

# Modem Frequently Asked Questions

File: Modem FAQ.sxw

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This document gives answers to some frequently asked questions about modems. For frequently asked questions about software, see "Software Questions", file soft.doc.

The answers in this document generally assume that the user has a 28800 bit/s or faster Maestro Executive, Jetstream or Companion modem which supports V.34. If that is not the case, then some modification of the advice given may be necessary, particularly the modem commands related to setting the maximum carrier speed. All 33.6k and 56k speed modems support V.34.

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## Basic Modem Test

*Q. I suspect that my modem does not work. What can I do to test it?*

A. Start communications software (for example, EasyLink, HyperTerminal, Telix, Cheyenne Bitware, QuickLink, COMit), set the serial port to: speed 57600 bit/s (also known as "Baud rate" in bps) fixed, 8 data bits, no parity, 1 stop bit, RTS/CTS hardware flow control. Check that the RTS light on the modem is on. Send an initialisation string to the modem (just type it in), such as:

```
AT&FT&D2\K4S91=14S95=45
```

Press Enter and the modem should respond OK. If it does not then the modem is not answering commands. That problem must be resolved before you can go any further in this test. See the section "Simple Port Test" for more information.

Issue the dial command "ATD131400" (without the ""), press Enter. The modem should go off hook, dial the Austpac number, you should hear ring-back tone, then answer tone from the remote modem. These tones should get more complex and finally the speaker should cut off. You should see the following

connection report (comments are shown in parenthesis):

CARRIER 14400

(A data carrier speed of 14400 bit/s has been established on the telephone line.)

PROTOCOL: LAP-M

(The normal V.42 error correction protocol used between modems has been successfully negotiated. You should just expect V.42 to start on every connection, if it does not, write down the actual PROTOCOL line reported.)

COMPRESSION: V.42BIS

(The normal V.42bis data compression used between modems has been successfully negotiated. You should also expect V.42bis to start on every connection, if it does not, write down the actual COMPRESSION line reported.)

CONNECT 14400

(The modem is connected, carrier speed is 14400 bit/s. End of connection report.)

After the connection report, the modem is in data mode. Then you will see some gibberish (that is the "welcome banner" from Austpac), but you should see in it most of the word "AUSTPAC". Observe that the "OH" and "CD" (or "DCD") lights are on.

Type "+++", do not press Enter, just wait up to 3 seconds, the modem will respond "OK", the modem is now in on-line command mode. You may now issue commands to the modem while the data connection is maintained. Sending a "break" instead of "+++" is preferable, see below for details.

Issue "AT%Q%LO", press Enter. (Note carefully, that is a letter "O", **not a digit zero** at the end of the command string.) The modem will respond with numbers reporting signal quality (SQ) and line level (LL), then an abbreviated connection report. For example:

003

(Signal Quality of 3. SQ is a measure of how difficult the modem is finding it to extract data from the incoming carrier from the other modem. SQ = 0 is perfect, = 20 is good, = 30 is fair, = 40 is poor, = 100 is terrible. SQ should be below 40. On the Austpac number, the maximum carrier speed is only 14400 bit/s, so SQ would normally be below 7.)

025

(Line Level of 25. LL is a measure of how loud the incoming carrier from the other modem is (in -dBm). LL should be between 20 (loud) and 30 (soft) inclusive. LL < 20 means the signal is unusually loud, which is not normally a problem. LL > 33 means the signal is unusually soft, which can cause problems with the modem recovering data, the gain in the exchange should be increased. Your telephone company may be willing to help.)

PROTOCOL: LAP-M

COMPRESSION: V.42BIS

CONNECT 14400

(The modem is back to data mode. You get an

abbreviated connection report without the CARRIER line. The CONNECT line reports the current carrier speed.)

Write down for future reference, the values for the carrier speed, signal quality and line level. Later, when you repeat the test, you can see whether the figures have become worse or better. SQ tends to get worse, the higher the carrier speed. LL tends to stay around the same. When comparing modems or telephone lines, always test with the same carrier speed. Carrier speed is controlled with the +MS command, **not** by changing the port speed.

Austpac has a short temper, so after a few seconds inactivity, it will automatically hang up and you will see the modem message "NO CARRIER". The "OH" and "CD" lights go off, the modem returns to command mode. If all that has worked, you have successfully dialled out, got connected, seen a connection report, transferred some data and hung up again.

Try dialling again, but with your ISP's dial in number instead of Austpac. You will see the connection report as usual, then the welcome banner from the ISP. Wait until the remote system is expecting some input from you, then go into on-line command mode and check SQ and LL, as given above. Write down the figures for carrier speed, SQ and LL. Feel free to try the Maestro Support BBS (Ph (02) 6253 4844).

