either seven or eight, the Amstrad serial interface can send and receive using five, six, seven or eight data bits.

Even under perfect conditions it is often a good idea to include a check that a transmitted character has been received correctly. The simplest way of doing this is to include a parity bit. This is an extra bit sent before the data bits to make the total number of low pulses sent always either odd or even. If the parity bit is set to make the total number of pulses odd then this is known as 'odd parity checking' and if it is set to make the number of pulses even then this is known as 'even parity checking'. For example, using even parity checking the parity bit for the letter A would be set high because there are already an even number of low pulses in its code. On the other hand, using odd parity checking the parity bit would be set low to make the number of low pulses three — an odd number. Of course the value of parity checking is that at the receive

end of the line errors can be detected simply by counting the number of low pulses in each character and making sure that it is odd or even as required. For example, if even parity checking is being used and an odd number of low pulses is received then one of the pulses must have been changed during transmission, by electrical noise or whatever. Parity checking is useful in detecting errors but it does need the use of another bit that doesn't carry information directly and this slows down the character rate. Because of this, sometimes no parity bit is transmitted at all. When it is used, the choice of odd or even parity is an arbitrary one as there is no technical advantage of one over the other.

To summarise: each character transmitted is composed of a start bit, an optional odd or even parity bit, five, six, seven or eight data bits and one or two stop bits. To receive information correctly the receiver must be set to the correct baud rate and expect the format that the transmitter is using. For example, the Prestel service transmits data at 1200 baud using odd parity, seven data bits and one stop bit. As each Prestel character takes 10 pulses to transmit (1 start bit + 1 parity bit + 7 data bits + 1 stop bit = 10 bits) the 1200 baud rate is equivalent to 120 characters per second.

The RS232 connection — handshaking

Most of the RS232 standard is concerned with the definition of the electrical characteristics and purpose of a wide range of connections that can be used as part of a serial link. To explain the use of some of these connections it is worth considering a real example of the serial link between a terminal/computer and a modem. This is in fact the situation for which the RS232 standard actually defines connections. The serial link between a computer and a modem is two-way in that there is a connection for the computer to send data to the modem and a connection for modem to send data to the computer. The RS232 standard defines which pins are to be used for the connection in each direction, as shown in Figure 5.5.
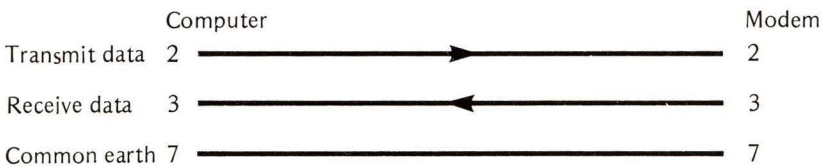
Figure 5.5 Simple RS232 link

Notice that from the computer's point of view the wire connecting pin 2 to pin 2 is an output but from the modem's point of view it is an input. This 'one equipment's output is another's input' principle is obvious but as will be explained later it can cause many problems. The connection between pin 7 and pin 7 is an earth connection that provides a return route for all the current that flows from one piece of equipment to the other.

Although the three-wire connection described above is often used it is not up to handling every situation that arises. For example, suppose the computer was processing the characters that it received from the modem; then it is possible that the modem could supply characters to the computer faster than it could deal with them. To cope with this situation it is necessary to add an extra connection that the computer can use to signal that it is or is not ready to receive data. In the same way the modem could use an extra connection to signal to the computer that it had some data ready to send. This use of extra connections to signal when there is data to be sent and when everything is ready to receive it is called hardware handshaking. The handshake line from the computer to the modem that signals that it is OK to send data is pin 20 and is called DTR (Data Terminal Ready) and the modem will only send data when the voltage on this is high. The handshake line from the modem that indicates that there is data ready to send is pin 6 and is called DSR (Data Set Ready). As there are two handshake lines concerned with the reception of data from the modem there are also two handshake lines concerned with the transmission of data from the computer to the modem. Pin 4 is called RTS (Request To Send) and it is set high to signal that the computer has data ready to transmit. Pin 5 is called CTS (Clear To Send) and it is set high by the modem to indicate that it is OK for the computer to transmit data. The complete RS232 connection, as described so far, can be seen in Figure 5.6.

	Computer		Modem	
Transmit data	2	→	2	Data line
RTS	4	→	4	Handshaking
CTS	5	→	5	lines
Receive data	3	←	3	Data line
DSR	6	←	6	Handshaking
DTR	20	←	20	lines
Common earth	7	—	7	
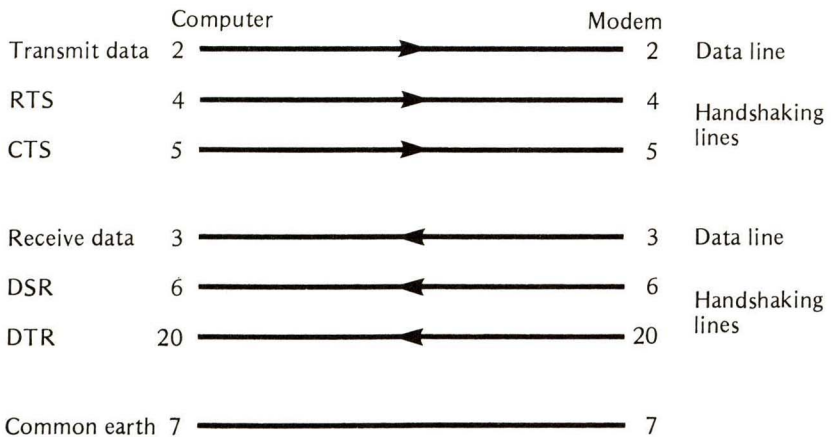
Figure 5.6 RS232 link with handshaking

As well as the handshaking connections, the RS232 standard specifies a number of other connections, used to signal such things as the ringing of the telephone and errors of various types. However, most practical implementations of the RS232 standard use very few of these additional connections. For example, in the Amstrad serial interface (CPC and PCW) the only connections other than the data and handshake lines that

are used are the RING pin 22, which the modem sets high when the phone is ringing, and pin 8 DCD (Data Carrier Detect), which the modem sets high when it has made contact with another computer and is ready to receive data. In many cases DCD and DSR signal the same condition, that is that the modem is ready to receive data from the computer, and for this reason they are often used interchangeably. The Amstrad serial interface only responds to DCD but this generally causes no problems. The complete RS232 link used by the Amstrad serial interface (CPC and PCW) can be seen in Figure 5.7.

	Computer		Modem	
Transmit data	2 ──────────▶		2	Data line
RTS	4 ──────────▶		4	Handshaking
CTS	5 ◀──────────		5	lines
Receive data	3 ◀──────────		3	Data line
DSR	6 ◀──────────		6	Handshaking
DTR	20 ──────────▶		20	lines
DCD	8 ◀──────────		8	Alternative
RING	22 ◀──────────		20	to DTR ring indicator
Common earth	7 ──────────────		7	
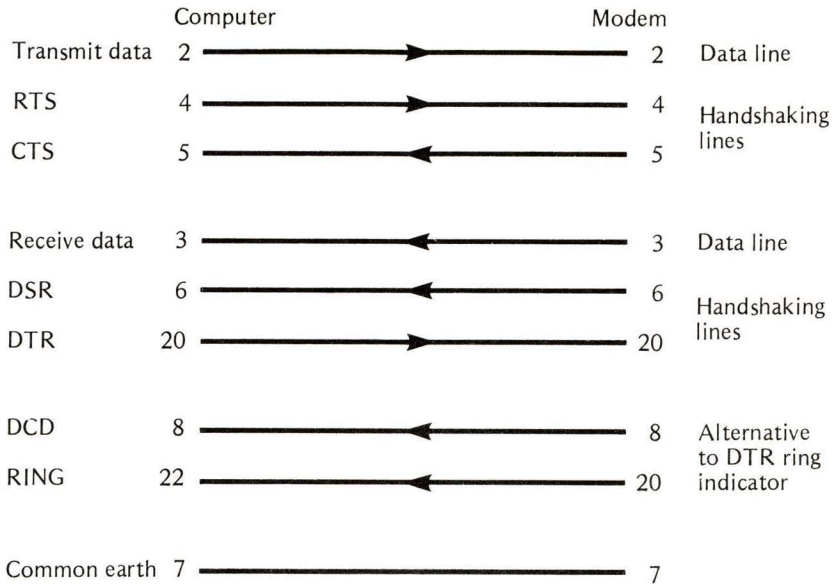
Figure 5.7 Amstrad CPC and PCW RS232 interface

It is sometimes desirable to turn off the hardware handshaking and allow both the modem and the computer to transmit and receive data at any time. Most serial interfaces allow you to select operation with 'hardware handshaking on' or 'hardware handshaking off'. Turning hardware handshaking off is usually a good idea when you are first trying to make an RS232 connection between two pieces of equipment.

On connecting A to B with RS232

The general connection scheme described above makes the problem of connecting two pieces of equipment together seem very easy and straightforward. And indeed it is if one of the pieces of equipment is a computer/terminal and the other is a modem and they both use and supply the same handshaking lines. In this case all that is necessary is to make up a cable with a 25-pin male D-type connector on one end and a 25-pin D-type female connector on the other and wired so that pin 1 is connected to pin 1, pin 2 to pin 2 and so on, for all 25 pins. (Even this simple scheme sometimes fails because the familiar 25-pin D-type plug

is not part of the RS232 standard and many manufacturers have used cheaper types of plugs and sockets.)

The difficulty really starts when you try to use the RS232 link to connect two computers/terminals together, or if one of the two pieces of equipment doesn't provide all of the handshake lines needed by the other. The completely general problem can be very difficult but things are a little easier if the problem is restricted to connecting the Amstrad serial interface to some other piece of equipment, and this is considered in the next chapter.

Modems

During all of this description of the RS232 serial link it has been assumed that the computer/terminal would be connected to a modem and that the purpose of this connection is to allow the computer/terminal to communicate with another computer/terminal: see Figure 5.8.
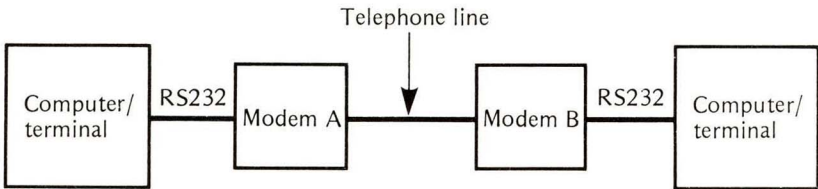
Figure 5.8 Communication using a modem

Of course you may be wondering why modems are necessary at all, because an RS232 link is quite capable of carrying data between two pieces of equipment. There are two main reasons why modems are necessary. The first is that a simple RS232 link is limited to a range of 10 metres. That is, without the use of special boosters, you cannot use an RS232 cable longer than 10 metres. In practice this maximum length is often conservative and communication over much longer cables can be achieved, though not guaranteed. The second reason is in some ways more important: the standard public telephone lines will not transmit fixed voltage levels. (Indeed, British Telecom go to some trouble to make sure that any equipment connected to the telephone line doesn't change its existing constant voltage level.) This makes it impossible to use the RS232 +12V and −12V signalling system over the public telephone network.

As the telephone network is very good (well, reasonably good) at transmitting tones in the range of the human voice the obvious solution to this problem is to convert the +12V and −12V signals into high and low tones of specific frequencies. The conversion of pulses into high and low tones and then back again is the job of a modem. (The name derives from MOdulator/DEModulator; to modulate is to convert pulses to tones and to demodulate is to convert them back again.)

The fact that a modem is concerned with the conversion of RS232 signals to audio tones and back again is familiar to many computer users

but what is not usually considered is the complication of using two modems over a single telephone line to provide two channels of communication. A telephone line is capable of carrying audio tones in two directions at the same time; this is called a duplex connection, as opposed to a half duplex or simplex connection which can only carry information in one direction at a time. As the modems at each end of the telephone line can be sending and receiving information at the same time they must use audio tones of different frequencies. Thus the simple modem link involves the use of two different types of modem, an 'originate modem' transmitting one pair of audio tones and receiving another, and an 'answer modem' which receives the pair of tones transmitted by the originate modem and transmits the tones that the originate modem receives: see Figure 5.9.
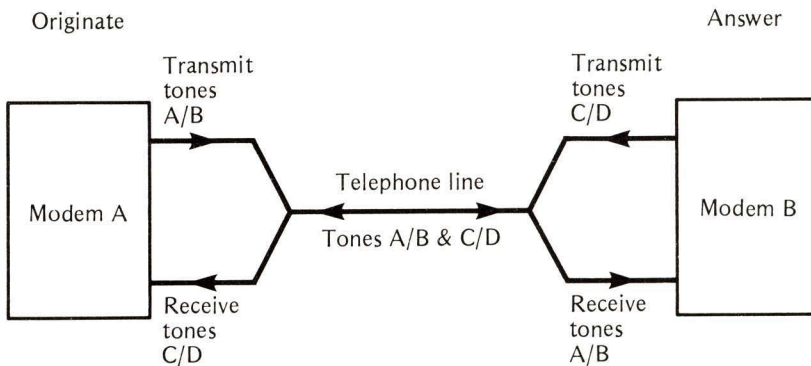
Figure 5.9 Originate and answer modems

The fact that two different types of modems are used in a communications link is something that is often overlooked and as a result can cause a great deal of trouble. In general, the modem that makes the call — that is, dials the number — is the originate modem, so called because it originates the phone call, and the modem that answers the call is, more obviously, the answer modem. That is, when you dial Prestel or a bulletin board the modem that you are using has to use the audio tones of an originate modem and the modem at the other end of the line has to use the audio tones of an answer modem. If you are only interested in using services such as Prestel then you only need an originate modem, but if you want to allow other people to dial your computer for any reason then you must have a modem that can be switched between originate and answer mode.

As you might imagine, there are standards that apply to modems as well as to serial communications. Unfortunately there are two distinct standards that have achieved a wide acceptance. In the USA the standard is BELL (from the Bell Telephone Company) and in the UK and most of Europe it is CCITT (standing for Comité Consultatif International Téléphonique et Télégraphique): see table 5.2.

Table 5.2 Modem standards: BELL and CCITT

Service	Max speed (baud)	Receive 0	1	Transmit 0	1
V21	300	1850	1650	1180	980
V23(2)	1200/75	2100	1300	450	390
Bell 103	300	2025	2225	1070	1270

Note: These tones are for an originate modem; the tones for an answer modem are obtained by simply swapping the column headings *receive* and *transmit.*

In most cases the CCITT standard is all that you need to use every UK service, but if you might ever aspire to a transatlantic call to one of the many USA services then a switchable BELL/CCITT modem is essential – – but illegal.

Although modems have nothing to do with setting the baud rate being used (this is solely the concern of the computer/terminal connected to the modem) they often have to be informed of the baud rate in use. The reason for this is that different audio tones are used for the various modem standards and these are associated with different maximum baud rates. In many ways common usage has resulted in the different modem standards being referred to by their typical baud rates; for example, a V21 modem is often known as a 300 baud modem. If you need a modem for Prestel then make sure that it supports transmit at 75 baud and receive at 1200 baud. Other useful baud rate combinations are 300 and 1200 baud transmit and receive. There are a number of low cost modems on the market that can be switched to operate at different baud rates and these are obviously more versatile.

To summarise: for Prestel you need a V23 modem which is often described as a 1200/75 modem, and for some other services (some bulletin boards and messaging services) you will need a V21 or 300 baud modem.

VDU emulation

(Note: the examples of commands given in this and following sections all refer to the Amstrad CPC serial interface. If you are using an Amstrad-compatible serial interface then it is likely that it will provide similar if not identical commands. The exception to this is the Amstrad PCW parallel and serial interface, which is supplied without any software to extend BASIC. This is described in a separate section later in this chapter.)

Normally, when you type on the Amstrad's keyboard the characters are displayed on the screen and passed on to BASIC or whatever

application program happens to be running. However, if you are trying to use the Amstrad as a terminal or VDU to communicate with another computer you need a slightly more complicated routeing of characters typed on the keyboard and received on the serial interface. If you are using the CPC serial interface then the command:

| TERMINAL

starts the VDU emulation procedure (emulation is just another way of saying simulation). That is, following the | TERMINAL command the Amstrad pretends to be a standard terminal. To stop VDU emulation mode it is necessary to press a key that generates ASCII code &FC, which is normally CTRL/ESC or just ESC. The baud rate and format used is determined by the most recent | SETSIO command. The | SETIO command is very simple:

| SETIO, transmit baud rate, receive baud rate, hardware flow control, data bits, parity bit, stop bits

can be used to set the format of both transmitted data and received data. The transmit and receive baud rates have to be one of the entries in table 5.1. The number of data bits has to be in the range 5 to 8; the parity bit is 0 for no parity, 1 for odd parity and 2 for even parity; and the stop bit has to be one of 0 for 1 stop bit, 1 for two stop bits and 2 for 1.5 stop bits. The hardware flow of control option turns on hardware handshaking if it is 1 and off if it is 0. For example, the command to set up a data format suitable for Telecom Gold, i.e. a transmit baud rate of 300, a receive baud rate of 300, seven data bits, even parity and one stop bit, is:

| SETIO,300,300,1,7,2,0

In VDU emulation mode any character typed on the keyboard is routed to the serial interface and then on to the distant computer, and any characters received by the serial interface are displayed on the screen: see Figure 5.10.
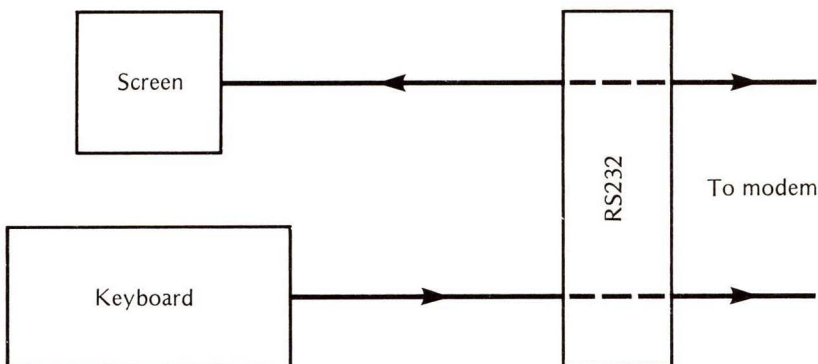
Figure 5.10 Full duplex VDU emulation

This type of VDU operation is called full duplex because it is supposed that the distant computer will transmit back anything that you type on

the keyboard; that is, the communication is in both directions at the same time. If the distant computer doesn't play the game and retransmit characters that it receives then there is no way for the user to see what has been typed on the keyboard; i.e. what is typed on the keyboard is sent to the distant computer but it doesn't appear on the screen. To get round this problem it is necessary to make the VDU emulation work in half duplex mode, where each character typed on the keyboard is printed on the screen and sent to the distant computer: see Figure 5.11.
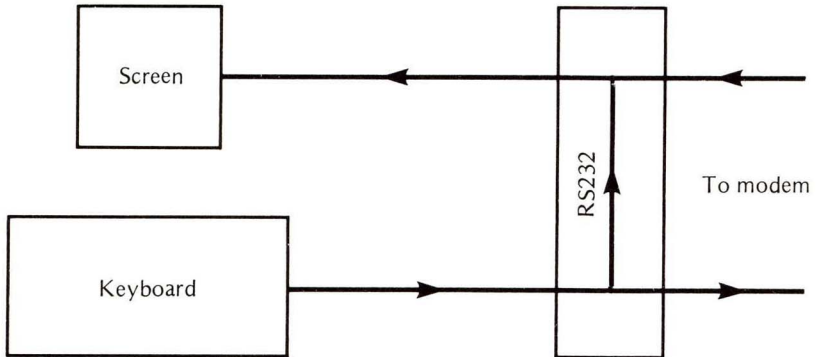
Figure 5.11 Half duplex VDU emulation

To change to half duplex mode use the command:

❘ HALFDUPLEX

and to change to full duplex mode use:

❘ FULLDUPLEX

before the ❘TERMINAL command. Notice that if your are in VDU emulation mode and everything that you type is appearing on the screen twice then it is likely that you are in half duplex mode and the distant computer is retransmitting everything you type.

VDU emulation and control characters
One of the problems of using a computer like the Amstrad to emulate a VDU is deciding which VDU it will pretend to be. The reason why this is important is that, while all VDUs agree on how to display the characters corresponding to ASCII codes 32 to 127, the way that ASCII codes 0 to 31 are treated varies quite a lot. ASCII codes 0 to 31 generally don't correspond to printable characters but to commands that the VDU should obey; for this reason they are called control codes. For example, ASCII code 7 is the BEL code and on reception of this code most VDUs will sound their bleeper or bell for a short period of time. Now, as already explained, the problem is that not all VDUs interpret the ASCII control codes in the same way and many of them use a non-standard system of 'escape sequences' to extend the range of commands beyond 32. The Amstrad in VDU emulation mode will respond to the ASCII control codes in exactly the same way as it would if they originated from

a BASIC program. That is, the control codes are interpreted as listed in Part One of the reference section of the Amstrad's manual, 'BASIC Control Characters'. For example, the Amstrad control code 14 sets the paper ink, as in:

PRINT CHR$(14);CHR$(I)

where I is the new ink colour, but the ASCII code defines control code 14 as 'Shift Out'; that is, all characters that follow should be displayed in lower case. Fortunately, the Amstrad responds to all of the common control codes according to the ASCII standard.

More serious problems can occur when using VDU emulation mode with a distant computer that sends control codes appropriate for a particular type of terminal, in that they could be misinterpreted and cause very strange screen displays. For example, the Zenith Z19/Z29 VDU interprets the control code sequence ESC,E (ASCII code 27 followed by 69) as 'clear the screen' but the Amstrad simply ignores the first code and prints the letter E in response to the second. The command:

I CTRLDISPLAY

causes control codes to be displayed as printable characters rather than obeyed. This can be useful when trying to find out which control codes are causing an odd screen display. The command:

I CTRLACTION

restores the normal interpretation of the control codes. Identifying which control codes are causing a problem is usually of little use, however, because the behaviour of the VDU emulator in response to them cannot be altered. This is a great pity, because it is easy to change the ASCII codes that each key on the keyboard generatyes (using KEY DEF) and, given a similar facility to change the meaning of control codes, emulating any particular VDU would be very easy indeed.

A simple BASIC VDU emulator

Although the VDU emulator provided by the Amstrad RS232 is a simple and effective way of getting online to a distant mainframe computer it lacks the facilities to imitate any of the more common VDUs in the way that it responds to control codes. However, it is not difficult to write a program in BASIC that will emulate any specific terminal. Not only is a general terminal emulator a useful program but it is also a good way of explaining the use of some of the fundamental commands provided to manipulate the serial interface.

The two basic RS232 commands for transmitting and receiving single characters are I OUTCHAR and I INCHAR. The command format is:

I OUTCHAR,@*status, char*

where *status* and*char* are *integer* variables defined earlier in the program.

ǀOUTCHAR waits until the RS232 interface is ready to transmit a character and then passes the ASCII code stored in *char* to it. When ǀOUTCHAR is finished the variable *status* contains a code that can be used to determine how successfully the command was obeyed:

status = 0   *character transmitted OK*
       = 256 *char* not specified properly
       = 512 timeout − character not sent

If hardware handshaking is enabled, the ǀOUTCHAR command will wait until the CTS line is high for a period of time set by the

ǀSETTIMEOUT,*time*

command. This idea of a timeout is common in communications programming; essentially it is an attempt at stopping the machine from waiting for ever and giving the user the impression of going dead. Many communications operations depend upon waiting for something to happen in the outside world, and there is always the possibility that whatever it is will never happen and the machine will wait for ever. Specifying a timeout period avoids this by fixing the maximum length of time that the machine will wait. The command ǀSETTIMEOUT specifies the timeout period, in milliseconds, for a range of communications operations. For example, after the command:

ǀSETTIMEOUT,5000

no operation will wait for longer than five seconds and when the timeout period is up a 'timeout error' is returned in *status*. The command:

ǀSETTIMEOUT,−1

disables the timeout facility and will cause the computer to wait for an unlimited time for the completion of a communications operation.