### **Exception: 33600 Speed Modems**

It happens that on some modems, it is possible to make the modem include the signal quality and line level figures in the connection report. The modem must be Companion, Jetstream or internal Executive modem. Older Executive external modems are also OK. It must also be 28800 or 33600 speed, without SVD. See the section "Voice Features" for an explanation of SVD. When the command string "ATI6" is issued, the modem must respond "RC288DPi Rev 05BA" or "RCV288DPi Rev 05BA". The "288DPi" part of that response is the critical bit, "288DPL" is also OK.

If all is well regarding the modem type, change the "S91=14" in the initialisation string above to "S91=30". That turns on bit 4 of register S91. The modem then reports SQ and LL in a line just before the CONNECT line. For example:

SQ:003 LL:025

(Signal Quality of 3, Line Level of 25.)

It is then not necessary to go into on-line command mode to get a reading of SQ and LL. Alas, S91 cannot be set to 30 on the present K56flex modems, or modems with SVD, or any Executive external modem, because the data transmit speed is seriously adversely affected. 14400 speed modems do not have the SQ/LL feature in the firmware. Maestro recognises that many customers like to use the SQ/LL line; the defect will be corrected in later firmware revisions.

### **Exception: Using Break**

When you type "+++" to go into on-line command mode, the "+++" characters are sent to the other end. Alas, some service providers have their computers set to echo characters and have failed to turn off the escape character in their modems. In that case, the modem at the other end goes into on-line command mode, as well as yours. Then, when you return to data mode, you find that your service provider gives you no responses. The remote modem is sitting there uselessly waiting for an AT command to make it go back to data mode. The only thing you can do then is to hang up.

Well written communications software allows you to send a "break" to the modem. A break is a continuous series of logical 0 bits on the serial data pin, lasting more than one character time. A break cannot be confused with any character, because all characters are followed by a stop bit, which is guaranteed to be a logical 1. A convenient time for the length of a break is a tenth of a second. Consult your software help on how to send a break and how to control the length of the break.

Provided that \K4 is set, which it is in the initialisation string above, then sending a break to the modem will make it go into on-line command mode without sending any characters to the other end. That avoids the problem of the other modem possibly going into on-line command mode. As far as the remote computer is concerned, your excursion into on-line command mode simply appears as you not typing anything for a while.

If your software allows it, when you want to check SQ and LL, do not type "+++", send a break instead. The modem will respond "OK" as usual and will be in on-line command mode. Proceed as given above.

## **No Dialtone**

*Q. In a basic modem test, the modem responded "NO DIALTONE" to a dial command. Now what?*

A. Issue the command "ATL3H1", that turns the modem loudspeaker volume up loud (L3) and makes the modem go off hook (H1), but do nothing more. The modem will respond "OK". The OH light on the modem should be on. You should hear dialtone on the modem's loudspeaker. When OH is on, the modem is "off hook" and is using or attempting to use the telephone line. When OH is off, the modem is sitting there pretending to be a telephone with the handset down. Other telephonic devices could use the telephone line when OH is off.

If the OH light does not come on, but the modem has responded "OK", then there is a hardware fault in the modem. Send it back to Maestro for fixing. If the OH light comes on, but no dialtone is heard, there are two possibilities, (1) dialtone is not getting to the telephone connector at the back of the modem, or, (2) there is a fault inside the modem.

To test that dialtone is getting to the back of the modem, obtain an ordinary telephone, such as a Touchfone, for test purposes. Business telephones used with a digital PABX are **not** suitable, nor are Commander system telephones. A Touchfone mounted on a wall is easy to remove; give the Touchfone a gentle thump upwards with your hand, it will pop off its bracket, disconnect the short telephone cable from the bracket to the telephone by unplugging the end at the telephone, the Touchfone will then be free. A fax machine often has a telephone built into it, you could use that.

Put the test telephone next to the modem. Unplug any telephone cable from the telephone, so that the US modular telephone socket on the telephone is free. Be careful not to unplug the handset. Unplug the telephone cable from the back of the modem and plug it into the telephone. Lift up the handset and listen for dialtone. If you hear dialtone, and can dial out normally, then the telephone line is OK. If you do not hear dialtone, then there is something wrong with the wiring of the telephone line up to that point. Try different telephone cables or sockets. If need be, call your electrician or telephone company. You must arrange things such that dialtone appears on the ordinary telephone.

Once you have dialtone on the telephone, unplug the telephone cable from the telephone and plug it back into the modem. Check that the OH light on the modem is still on. You should now hear dialtone on the modem's loudspeaker. If not, then the modem is faulty, send it back to Maestro for fixing. To make the modem hang up, issue "ATH". To hang up and reset, issue "ATZ". To go off hook again, issue "ATH1". Check that dialtone appears and disappears as expected. Try issuing a dial command (ATDnnn), the modem should dial out and connect.