The command

ǀINCHAR,@*status*,@*char*

returns the ASCII code of the next character received by the RS232 interface in the integer variable *char*. The integer variable *status* contains a code that gives information about how successfully the operation was performed:

status   0 character read in OK
        256 *char* not specified correctly
        512 timeout error
        768 break received from distant computer
        1024 character read with framing error, i.e. error in start or stop bits
        1280 overrun error, i.e. characters have been received but not read
        2048 parity error

In addition to ǀINCHAR, ǀOUTCHAR and ǀSETTIMEOUT there are four

other more specialised commands that are sometimes useful in writing communications programs. The command:

I SIO,@*status*

returns a code in the integer variable *status* that can be used to find out the general state of the serial interface (see the serial interface manual for a complete list of codes). The command:

I RINGWAIT@*status, time*

waits for the ring detect line (RING) to go high for no longer than *time* milliseconds. The command:

I BREAKSEND,@*status, time*

sends a break signal to the distant computer for the number of milliseconds specified by *time.* A break signal is different from any other in that it consists of holding the transmit line low, without the customary start and stop bits for the specified time. The integer variable *status* contains 0 if the break was sent successfully and 512 if not. finally, the command:

I CLOSESIO,@*status*

waits until all the characters have been transmitted and then shuts down the RS232 interface, i.e. sets RTS and DTR low. The integer variable *status* contains 0 if the interface was closed successfully and 512 otherwise.

At this point we have all the tools to write a simple VDU emulation program in BASIC:

```
10 C%=0
20 S%=0
30 I SETSIO,9600,9600,1,8,0,0
40 REM MAIN LOOP
50 I INCHAR,@S%,@C%
60 IF S%=0 THEN GOSUB 1000
70 A$=INKEY$
80 IF A$< >"" THEN GOSUB 2000
90 GOTO 40

1000 REM PROCESS RECEIVED CHARACTER
1010 PRINT CHR$(C%);
1020 RETURN

2000 REM PROCESS TRANSMITTED CHARACTER
2010 PRINT A$;
2020 C%=ASC(A$)
2030 I OUTCHAR,@S%,C%
2040 RETURN
```

Line 30 uses I SETSIO to determine the data rates and format. In a more sophisticated program the user would be offered a choice of data rates

and formats using a menu selection. The essence of the terminal emulator is contained in the main loop between lines 40 and 90. Each time through this loop the serial interface is read to see if a character has been received (line 50). If it has (indicated by a *status* of 0) then line 60 calls subroutine 1000 to process the received character. It then checks the keyboard, line 70, to see if a key has been pressed. If a key has been pressed, line 80 calls subroutine 2000 to process the character for transmission. In this terminal emulator, subroutine 1000 simply prints the character on the screen but it could quite easily test for and act on control codes. In the same way subroutine 2000 prints the character on the screen and then sends it to the serial interface, but it could perform any desired control code translation before sending the data on its way.

This simple terminal emulator will work at any data rate as long as hardware handshaking is used, but if you add too many features to it you will find that BASIC eventually proves too slow. Commercial terminal emulators are generally written in machine code and so they have no such restriction.

You can use the same serial interface commands in combination with BASIC to enhance the terminal emulator provided by the I TERMINAL command. For example, the following program adds a text screen dump to the terminal emulator:

```
10 MODE 2
20 I SETSIO,9600,9600,1,8,0,0
30 I HALFDUPLEX
40 KEY 159, CHR$(&FC)
50 KEY DEF 68,1,159
60 I TERMINAL
70 GOSUB 1000
80 GOTO 60

1000 FOR I%=1 TO 24
1010 FOR J%=1 TO 80
1020 LOCATE J%,I%
1030 PRINT#8,COPYCHR$(#0);
1040 NEXT J%
1050 PRINT#8
1060 NEXT I%
1070 RETURN
```

Lines 40 and 50 set the TAB key to return the code &FC which stops the terminal emulator running. Subroutine 1000 is a simple screen dump program based on the use of COPYCHR$ to find out which character is displayed on the screen at every location. You can use the same technique to add a 'save to disk' option; all that is necessary is to add lines to open a file and change line 1050 to PRINT to it instead of the printer.

Prestel emulation
A terminal emulator for Prestel has to provide a few more facilities than

a simple terminal emulator. In particular, it has to provide a complete set of Prestel graphics characters and it has to handle the Prestel control codes correctly. All of this is much too difficult to write in BASIC and for this reason the Amstrad serial interface provides a Prestel emulator. The command:

I PRESTEL

starts the Prestel emulator. This not only handles the Prestel display but also redefines the keyboard so that ENTER returns the standard Prestel character # and the decimal point on the numeric key pad returns *. The Prestel emulator can be stopped by pressing a key that returns the code &FC (usually ESC or CTRL–ESC) and this means that it is possible to extend the range of features it offers in the same way that the terminal emulator was extended at the end of the previous section. There are also four other Prestel commands:

I SAVEPRESTEL, @*filename*

which will save a Prestel display into a file on cassette or disk;

I LOADPRESTEL, @*filename*

which will load a previously saved Prestel display back into the emulator's internal buffer (note: *filename* is a string variable that holds the name of the file);

I REFRESH

which will redisplay a Prestel frame stored in the emulator's internal buffer; and

I CURSOR, *col, row*

which will set the cursor to column *col* and row *row*.

Perhaps the simplest way to give some idea of how these commands might be used is to incorporate them into a simple extension to the Prestel emulator that can save Prestel frames to tape or disk.

```
10 MODE 0
20 I SETKEY,75,1200,1,7,1,0
30 KEY 159,CHR$(&FC)
40 KEY DEF 68,1,159
50 I PRESTEL
60 GOSUB 1000
70 GOTO 60

1000 PRINT"FILENAME=";
1010 INPUT F$
1020 I SAVEPRESTEL,@F$
1030 RETURN
```

Lines 30 and 40 set the TAB key to return the control code &FC. Pressing this key causes the Prestel emulator to stop and subroutine 1000 is then called. This asks for the filename and then uses the I SAVEPRESTEL to

save the Prestel buffer to disk or tape. The files saved by this program can be redisplayed using I LOADPRESTEL and I REFRESH commands. You can easily modify this program to print a Prestel frame by replacing subroutine 1000 by a mode 0 screen dump.

The PCW (CPS8256) serial and parallel interface

The Amstrad serial interface for the PCW range of computers is different from most of the serial interfaces for the Amstrad CPC range in that it doesn't come with any additional commands for BASIC. This means, for example, that there is no equivalent for the programs listed in earlier sections. Instead there is a small communications program, MAIL232, included on Side One of System Disk One. This program is very easy to use in that it is controlled via the same sort of 'pull down' menu familiar to Locoscript users. Although it is easy to use it is fairly limited. There is a simple terminal emulation facility, suitable for Telecom Gold, One-To-One, etc., but not Prestel. If you want to use Prestel then you will have to buy a more comprehensive comms package such as Chit-Chat. The only other facility that MAIL232 provides is file transfer using the same method (Protocol) as the CPC serial interface (see BLOW and SUCK in the next chapter). You can also use the PCW's serial interface from CP/M and in this respect it behaves like the Amstrad CPC serial interface. The use of both interfaces with CP/M is described in the next chapter.

Computer to computer 6

In Chapter 5 the basic ideas and principles of communicating over a serial link using modems was explained. A closely related situation is the connection of two pieces of equipment — a pair of computers, or a computer and a printer — without any intervening modems. At first sight it might appear that this situation is little different from dialling up a distant computer — it's just a matter of using an RS232 link without the trouble of the miles of telephone line. However, there are substantial differences in two ways. First, there is the problem of making the right connection between the two pieces of equipment, each of which probably implements a different subset of the RS232 standard, and secondly, there is the possibility of high speed transfer of large quantities of data. Data transmission over telephone lines is limited to 120 characters per second and, more usually, works at a slow 30 characters per second. For this reason only small quantities of data are normally transferred using a modem connection; but if you can make a direct RS232 link between two machines then the data rate can be increased to 960 characters per second or, with care, to 1920 characters per second, and this opens up the possibility of transferring large quantities of data in a reasonable period of time. In this chapter we look at the subject of connecting one piece of equipment to another using RS232 and at methods of transferring large quantities of data between two machines reliably.

The null modem

In Chapter 5 the purpose of each of the pins used in the Amstrad RS232 interface was described and this resulted in the conclusion that to connect a computer/terminal to a modem all that was necessary was a simple cable with pin 1 connected to pin 1, pin 2, to pin 2, and so on. However, things are not so simple once you consider connecting a computer/terminal to another computer/terminal. For example, consider the problem of connecting two Amstrads together (a problem that is easier than most because you can be sure that both pieces of equipment implement the same RS232 control lines). In this case simply connecting

pin 1 to pin 1 and so on will not work. Consider the problem with connecting pin 2 to pin 2, for example. Both Amstrads use pin 2 to transmit data and connecting them together is obviously wrong! The correct thing to do is to connect pin 2 on each Amstrad to pin 3 on the other Amstrad: see Figure 6.1.
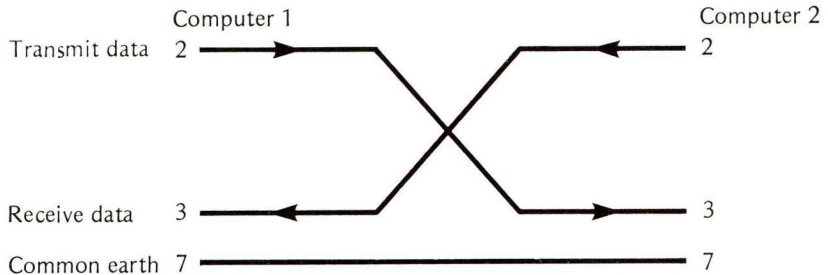
Figure 6.1 Simple null modem

This arrangement of a cable with pins 2 and 3 crossed over is usually referred to as a null modem, because it is used to connect two computers together without the use of a pair of intervening modems.

In practice it is often necessary to connect the hardware handshaking lines associated with each data line, in the same crossed-over fashion. For example, in Figure 6.1, computer 1's transmit data line (pin 2) will only send data if its CTS line (pin 5) is high. However, there is no point in connecting this to computer 2's CTS line (pin 2), as in the case of a modem, because this is the line that must be set high for computer 2 to send data on its transmit line. The solution is to connect the CTS line (pin 5) on computer 1 to the DTR line (pin 20) on computer 2, because the DTR line goes high when computer 2 is ready to receive data and this connection will cause it to set computer 1's CTS line high and so enable computer 1 to send data. In the same way you can work out that computer 1's RTS line (pin 4) has to be connected to computer 2's DSR line (pin 6) — or in the case of the Amstrad and many other pieces of equipment to the DSR and DCD line (pin 8). The arguments involved in where to connect a given line are symmetrical from the point of view of computer 1 or computer 2, so if you connect computer 1's pin 5 to computer 2's pin 20 then you also have to connect computer 2's pin 5 to computer 1's pin 20, and so on. Thus a complete null modem cable, including all the crossovers for the hardware handshaking lines is quite complicated: see Figure 6.2.

One of the problems with the complete null modem described in the previous section is that it will only work if both computers/terminals have the same set of handshake control lines. When connecting a machine other than another Amstrad, it is often the case that some of the handshake control lines will be missing or that different ones will be provided because, while RS232 is a standard, which parts of the standard any particular manufacturer implements varies widely. In these situations a common approach is to eliminate the control that the handshaking lines have over transfer of data by connecting them to
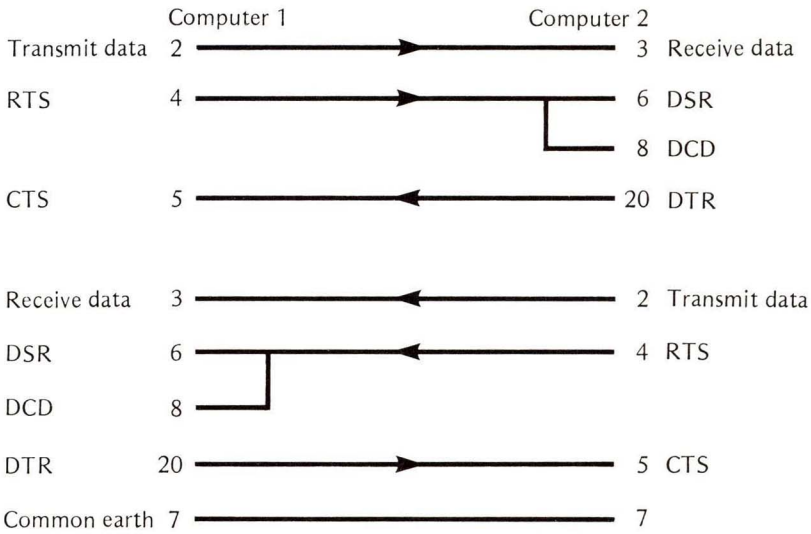
Figure 6.2 Complete null modem with handshaking

suitable signals at the same end of the cable. For example, to defeat the control that the DSR or DCD line has over the reception of data you could connect them to the RTS line at the same end of the cable. That is, when the RTS line belonging to computer 1 goes high it automatically sets its own DSR and DCD lines high. In other words, computer 1 signalling a 'request to send' automatically sets its own handshaking lines to indicate that the computer/terminal at the other end of the cable is also 'ready to send' see Figure 6.3.
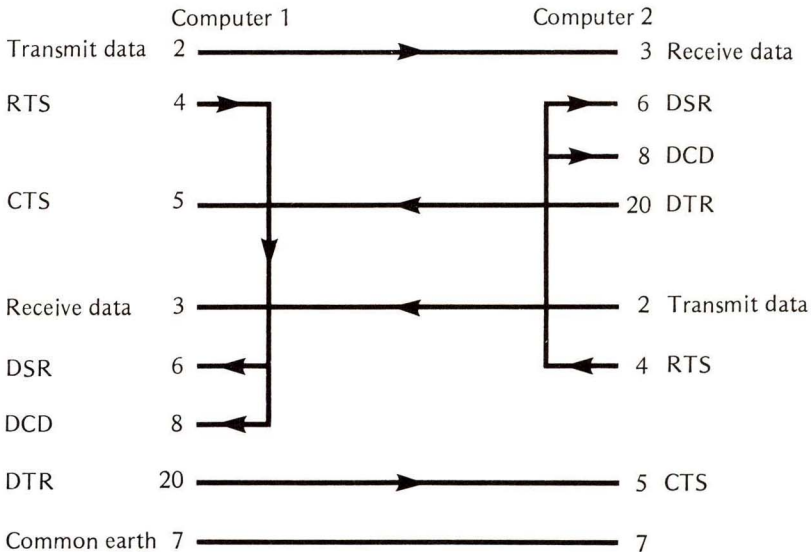
Figure 6.3 Always ready to send null modem

With this connection at both ends of a null modem there is still a degree of hardware handshaking for, while both computers/terminals are always signalling that they are ready to send, the computer/terminal at the other end can still use its DTR line to signal that it is not ready to receive. To remove this level of handshake control you also have to connect RTS to CTS at both ends. This ensures that every time one of the machines signals a 'request to send' it receives the signal that it is 'clear to send'. The complete wiring diagram for the null modem with no handshaking can be seen in Figure 6.4.
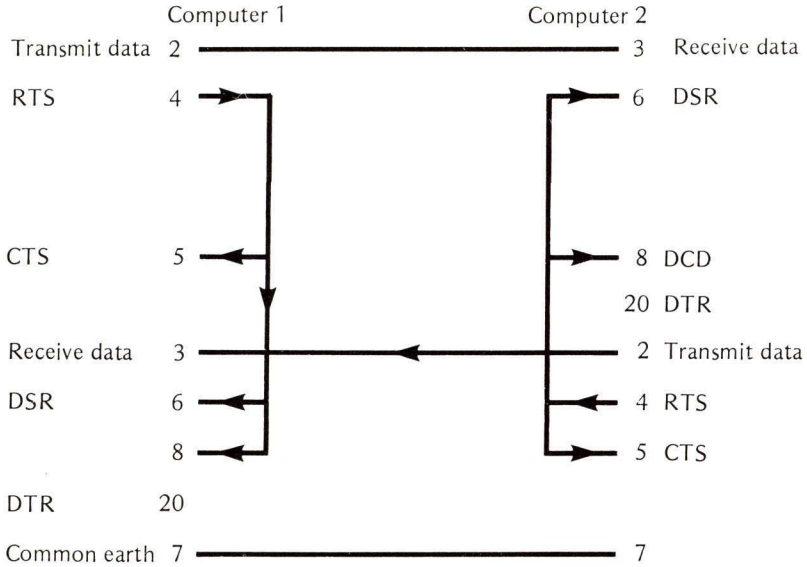
Figure 6.4 Null modem without handshaking

In practice it is sometimes necessary to connect additional pins together to make a piece of equipment work. For example, many VDUs have a pair of pins called 'clock in' and 'clock out' that in normal use have to be connected together.

Modem or terminal ?

The above description of the various types of null modems needed to connect a pair of computers/terminals together might make you think that it is better to stick to connecting a computer/terminal to a modem. Many manufacturers are of the same opinion and as a result they wire up the RS232 connection on their personal computer or printer as if it was a modem. This does make it easier to connect some pieces of equipment together. For example, a printer that is wired as a modem can be connected, without a null modem, to a computer that is wired as a computer/terminal. However, it can make no difference at all if both the

printer and the computer are wired as modems because then a null modem is still required for the connection. What it does for certain is to confuse the issue entirely and make it impossible to be sure if a null modem is needed or not!

It is usual for equipment that is wired as a modem to have a female 25-pin D-type connector and for equipment wired as a computer/terminal to have a male connector, but this cannot be taken as a sure guide as there is also a trend to using female connectors on all equipment and male connectors on all cables. The only sure way of determining how an RS232 connector has been wired is to determine which of pins 2 or 3 is being used to transmit data. If a manual is available then for a modem pin 3 is used to transmit data and for a terminal pin 2 is used. Which pin is used to transmit data can be checked with a simple multimeter or with a BOB (Break Out Box — described later). The voltage between the pin (2 or 3) carrying the transmitted data and pin 7 should be +12 V.

Dealing with difficult connections — the BOB

There are a great many analysis and diagnostic tools available for finding out how a particular RS232 interface works. The best known of these is the BOB, or break out box. A BOB can be plugged into an RS232 cable and it will show the state of all the lines (high or low) using LEDs (light-emitting diodes). Most BOBs also include a 'patchboard' area that can be used to make connections between different pins. BOBs can make sorting out RS232 connections easy but they are not cheap —£25 to £100 — and you can find out the same information by using a simple test meter to measure the voltage (+12 V or −12 V) on each pin.

There are a few very sophisticated gadgets on the market that make the job of connecting two RS232 devices together a matter of throwing a few switches, or will even do the entire job without any human interference. At the most extreme these devices amount to complete, but tiny, microcomputer systems that examine the RS232 lines and work out how they should be connected! As you can imagine, these devices are very expensive.

Connecting a printer — software handshaking

It is more usual to connect a printer to a computer using a parallel interface rather than a serial interface. However, some printers do use a serial RS232 interface and some special techniques of their own. From the point of view of wiring a serial printer cable the only two questions that have to be answered are whether the printer is set up as a modem or as a computer/terminal, and how many and which handshake control lines are implemented. The former question governs whether the cable has to be wired as a null modem or not. The handshake control line can be dealt with either by connecting them to the appropriate control lines

on the computer or by disabling their function as described in the previous sections. In difficult cases a BOB can be used to determine the correct connections for a printer.

Many printers only implement the receive part of an RS232 interface and in this case it is important to try to make use of any hardware handshaking lines provided: see Figures 6.5 and 6.6.

Figure 6.5 Null modem for printer connection

Figure 6.6 Connection for printer wired as a modem

If you cannot find a way to make the handshaking lines work you will have to select a baud rate that is slow enough for the printer to finish printing a character before the next character is transmitted. For example, if the printer can only print at 10 characters per second then the baud rate must be less than 110 baud (assuming 10 bits per character). If you are running a printer without handshaking and it occasionally misses a character or reports an error then it is probable that the baud rate has been set too high.

Some serial printers provide a system of software handshaking that can be used to replace or supplement hardware handshaking. Software handshaking uses the receive side of the RS232 connection to allow the printer to send 'continue sending' and 'stop sending' signals to the computer. The standard codes used for this purpose are XON (ASCII code 17) for 'continue to send data' and XOFF (ASCII code 19) for 'stop transmission'. Thus handshaking is achieved by the computer checking for an XOFF code sent back to it by the printer after every character it

sends. On reception of the XOFF code the computer sends no more data until it receives an XON code from the printer to signal that it is able to deal with more data.

Once the problem of connecting a serial printer to the Amstrad CPC range has been solved the baud rate and data format can be established using the I SETIO command. Output to the standard parallel printer (stream #8) can be diverted to the serial interface by the I SERIAL command. The serial interface will respond to hardware handshaking if it was enabled in the I SETIO command and software XON/XOFF handshaking.

To disable software handshaking use the I NOXON command and to restore it the I XON command. Finally, to switch printer output back to the standard parallel printer port, use I PARALLEL.

If you are using one of the PCW range then output can only be redirected to a serial printer using CP/M — see later.

Transferring large quantities of data

A direct RS232 link, without the use of modems or telephone lines, can be used to transmit data at almost 2000 characters per second. With this sort of data rate it becomes feasible to consider transferring large blocks of data or even complete files. For example, at 2000 characters per second it would only take about 3 minutes to transmit the entire text of this book, but it would take more like an hour at the standard Prestel transmission rate. While there is generally little reason for transferring data in this way between a pair of Amstrad computers (it is simpler to transfer diskettes containing the data), it is often the only convenient method of transferring data between two different types of machine. For, while the RS232 interface is almost a uniform standard and different machines can be connected together using it, the formats used for data storage on diskettes is far from standard and different machines will rarely read each other's diskettes.

Block transfer — Amstrad CPC serial interface only

(Note: the commands described in this section can only be used with the Amstrad CPC serial interface. Other CPC Amstrad-compatible serial interfaces usually have very similar if not identical commands.)

The simplest way of transferring more than one character at a time over a serial link is to use the I INBLOCK and I OUTBLOCK commands. These permit the exchange of strings of characters as a single operation. The command:

I OUTBLOCK,@*status*, @*string*

will send each character in the variable *string* to the RS232 interface, taking notice of the hardware handshaking lines if they have not been disabled by the most recent I SETSIO command. When the command is

complete the integer variable *status* contains a code that indicates how successful the transfer has been:

status   0   the string was sent OK
          256   no string or a zero length string specified
          512+N   hardware handshaking causes the Amstrad to wait for longer than the timeout period and N characters in the string remain to be sent

The I OUTBLOCK command send the data in the string variable without any alteration and so it is up to the computer receiving the data to read it and use it as appropriate. However,

I SETBLOCKEND,*char*

will set the character whose ASCII code is *char* as the 'end of block marker'. The end of block marker is sent as an extra character after all the characters in the string have been sent, so as to signal to the receiving computer that all the data has been transmitted. For example, following:

I SETBLOCKEND,26

the computer receiving the string of characters should check each character it receives to detect ASCII code 26 and interpret this as meaning that the transmission is complete. (ASCII code 26 represents CTRL/Z the standard 'end of file' marker.) Of course, if the string of characters includes the character that is being used as the end of block character the receiving computer will detect this and erroneously conclude that there is no more data to come.

The associated

I INBLOCK,@*status*,@*string*

command can be used to read a string of characters into the variable *string*. The string variable used in this command must be initialised by storing M characters in it, where M is the maximum number of characters in a received block. This storing of M dummy characters effectively reserves that amount of storage ready for the characters received over the RS232 interface. The I INBLOCK command reads in characters one by one, taking notice of the hardware handshaking if it was enabled by the most recent I SETSIO command, until either:

1 M (the initial length of the string) characters are received,

2 the end of block character is received,

3 a timeout occurs waiting for the next character,

4 a line break is received (see I BREAKSEND in Chapter 5), or

5 a character is received with a framing, overrun or parity error.

When the I INBLOCK command is completed, *status* contains a code that can be used to discover which of the above events occurred:

status	0	string was filled
	0+N	N characters including the end of block character have been received
	256	No *string* or zero length *string* specified
	512+N	timeout after N characters
	768+N	character N was a line break
	1024+N	the Nth character was received with a framing error
	1280+N	the Nth character was received with an overrun error
	1536+N	the Nth character was received with a parity error

File transfer — CPC and PCW range

Transferring data in the form of a string of characters is not really up to the task of moving very large quantities of data between one machine and another. For this task it is necessary to read data from disk or cassette at the transmitting computer and write it to disk or cassette at the receiving computer so as to avoid the need to store everything in memory. Involving a disk or cassette drive in the transfer operation implies that some sort of handshaking has to be used, because transmission has to be halted for the time that it takes to write a block of data to disk or cassette at the receiving end. The reason for this is that using a disk or cassette is normally a full-time operation for a computer and this means that it doesn't have the time to read data from serial interface while writing data to the disk or cassette and so, unless transmission can be halted for this time, an overrun error will occur. The Amstrad serial interfaces for both the CPC and PCW range of computers support the same system of 'intelligent' file transfer (that is they use the same 'protocol', see below) although they use different commands to initiate and control the transfer.

The Amstrad serial interface for the CPC range also supports a simple method of file transfer that relies on hardware handshaking to keep the two machines in step. As long as hardware handshaking is being used the two commands I INFILE and I OUTFILE can be employed to transmit files over moderate distances and baud rates. The command:

I OUTFILE,@*filename*

will send each character in the file *filename* to the RS232 interface and then send an 'end of file' character. The end of file character can be set by

I SETFILEEND,*char*

where *char* is the ASCII code of the character required. (The default end of file character is ASCII code 26, which is generated by pressing CNTRL−Z.) The command:

I INFILE,@*filename*

reads characters from the RS232 interface and stores them in the file *filename* until the current end of file character is received. Notice that

unless hardware handshaking is being used it is certain that the receiving computer will miss transmitted characters while it writes data to disk or cassette. Also, if the end of file character is contained as a legitimate character within the file being transmitted then the I INFILE command will terminate before the whole file has been transmitted. The solution is, of course, to select a character that isn't used in the file being transmitted. This is quite easy when the file is composed of nothing but text characters, when a control code such as ASCII 26 can be used, but if the file is composed of binary codes or control codes then you cannot be certain that any given ASCII code will not be present.

The I INFILE and I OUTFILE commands are very simple and effective for transferring text files between machines when hardware handshaking is employed but there are two more file transfer commands that not only make hardware handshaking unnecessary but also remove the need to use an end of file character and add significant error checking and recovery. This intelligent file transfer method is supported by the Amstrad CPC and PCW serial interfaces and so it is also ideal for exchanging files between Amstrads. Of course, this is all achieved at the cost of increased complexity, and for many applications the rather simpler file transfer commands are all that are necessary.

For the CPC range, the command:

I BLOW,@*filename*

will transmit the characters in the file *filename* using a special format. Such special data transmission formats are more generally referred to as protocols. In this case the protocol is based on the idea of dividing the file up into a number of blocks, each one being sent with some information concerning how long it is, error checking details and software handshaking. The exact protocol is as follows.

At the start of transmission:

1 Send ASCII code 2, which is STX or Start Transmission, and then wait for the receiving computer to transmit ASCII code 6, which is ACK or ACKnowledge, back. (This is the first part of the software handshaking in that it makes sure that no transmission occurs before the receiving computer is ready. Notice that as the STX is only sent one the receiving computer must at least be ready to receive this one character.)

Then for each block:

2 Send an initial 21-character information group consisting of a 16-character file name, a two-character block number, a one-character block length (0 to 128 characters), and a two-character checksum. (The information contained in these initial 21 characters is then used to read in the block and check for errors.)
3 Send the characters that constitute the data part of the block. (This has to consist of exactly the number of characters specified by the block length transmitted earlier.)
4 Wait for the receiving computer to transmit a character that indicates that the block was received or that there was an error. If the receiving

computer transmits ASCII code 6, for ACK, then the block was received correctly and the transmitting computer should repeat steps 2 and 3 for the next block. If the block was not received correctly then the receiving computer transmits ASCII code 21, for NAK or Not AcKnowledge, and the transmitting computer should repeat steps 2 and 3 using the same block, i.e. it should re-send the block in error until it is correctly received. If the receiving computer has detected an error that cannot be recovered by simply retransmitting the block, e.g. if the block was received without error but it had the wrong block number, then it transmits ASCII code 3, for ETX or End Transmission, as a signal that the transmitting computer should abort its attempt at transferring the file and report an error.

You should be able to see that step 4 constitutes both software handshaking and an element of error recovery. The checksum characters that are transmitted as part of the initial 21-character information block is simply the sum of all the ASCII codes in the following data block, and this can be used by the receiving computer as a simple check that nothing has been distorted by the transmission. The end of file is signalled by the transmitting computer sending a block of zero length and so no end of file characters are involved. For the PCW range a file can be transmitted using the same protocol by using the f3 menu of the MAIL232 program.
    On the CPC range the command:

I SUCK,@*filename*

will receive blocks of data using the above protocol and store the data in the file *filename* and once again option f3 of the MAIL232 program will make a PCW receive a file using the same protocol. In other words, if you have two Amstrads connected together via an RS232 link then you can transfer files between them using

I BLOW,@*filename*

or the 'transmit a file' option in the MAIL232 program at the transmitting machine, and

I SUCK,@*filename*

or the 'receive a file' option in the MAIL232 program at the receiving end. Unfortunately, it is rare that both ends of such an RS232 link are Amstrad computers and as a result it is often necessary to write a small program that will perform the equivalent of I SUCK or I BLOW for the non-Amstrad computer. For example, the following Microsoft BASIC program will receive a file, i.e. it performs the job of I SUCK:

```
  5 DIM BF%(128)
 10 PRINT "FILENAME";
 20 INPUT F$
 30 OPEN "O",#1,F$
```

```
40 REM WAIT FOR STX
50 GOSUB 1000:REM GET INPUT
60 IF C%<>2 THEN GOTO 50
70 BC%=0
80 REM SEND ACK
90 C%=6:GOSUB 2000
100 GOSUB 3000:REM RECEIVE BLOCK NO. BC%
110 IF BL%<>0 THEN BC%=BC%+1:GOTO 80
120 CLOSE#1
130 STOP

1000 REM REPLACE BY A SUBROUTINE
1010 REM THAT READS A CHARACTER FROM
1020 REM SERIAL INTERFACE AND RETURNS
1030 REM ITS ASCII CODE IN C%
1040 RETURN

2000 REM REPLACE BY A SUBROUTINE
2010 REM THAT WRITES A CHARACTER TO
2020 REM THE SERIAL INTERFACE
2030 REM THE CHARACTERS ASCII CODE IS IN C%
2040 RETURN

3000 REM RECEIVE BLOCK BC%
3010 CS%=0:F$=""
3020 REM GET FILENAME
3030 FOR I=1 TO 16
3040 GOSUB 1000
3050 F$=F$+CHR$(C%)
3060 NEXT I
3070 REM GET TRANSMITTED BLOCK NUMBER
3080 GOSUB 1000
3090 TBN%=C%
3100 GOSUB 1000
3110 TBN%=TBN%+C%*256
3120 REM GET BLOCK LENGTH
3130 GOSUB 1000
3140 BL%=C%
3150 IF BL%=0 THEN RETURN
3160 REM GET REST OF BLOCK
3170 CS%=0
3180 FOR I=1 TO BL%
3190 GOSUB 1000
3200 BF%(I)=C%
3210 CS%=CS%+C%
3220 NEXT I
3230 REM GET CHECKSUM
3240 GOSUB 1000
```

```
3250  TCS%=C%
3260  GOSUB 1000
3270  TCS%=TCS%+C%*256
3280  REM CHECK FOR ERRORS
3290  IF TBN%<>BC% THEN GOSUB 4000:RETURN
3300  IF TCS%<>CS% THEN GOSUB 5000:GOTO 3000
3310  REM NO ERRORS WRITE OUT BLOCK
3320  FOR I=1 TO BL%
3330  PRINT#1,CHR$(BF%(I));
3340  NEXT I
3350  RETURN

4000  REM FATAL ERROR
4010  REM SEND ETX
4020  C%=3
4030  GOSUB 2000
4040  PRINT "FATAL ERROR"
4050  BL%=0
4060  RETURN

5000  REM NON FATAL ERROR
5010  PRINT "NON FATAL ERROR ON BLOCK";BN%
5020  PRINT "REQUESTING RETRANSMISSION"
5030  REM SEND NAK
5040  C%=21
5050  GOSUB 2000
5060  RETURN
```

To make use of this program you have to provide subroutines 1000 and 2000 which receive and send data to the serial interface. You should be able to find enough information in the manual of the transmitting machine for which this program is intended. An equivalent of the I BLOW routine is just as easy to write.

Using RS232 with CP/M

The versions of CP/M (CP/M 2.2 and CP/M Plus) that come with every Amstrad model equipped with a disk drive all have the ability to make use of an Amstrad-compatible serial interface if one is connected. (The only requirements that a serial interface has to satisfy to be Amstrad compatible are to use a Z80 DART or SIO, and an 8253 interval timer as a baud rate generator, with the DART data register at &FADC and the 8253 counter 0 register at &FBDC.)

All versions of CP/M handle I/O devices by defining a number of 'logical devices' which are used for particular tasks and then assigning these to any of a range of 'physical devices' that might be found on the system. For example, the logical device LST: is used by all programs for

listings but it could be a parallel printer, a serial printer or even a VDU. The important thing to understand is that a logical output device is named and identified by the use to which the device is put, and physical devices correspond to real-world printers, modems, etc. Although both CP/M 2.2 and CP/M Plus use logical and physical devices they differ in the range they can accommodate and in the commands that are used to manipulate them.

Serial I/O in CP/M 2.2

CP/M 2.2 has four logical devices:

CON: the console, i.e. the device that is normally used for the dialogue
       with the user
LST: the listing device
RDR: an auxilliary input device
PUN: an auxilliary output device

and, on the Amstrad CPC range, three physical devices:

CRT: the screen and keyboard
LPT: the parallel printer port
TTY: the serial port (if any)

When you first start CP/M 2.2 the default assignment is:

CON: to CRT:
LST: to LPT:
RDR: to input of TTY:
PUN: to output of TTY:

So sending data to the listing device make it appear on whatever is connected to the parallel port. If you want to change these default allocations, use:

STAT *logical device* = *physical device*

For example, to set the listing device to be the serial interface you would use:

STAT LST:=TTY:

After this command all the data that would normally appear on the printer connected to the parallel interface will appear on the printer (or whatever) connected to the serial port. If at any time you want to know what the current state is, use:

STAT DEV:

which produces a list of logical to physical assignments.

     You can determine the data rate and format used by the serial interface via the SETUP command. This is a fully menu driven program and all you need do is select the appropriate options form each menu. You can also transfer data to and from the serial port by using PIP —

Peripheral Interchange Program. The use of PIP is described in the next section.

Serial I/O in CP/M Plus

(Note: there is a bug in the way CP/M Plus Version 1 deals with the serial interface. However, it is easily fixed by a software patch, details of which can be obtained from Amstrad or an Amstrad dealer.)

CP/M Plus has three logical devices:

CON: the system console, which can be divided into CONIN: and CONOUT:
LST: the listing device
AUX: an auxilliary I/O device, which can be divided into AUXIN: and AUXOU:

and three physical devices:

CRT   the screen and keyboard
CEN   the parallel printer port
SIO   the serial port (if any)

When you first start CP/M Plus the default assignment is:

CON: to CRT
LST: to CEN
AUX: to SIO

That is, all output to a printer, the listing device LST:, is initially sent to the parallel port. You can reassign logical to physical devices at any time by using the command:

DEVICE *logical device=physical device*

For example, to set the serial port as the printer you would use:

DEVICE LST:=SIO

and to restore it to the parallel port, use

DEVICE LST:=CEN

You can find out the current device assignment at any time by typing

DEVICE

which produces a list of logical and physical devices and then gives you the opportunity of changing the assignments.

You can set the data rate and format of the serial interface using the command:

SETSIO TX *rate* RX *rate* BITS *n* STOP *m* PARITY *type* XON *x*

    HANDSHAKE *y*

where TX sets the transmit rate, RX the receive rate, BITS the number of

stop bits, PARITY the type of parity, XON enables or disables software handshaking, and HANDSHAKE enables or disables hardware handshaking. For example, to set up 75/1200 baud, seven data bits, one stop bit, odd parity and no software or hardware handshaking, you would use:

SETSIO TX 75 RX 1200 BITS 7 STOP 1 PARITY ODD XON OFF

      HANDSHAKE OFF

The PIP command can be used to transfer data between any pair of logical devices and any logical device and a file. There are three general forms of the PIP command:

1 device to device   PIP *logical device=logical device*
2 file to device   PIP *filename=logical device*
3 device to file   PIP *logical device=filename*

For example, to send the data in a file to the serial port you would use:

PIP AUX:=MYFILE

To receive a file from the serial port, use:

PIP MYFILE=AUX:

and to send all the data typed on the keyboard to the serial port and all the data received over the serial port to the screen, use:

PIP CON:=AUX:

All data transfers in PIP are terminated by CTRL/Z.

   If you want to know more about CP/M commands, consult *SOFT971 - – A Guide to CP/M Plus,* available from Amsoft.

Inside the system   7

Inside this chapter we examine the way that the larger components of the communications system work. In particular we take a look at the telephone system, old and new, and at videotext services and Prestel especially. Although none of this information is necessary to using the facilities offered by computer communication it is interesting and it will help with understanding any new developments and changes over the coming years.

The telephone system — PSTN

The basis of nearly all communications in the UK is the Public Switched Telephone Network or PSTN. The PSTN was originally designed to carry voice signals and not the digital signals used by computers. How a modem is used to convert digital signals to audio tones is described in Chapter 5 but in practice this is very much a second-best solution because of limitations placed on the signalling tones used by the nature of the methods used to make a long distance call. At the moment the technology of the telephone system is mainly electromechanical (Strowger and Crossbar) but it is slowly being changed to use digital electronics (System X). The phone system may be old technology but it is fascinating because of its enormous size!

The whole appearance of the telephone network has been changing due to the introduction of Subscriber Trunk Dialling (STD). This is a system that, in principle, allows any user to dial any other user, no matter to which local exchanges they are connected. The telephone line that comes into your house goes directly to a local exchange where you can dial other users also directly connected to the same exchange. If you want to make a long distance call then things become a little more complicated. Your local exchange is connected to a Group Switching Centre. This is a sort of gathering point for all the lines from a group of local exchanges — there are around 6000 local exchanges and 400 group switching centres. These group switching centres are in turn connected to a network of 40 Zone Switching Centres. Nine of these zone switching centres are special in that they are completely interconnected

with high quality trunk cables — these are called Master Switching centres. The remaining zone switching centres are usually referred to as District Switching Centres. This may sound complicated but the most important thing to realise is that the network is made up of two parts: a local and 'not very long distance' component, which uses traditional — Strowger — technology; and a long distance trunk component, which uses a more modern multi-tone signalling method (see Figure 7.1).
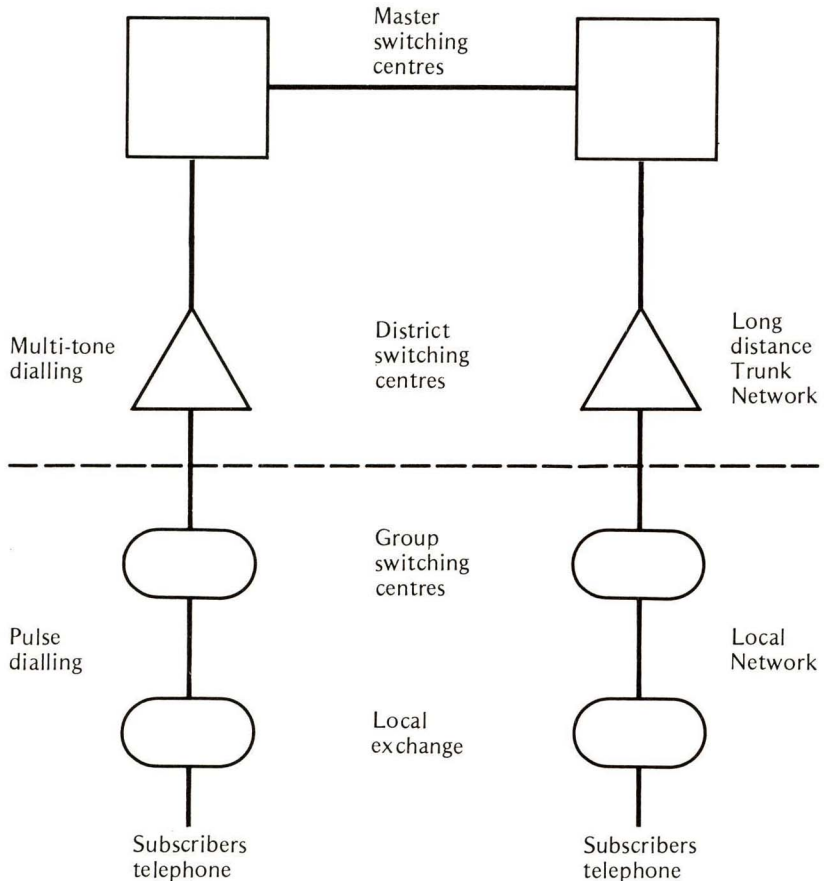
Figure 7.1 The STD network

When you dial a long distance number the first part of the call, to the group switching centre, is completed using the traditional pulsed dialling method. Pulsed dialling is best understood by examining one of the original mechanical dial telephones. Each number that you dial sends a number of grouped pulses down the telephone line. For example, dialling the number 123 sends one pulse, then two then three. (For correct operation the pulses have to be sent at around 10 pulses per second and the mark to space ratio should be 1/3 to 2/3.) Pulse dialling is so simple that you can dial a number by tapping the switch used to hang

up in the correct sequence! Tone dialling replaces the pulses by a sequence of audio tones. This is the method generally used in the USA, and it is a faster way of making a call than our '10 pulses a second with pauses in between' method. Although local calls are connected by pulse dialling, connections beyond the group switching centres are made by multi-tone dialling. That is, the group switching centre stores the number you have dialled and then asks the district or master switching centres to find a routeing for the call by sending coded audio tones to them. The district and master switching centres are clever enough to find alternative routeings for calls at different times of the day and to take account of other exceptional situations.

The tone dialling used to make a trunk call is only present on the line while the call is being set up, but the trunk lines will still respond to some of the command tones — in particular one tone will tell the trunk that the call has finished and the line will disconnect ('clear down') in telecom jargon). The practical significance to the home computer/comms user is that the audio tones used to control trunk lines limit the range of tones that a modem can use. Part of the British Telecom approval is to ensure that a modem doesn't emit illegal tones. This is the reason that a badly designed modem can be responsible for repeatedly disconnecting you during a long distance call. Finally, it is worth noting that the trunk tone dialling system is exploited by phone freaks by sending the correct tones down the telephone handset to give instructions to the trunk lines. Even if you know the signalling frequencies used, phone freaking is no longer a safe occupation because many local exchanges now contain filters and detectors for the dialling tones on lines where they shouldn't be!

On a more domestic level, British Telecom have changed the way that they supply phone connection points. The new style, Type 600, rectangular phone plugs that are now used to connect everything to the phone lines — modems, answering machines, autodiallers, etc. — are also associated with a new wiring scheme. This new wiring scheme allows a number of different devices to be operated in paralled. In other
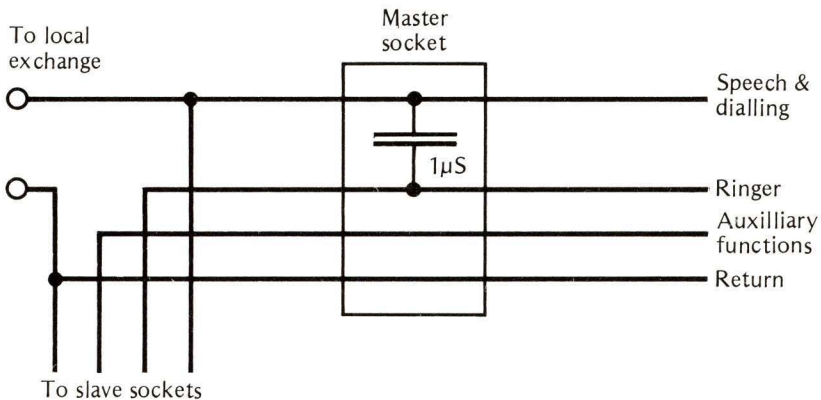
Figure 7.2 The new BT wiring layout

words it is a simpler method of creating extensions. In any telephone installation there is one master socket that converts the two-wire incoming line into a special four-wire arrangement: see Figure 7.2.

One of the four wires carries the speech and dialling signals and another the ringer signal. The third wire can be used for control functions between extensions, and the final wire is simply an earth return. Notice that the only difference between the master socket and the slaves is the capacitor used to separate the speech and dialling signals from the ring signal. All the slaves are simply connected in parallel using the four wires coming out of the master. The number of telephones that can be used on this new system is governed by the Ring Equivalent Number or REN. Each piece of approved equipment you connect to the telephone line is assigned a REN and as long as the sum of all the REN numbers is less than or equal to 4 then everything will work. If you put too much equipment on a single line you will find that calls are sometimes missed because the ringer line will not have enough power to make any of the phones ring.

Packet switching — PSS and IPSS

British Telecom's Packet Switch Stream or PSS network has already been described from a user's point of view in Chapter 4 but it is also an example of an important change in telecommunications methods. Packet switching is the modern digital way to communicate, but strangely enough it has more in common with the traditional postal system than with the telephone network! When you send someone a message by letter post you place the message inside an envelope, address it and pop it in a post box. After this the GPO does all the work of getting it to its correct destination, no matter where that might be, using their standard distribution system. If you post a letter from Newcastle to Plymouth the letter might very well go via sorting offices in several other cities before reaching its destination; each sorting office knows where to send it next by looking at the address. The letter eventually gets to Plymouth even though there might not be any GPO carrier going all the way from Newcastle to Plymouth.

This indirect and flexible routeing is the principle used in packet switching. When you send data via a packet switching network the data is first 'wrapped up' in the electronic equivalent of an envelope complete with an address — this is known as a packet. The packet switching network is made up of a number of special computers connected by high speed communications lines. The packet is then sent on its way through the network from computer to computer. Each computer acts rather like a sorting office in that it reads the address on the packet and sends it on to a computer closer to its destination. You should be able to see that packet switching makes it possible to transmit data from one computer to another without having to monopolise a cable between them. Packets from different sources and intended for different final destinations may be interleaved on the same data line. For example, a computer in

Newcastle can send a packet to a computer in Plymouth sharing some of the same data lines as a computer in Newcastle sending a packet to a computer in London. This should be compared to the conventional dial-up method of exchanging data, where a telephone line all the way from the transmitter to the receiver is monopolised no matter how little data is being transmitted. It is this sharing of common distribution lines that makes packet switching so much cheaper than other methods of data transmission.

In 1980 the Post Office, just before it became British Telecom, introduced the Packet SwitchStream (PSS) service, a completely new data transmission network based on packet switching technology — known as X25. Special packet terminals can be directly connected to the PSS but character terminals, i.e. standard VDUs or microcomputers, have to use a Packet Assembler/Disassembler or PAD (a PAD is in fact a small computer in its own right) to create packets for transmission and to extract the data from received packets. The VDU or microcomputer is usually connected to the PAD by a standard serial link: see Figure 7.3.
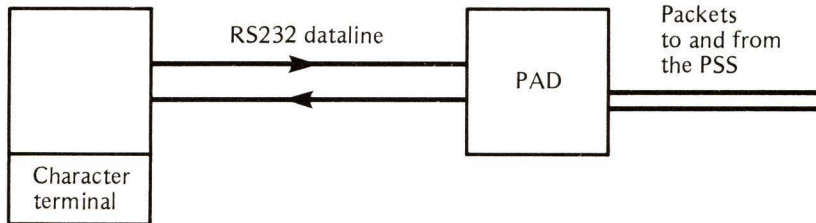
Figure 7.3 The use of a PAD

The PAD is usually kept at one of the Packet Switching Exchanges (PSEs) and the data line is a specially rented connection. For more casual use the PSE provides a number of PADs connected to standard V21, V22 and V23 modems so that they can be dialled up using the Public Switched Telephone Network, PSTN. This is the usual method of access for the messaging service user. Notice that, as the PAD converts the V21, V22 or V23 data stream into packets which are then converted back to a serial stream at the far end, the PSS also provides a way of converting between different communications standards. The PAD can also accept commands from the user and recognises a range of terminal types — see Appendix 3 for more details.

The packets used by PSS each contain 128 bytes and you are charged for the number of packets you use — around 25p per 64K of data — and for the time that you are connected to the PSS — around £1 per hour. When you dial the PSS, the PAD you are connected to initially needs to know where you want to send your data so that when it assembles your packets in can include the correct address. The address is a 12-digit number called the Network User Address (NUA) and this is given in the initial dialogue with the PAD (see Chapter 4 and Appendix 3). After this the PAD simply assembles packets and sends them into the PSS without any more intervention from the user.

As well as local data transmission the PSS can also be used to transmit international data at reasonable rates (compared to the equivalent international phone call). For example, to send data to the USA costs £3.50 per 64K and £6.00 per hour connection charge. Unfortunately, casual use of the system is currently restricted by the need to book ahead to gain access permission to the overseas PSS networks. However, this might change and, if it does, worldwide data communication should be within the reach of everyone.

Some of the problems of using the PSS service, i.e. no support for Prestel graphics and a complicated user interface, are being overcome by the introduction of Multistream. This is essentially only some new software for the PAD computers but it seems to be a big step forward. Multistream supports Prestel graphics by way of special PADs called VPADs. If you are only using a single computer via PSS, Multistream can connect you automatically without the usual PSS dialogue asking for NUI and NUA etc. Finally, Multistream introduces a new error correction code called EPAD for the transmission of data between a PAD or VPAD and modem. This is important because it eliminates most transmission errors between the terminal and the PSS, and this is the only place where errors *can* occur!

Videotex

One of the great advantages of the Prestel system is that it uses a standard set of graphics characters and control codes to alter the display colour and for editing — videotex. It is true that other services use the ASCII code as a standard but this doesn't define any graphics characters and, more importantly, it doesn't define any standard control codes. The lack of control codes is important because without standard control codes the distant computer cannot even do something as simple as clearing the screen. This is the reason that most messaging services work on a 'scrolling' basis and do not offer any screen editing facilities. In contrast to this, every Prestel frame starts with a standard clear screen command and it is this that allows the use of a frame/page-based system. The UK videotex standard is also used by the broadcast systems such as Cefax and Oracle, but in this case it is supplemented by a few extra control codes for features such as screen subtitles.

The standard Prestel frame is 24 rows of 40 characters. Each character is usually made up of a matrix of 10 rows of six or eight dots but this is not universal. The character set includes the full range of upper/lower case letters, digits and mosaic graphics characters. Each mosaic graphics character is obtained by dividing a standard character cell into six parts and colouring some of them in: see Figure 7.4.

To find the character code for a particular mosaic graphics character all you need do is add up the numbers written in each of the small segments in Figure 7.4 for all of the segments that you want to show in the foreground colour.

Videotex uses a system of attribute — that is, colour, size of character,

1	4
8	16
32	64

Figure 7.4 Mosaic graphics characters

flashing, etc. — control known as serial attributes. The way this works is that the control codes which set the attributes are stored in character locations on the screen. They display as blanks in the current background colour and they affect all of the characters to the right of their position. For example, storing a control code for red graphics characters in the fifth location on a line would cause every character from the sixth location to the end of the line to show as mosaic graphics in red. Of course, you can store more than one attribute code in a line to produce more than one colour per line. The full Prestel character set is given in Appendix 4.

The only problem with this character set is that it is too big. Prestel uses seven data bits and this can only represent 128 characters and control codes. To get round this problem all of the attributable codes in columns 4b and 5b are transmitted as two characters: ESC (code 27 decimal); followed by the standard character in the same row in columns 4 and 5 respectively. For example, the two characters ESC,A are sent to stand for the attribute code Alphanumeric red. Although two characters are used to transmit the attribute codes they are recorded to a single-character code once they are received so that they can be stored in one character location in the screen memory area (Prestel buffer in the case of Amstrad Prestel emulators). As the control codes in columns 0 and 1 do not have to be stored in the screen area it is customary to use these codes. For example, the attribute code for Alphanumeric red would be transmitted as the two characters ESC,A but would be stored in the screen memory (Prestel buffer) as control code 01. This complicated coding scheme is used to save both transmission time and the amount of storage needed to display a Prestel frame.

The Prestel computer system

The actual hardware and software used to implement the Prestel system is fascinating in itself. The Prestel system is based on frames of data linked together to form pages. A complete database is formed by linking together frames and pages into larger structures. Each frame contains the number (up to 11) of other frames to which it is connected. The user is normally given a choice of which frame should be displayed next and

in this way the entire database has a branching structure: see Figure 7.5. A Prestel frame is composed of 960 characters and if you add a 64-character frame table to this you arrive at a total storage requirement of 1024 character, or 1K. This is a very convenient storage unit as disk drives can be made to work quite easily in 1K units or records. The frame table contains information about the information provider, how many times the frame has been accessed and the numbers of the 11 frames to which the user can be routed by pressing one of the keys 0 to 9 and #. Thus setting up a Prestel-like system isn't that difficult: all you need is a master menu frame that points to 11 other frames, which are probably submenus, and so on. The only question is, how do you give the user a choice of more than 11 frames? The answer is to use more than one frame to do the routeing. For example, suppose the frame that is selected by pressing 1 is another menu that routes to 10 other frames, then by pressing 1 followed by 4 you will be routed to option 1 on the first menu, and then on to option 4 on the second menu; but if you press the second key fast enough the second menu wil not be displayed and it will look as if you have selected an option corresponding to the number 14: see Figure 7.5.
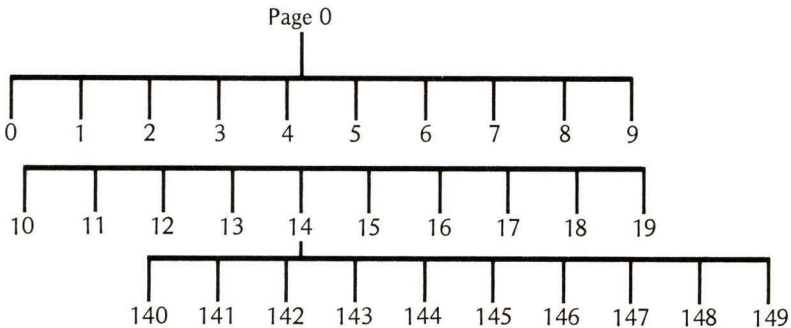
Figure 7.5 The branching structure of the Prestel database (not all pages shown)

The Prestel system is a network of GEC computers linked by high speed lines that form a private packet switching network. There are two types of computer centres: Information Retrieval Centres (IRCs) and Update Centres (UDCs). The network currently consists of one UDC (the Duke computer), six IRCs, called Kipling, Dickens, Keats, Dryden, Derwent and Enterprise, and one special messaging computer (Pandora) which is linked to all of the others: see Figure 7.6. The UDC's role in life is to give information providers access so that they can enter and update their frames. These frames are then distributed to the IRCs via the private lines. This means that identical copies of the entire Prestel database are held at each IRC.

The IRCs are located within areas of high use (London, Croydon and Birmingham) so that as many users as possible can dial direct at local rates. In areas where use isn't high enough to warrant an IRC, local call access is provided by special private data lines and modems to local
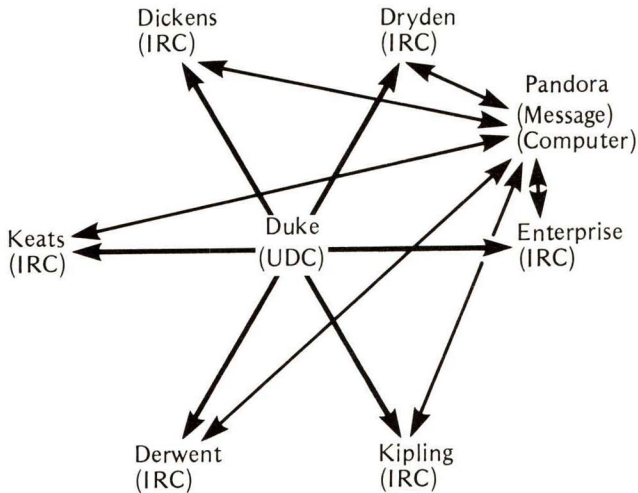
Figure 7.6 The Prestel network

exchanges. However, by the end of 1986 these will have been replaced by a packet switching network that promises to bring local call rates to all users.

Most of the Prestel computers run unattended for long periods of time. However, they are watched over by the rather fancifully named VAMPIRE (Viewdata Access Monitor and Priority Incident Reporting Equipment). This consists of a microcomputer system installed at each computer centre, which monitors the condition of all access ports, detecting conditions such as port free, line in use and incoming calls. This information is displayed graphically in the National Operations Centre and allows the detection of faulty ports and gives an impression of the overall use of the system. There is also a special facility whereby the National Operations Centre is automatically phoned and a pre-recorded message played if a serious fault occurs.

Currently, Prestel serves 65 000 terminals and holds 288 000 frames of information (held on 70M hard disks). Around 9 million frames are requested every week and 150 000 messages are sent, and all of these figures are steadily increasing. The Prestel system is still growing and there are a number of new developments waiting in the wings. In particular, experiments to replace the familiar mosaic graphics with high resolution images are well advanced, to produce Picture Prestel.

Becoming an information provider

If you are contemplating becoming a Prestel information provider then the first thing you need to know is that this activity is not cheap. Unless you intend to contribute large quantities of data it is easier to become a sub-information provider. Many Prestel information providers will create Prestel displays or rent editing facilities and frames to sub-

information providers. For example, the Council for Educational Technology (CET) charge £32 per frame per annum and £60 per response frame (including a daily printout and forwarding of completed frames). CET can be found on page *211#.

Hacking

Hacking is the art of breaking into computer systems or finding your way into areas that normal users are not allowed into. There are three pieces of information needed to break into a computer system: the correct phone number, the operational procedure and the password and/or user number. Although hacking is usually presented in the media as a glamorous activity involving careful analysis and presenting an intellectual challenge, most illegal computer entry starts from leaked information plus guesswork. It is true that to find your way around a computer system requires a great deal of knowledge but much of this is simply a matter of reading a manual and remembering what you read. Of course, you have to get access to manuals and even for legitimate users this can prove difficult — there is an old computing proverb to the effect that the man who has control of the manual is in charge!

If you are attracted to the area of hacking there are a two facts of life worth knowing. The first is that even a harmless break-in to a computer system, i.e. one that does no damage to files nor breaches any security, is likely to meet with as much legal action as a firm can arrange. The reason for this is simply to maintain credibility with their customers and to make an example. The amount of effort that a firm puts into prosecution is almost certain to increase with the amount of publicity that the break-in receives. The second is that with the introduction of the Data Protection Act computer firms are now liable for damages to their customers caused by anyone breaking into their computer system. If they are liable it is only reasonable for them to consider very seriously if there is any chance that they might prosecute the hackers who caused the problem. All in all, there are plenty of reasons for assuming that the general attitude towards hacking will harden over the coming months and years, making hacking a dangerous game.

Appendix 1
When things go wrong

1 Link completely dead

The most common way in which a communications link fails to work is that it remains completely dead, refusing to receive or transmit data. If you are establishing a physical connection for the first time then obviously the suspicion for failure will fall on the RS232 connection itself. In these cases it is usually the handshaking lines that cause the trouble and it is better initially, to try to make a connection ignoring handshaking. If the handshaking lines are either disabled or known to be correct then it is worth checking that pin 2 and pin 3 are connected the right way round. If the RS232 interface is thought to be working correctly then suspicion should fall on the modem. If the computer that you are trying to contact is using an incorrect type of modem, for example a V23 when you are using a V21 modem, then communication will be impossible. Another problem that occurs with modems is that both parties might be using originate or answer modems. To work at all, answer modem has to talk to an originate modem of the same standard. You can usually tell that you have modem incompatibility problems in that the computer that you are trying to dial will repeatedly hang up after a few seconds because it doesn't receive the correct answering tone.

2 Nothing but random characters received

If you are receiving screenfuls of random characters, this generally means that the RS232 link to your modem is working but you are using the wrong data rate or data format. Try changing the receive and transmit baud rates, the number of data bits, stop bits and parity. If this doesn't work then it could be a bad telephone line or a defective modem but both of these are rare.

3 Occasional random characters received

There are two main reasons for this: either there is noise on the telephone line or the remote computer is sending control codes that your terminal emulator cannot make sense of. You can often check for line noise by listening and disconnecting and redialling will often clear the problem. If redialling fails to clear the problem then it is likely that you

are receiving inappropriate control codes. Apart from altering your terminal emulation software, there is generally little that can be done about this.

4 Receive and transmit to remote computer working OK but what is typed on the keyboard doesn't appear on the screen

This is a simple problem caused by the remote computer not echoing back what you type. The solution is to set your terminal emulator to half-duplex so that everything is echoed locally.

5 Everything appears on the screen twice

This is the opposite problem to that encountered in problem 4. In this case the remote computer is echoing characters back and the terminal emulator is incorrectly set to full-duplex. The solution is to change to half-duplex to switch off the local echo.

6 The only characters displayed are solid blocks or ?s

Most terminal emulators display a solid block or a question mark when they receive a character incorrectly. This type of reception error could be a framing error or a parity error, but if it is happening consistently it is almost certain to mean that your terminal emulator is set to the wrong parity. Try odd, even and no parity and if this still doesn't clear the fault, then the only remaining possibility is that the connection is very noisy. Listen to the telephone line and check all of the connections in the serial lead.

7 Double spaced lines

If you are receiving everything double spaced this is because the remote computer is transmitting a carriage return followed by a line feed and your terminal emulator is inserting an automatic line feed after each carriage return it receives. The only solution to this problem is to set your terminal emulator to no auto line feed after carriage return.

8 Lines print on top of each other

This is the opposite problem to 7, in that the remote computer is only sending a carriage return at the end of each line and the terminal emulator isn't inserting an auto line feed after each one. This time the solution is to set the terminal emulator to auto line feed after carriage return.

9 The remote computer hangs up in the middle of a call

The main reason for this is that the signal from your own modem isn't getting through at a sufficiently high volume for the remote computer to detect and so it thinks you have logged off. The simplest solution for this is to dial again and hope that you get a better line. If you are using an acoustic coupler check that the handset is pushed well into the rubber cups and is the correct way round. There are some modem faults that can cause the accidental generation of the 'hang up' command tone on long distance lines but this is rare.

Appendix 2
Useful addresses

AMSTRAD
P.O. Box 462, Brentwood, Essex CM14 4EE. Tel: 0277 23022
BLAISE-LINE — The British Library Bibliographic Services,
2 Sheraton Street, London W1V 4BH. Tel: 01 636 1544 ext 242 or 284
COUNCIL FOR EDUCATIONAL TECHNOLOGY — CET Videotex
Unit,
261/265 Gray's Inn Road, London WC1X 8QT. Tel: 01 837 0436
CIRKIT
Park Lane, Broxbourne, Hertfordshire EN10 7NQ. Tel: 0992 444111
COMET
Istel Ltd, Grosvenor House, Prospect Hill, Redditch. Tel: 0527 64274
DATABASE PUBLICATIONS
Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.
Tel: 061 456 8383
EASYLINK
Cable and Wireless Easylink Ltd, Smale House, 114 Great Suffolk Street,
London SE1 0SG. Tel: 01 928 9001
HOBS
Bank of Scotland Home and Office Banking Service,
P.O. Box 403, 2 Bankhead Crossway North, Edinburgh.
KDS ELECTRONICS
15 Hill Street, Hunstanton, Norfolk. Tel: 04853 2076
MICROLINK
contact DATABASE PUBLICATIONS
MICRONET 800
Telemap Ltd, Durrant House, 8 Herbal Hill, London EC1R 5EJ.
Tel: 01 278 3143
MIRACLE TECHNOLOGY
St Peters Street, Ipswich IP1 1XB. Tel: 0473 216141
MODEM HOUSE
70 Longbrook Street, Exeter EX4 6AP. Tel: 0392 213355
MONODATA
British Monomarks Ltd, Monomark House, 27 Old Gloucester Street,
London WC1N 3XX. Tel: 01 405 4442

ONE-TO-ONE
Scorpio House, 102 Sydney Street, Chelsea, London SW3 6LN.
Tel: 01 351 2468
ONLINE
Personal Computer World, 32–34 Broadwick Street, London W1E 6EZ.
Tel: 01 439 4242
PACE MICRO TECHNOLOGY
Juniper View, Allerton Road, Bradford. Tel: 0274 488211
PACKET SWITCHSTREAM
Customer Service Group, Room G07, Luytens House, 1–6 Finsbury
Circus, London EC2M 7DP. Freephone 2170 or 01 920 0661
PRESTEL
British Telecommunications plc, Telephone House, Temple Avenus,
London EC4Y 0HL. Freephone Prestel or 01 822 1122
PRESTEL CITISERVICE
Woodstead House, 72 Chertsey Road, Woking, Surrey GU21 5BJ.
Tel: 04862 27431
SAGESOFT
NEI House, Regent Centre, Gosforth, Newcastle NE3 3DS.
Tel: 091 284 7077
TELECOM GOLD
60–68 St Thomas Street, London SE1 3QU. Tel: 01 403 6777
TIMATIC SYSTEMS LTD
Fareham Markets, Fareham, Hampshire PO16 0LB. Tel: 0329 236727

Appendix 3
The PSS — commands, codes and characteristics

PAD Commands

You can send commands via the PAD to alter the way that it transmits data. All PAD commands start with a ∧ P (Control P) and then you can set any one of 18 PAD parameters. Most of these parameters are not of any interest to the average user and the few useful ones are listed below:

parameter number	function
2	Echo on/off 0=off 1=on
3	range of data characters in use
	0 none 8 DEL,CAN,DC2
	1 A–Z,a–z,0–9 16 ETX,EOT
	2 CR 32 HT,LF,VT,FF
	4 ESC,BEL,ENQ,ACK 64 NUL to US
	128 remainder of character set
	(Values can be added to give a combination of characters)
4	Time out 0=none 1–255=time in 1/20ths sec.
9	Padding characters after CR 1–7=number of padding characters
10	Line length 0=no limit 1–255=line length
13	Auto line feed after CR =no line feed after CR
	1=line feed after CR from remote
	4=line feed after CR from terminal

127

14   Padding after line feed 1–7=number of padding
                characters

For example to set the PAD to half-duplex (i.e. parameter 2 to 0)

Set 2:0

to set the PAD to full-duplex

Set 2:1

to set the PAD to auto line feed after carriage return

Set 13:4

Pad Profiles
When you log on to the PSS you can set the PAD to any one of twenty
possible profiles corresponding to various terminal characteristics. In
most cases these profiles vary only in line length and number of padding
characters used. Some examples are:

Profile	Characteristics
A1	Full duplex, 8 seconds time out, speed dependent padding and 72 characters to a line
A2	essentially the same as A1 but 80 characters to a line
A3	essentially the same as A1 but 120 characters to a line
D1	Full duplex, 80 characters to a line but no padding
D2	as D1 but 72 characters to a line

Any profile that you select can be modified using the SET command
described above.

Network Error messages
While using the PSS you will sometimes receive one of the following
error messages:

CLR OCC	Called number engaged
CLR NC	Call not connected due to network congestion
CLR INV	Invalid facility requested
CLR NA	Access not permitted
CLR ERR	Invalid request from terminal
CLR RPE	Remote computer error
CLR NP	Number called doesn't exist
CLR DER	Number called out of order
CLR PAD	PSS disconnected call at request of remote

CLR NRC   No reverse charge calls to this number
CLR DTE   Remote computer has disconnected call
RESET ERR   Reset by PAD
RESET NC   Reset by network
ERROR   Invalid command from terminal
INV   Invalid parameter in command

The Hostess On-line directory
The PSS offers its own information service in the form of the Hostess On-line directory. The PSS part of the access to Hostess is free so you only have to pay for the telephone call. The Hostess NUA is A21920100515.

Prestel Transmission Codes

Bits (b4 b3 b2 b1)	Row	0	1	2	2a	3	3a	3b	4	4b	5	5b	6	6a	7	7a
0 0 0 0	0	NUL		(space)	(mosaic)	0	(mosaic)		@		P		—	(mosaic)	p	(mosaic)
0 0 0 1	1		Cursor on	!	(mosaic)	1	(mosaic)	Set verify mode (1)	A	Alphanumeric Red	Q	Mosaics Red	a	(mosaic)	q	(mosaic)
0 0 1 0	2			"	(mosaic)	2	(mosaic)	Set verify mode (2)	B	Alphanumeric Green	R	Mosaics Green	b	(mosaic)	r	(mosaic)
0 0 1 1	3			£	(mosaic)	3	(mosaic)	Skip block	C	Alphanumeric Yellow	S	Mosaics Yellow	c	(mosaic)	s	(mosaic)
0 1 0 0	4		Cursor off	$	(mosaic)	4	(mosaic)	Set programme mode	D	Alphanumeric Blue	T	Mosaics Blue	d	(mosaic)	t	(mosaic)
0 1 0 1	5	ENQ		%	(mosaic)	5	(mosaic)	Tape pause on playback	E	Alphanumeric Magenta	U	Mosaics Magenta	e	(mosaic)	u	(mosaic)
0 1 1 0	6			&	(mosaic)	6	(mosaic)	Tape start	F	Alphanumeric Cyan	V	Mosaics Cyan	f	(mosaic)	v	(mosaic)
0 1 1 1	7			'	(mosaic)	7	(mosaic)	Tape stop	G	Alphanumeric White	W	Mosaics White	g	(mosaic)	w	(mosaic)
1 0 0 0	8	Cursor left	Delete line*	(	(mosaic)	8	(mosaic)		H	Flash	X	Conceal Display	h	(mosaic)	x	(mosaic)
1 0 0 1	9	Cursor right		)	(mosaic)	9	(mosaic)		I	Steady	Y	Continuous Mosaics	i	(mosaic)	y	(mosaic)
1 0 1 0	10	Cursor down		*	(mosaic)	:	(mosaic)		J	End edit*	Z	Separated Mosaics	j	(mosaic)	z	(mosaic)
1 0 1 1	11	Cursor up	ESC	+	(mosaic)	;	(mosaic)		K	Start edit*	←		k	(mosaic)	¼	(mosaic)
1 1 0 0	12	Cursor home & clear screen	Single shift 2	,	(mosaic)	<	(mosaic)		L	Normal Height	½	Black Background	l	(mosaic)	‖	(mosaic)
1 1 0 1	13	Cursor return	Single shift 3	-	(mosaic)	=	(mosaic)		M	Double Height	→	New Background	m	(mosaic)	¾	(mosaic)
1 1 1 0	14	Shift out	Cursor home	.	(mosaic)	>	(mosaic)		N		↑	Hold Mosaics	n	(mosaic)	÷	(mosaic)
1 1 1 1	15	Shift in		/	(mosaic)	?	(mosaic)		O		#	Release Mosaics	o	(mosaic)	▮	(mosaic)

NOTE:

Columns 0 and 1 form the C0 control character set.

Columns 4b and 5b form the C1 set of display attribute control codes.

Columns 2, 3, 4, 5, 6 and 7 form the G0 character set.

Columns 2a, 3a, 4, 5, 6a and 7a form the mosaic character set. The shaded area represents foreground colour.

Column 3b is a non-standardised set of control characters, used from computer to terminal only.

*From terminal to computer only.

Index

AMSTRAD
COMMUNICATIONS
FOR CPC & PCW RANGES

Amstrad computer owners will find this book an ideal introduction to the communications facilities of both the CPC range of machines (the CPC464, 664, and 6128) and the PCW range (the PCW8256 and the 8512).

Throughout the book the emphasis has been placed on the practical aspects of communications within the reach of the majority of Amstrad users.

The book starts with an overview of the major information and messaging services — Prestel, Telecom Gold, One-To-One, Micronet 800, Microlink and others — and then discusses the hardware and software needed to get 'online'. It shows you (with lots of demonstration screen dumps) how to use your computer to send and receive electronic mail, how to use it as an international telex machine, how to go armchair shopping and telebanking and how to derive lots of other interest and entertainment via communications.

After extensive exploration of Prestel and messaging services, the background technology — both in terms of the user's own Amstrad system and the national telephone and data network (the Packet SwitchStream service) — is described to enable you to get to grips with modern communications.