In some remote country areas, the dialtone may be slow to appear, due to repeater equipment on the telephone line. The dialtone sounds normal when it arrives, but it is preceded by silence, clicks or buzzes. The modem as standard only waits 2 seconds for dialtone to appear. To make the modem wait for up to 5 seconds, set S6=5. That is enough in all but the most unusual circumstances. In Windows 95/NT put "S6=5" in modem Properties, Extra settings. Alternatively, put "S6=5" in the initialisation string after just before the carriage return. Another way is to modify the dial prefix from "ATDT" to "ATS6=5DT".

Occasionally, the modem is connected to an ancient exchange which does not produce a dialtone sound which the modem recognises. This will not happen in cities or towns. In that case, "S6=5" does not work, use "X3" instead. That will make the modem ignore the dialtone and dial blind. X3 should only be used as a last resort, S6=5 is preferable.

## **Cannot Connect**

*Q. When I try to dial out, the modem goes off hook, I hear dial tone, the modem dials, I hear ring-back*

tone, then the high pitched answer tone from the other end, all as usual. Then the tones just go on and on and finally the modem reports "NO CARRIER". What can I do?

A. The quality of your telephone connection is poor and the modem is trying to connect at a too high carrier speed, so it cannot get carrier established. Then it steps down in carrier speed and tries again. If left for long enough the modem would eventually find a carrier speed low enough so that it could connect. However, the time to establish the connection expires first. Another thing which can happen is that, due to bugs in the firmware, the modem gets "stuck" at some stage in the process and cannot proceed. It just sits there making repetitive noises and does not connect.

The answer is to force the maximum carrier speed down lower, to give the modem a more reasonable starting point. Try around two-thirds of the maximum carrier speed you tried last time. For example, to set the maximum carrier speed to 24000 bit/s, use "+MS=,,,24000". Then check SQ and LL. If SQ is above 40, go down in carrier speed. If SQ is significantly less than 40, you might be able to go up in carrier speed. Try the next step up. For V.34 modulation, allowable carrier speeds are integer multiples of 2400 bit/s, from 4800 to 33600.

The +MS command may be: put in the initialisation string, issued by itself (preceded by AT and followed by <CR>, as usual), put in the dial string, or, in the case of Windows 95/NT, put in the Extra settings string. Just make sure it gets sent to the modem before the D command, without being countermanded, such as by the &F command.

K56flex sometimes has difficulty with automatically selecting a carrier speed. Usually, 42000 bit/s works well, to set that, use "+MS=,,,42000". Note that allowable K56flex carrier speeds are integer multiples of 2000 bit/s, from 32000 to 56000.

Telstra guarantees that their telephone lines will carry 2400 bit/s carrier. To force a carrier of 2400 bit/s and V.22bis modulation, use "+MS=2,0,300,2400". If going down to 2400 bit/s does not work, either:

- (1) The modem at the other end has been set to reject carrier speeds as low as 2400 bit/s. Check with your service provider to make sure.
- (2) Your telephone line quality is really bad. Complain to your telephone company, they may be able to fix it. Have a look at the section in this document "Dissatisfied With Carrier Speed".
- (3) Your modem has a fault. Send it back to Maestro for fixing.

## Gibberish After Connection

*Q. I am trying to get connected using a communications program. Sometimes I get a normal connection report, but quite often, when I try to*

*connect, I get pages and pages of gibberish coming up after dialling. What is going on?*

A. The gibberish on your screen is caused by a "protocol failure", the modem has failed to successfully establish an error correcting protocol. What happens is that the modem initially negotiates a carrier speed which is a little bit too high, then the signal quality is poor so there are a lot of erroneous bits in the data stream. The next thing the modem tries to do is establish error correction, but that fails, so the modem falls back to a non-error corrected connection and you see the gibberish, which comes from the erroneous bits. The same thing can happen in any program which uses the modem to transfer data, but sometimes it is not so easy to see the gibberish.

Sometimes it all works, that is when the modem has initially negotiated a slightly lower carrier speed, signal quality is better, then error correction succeeds. With error correction running, the erroneous bits are still there on the telephone line (but less frequent, due to the better signal quality). The error correction transfers all data in the form of packets, with error detection information attached. If a packet gets corrupted, this is detected, the packet is thrown away and retransmitted. All errors are concealed from you, but an increasing error rate on the telephone line results in a reduced throughput of useful data.

The answer is to reduce the carrier speed using a modem command in the initialisation, so that the modem starts at a reasonable carrier speed every time, then it will establish error correction reliably. The optimum carrier speed will give you reliable connections every time with the best possible throughput for your particular telephone line.

Let's say you wanted to reduce your carrier speed to 24000 bit/s and force an error corrected connection every time. Send the initialisation string:

```
AT&FT&D2S91=14S95=45S36=4+MS=,,,24000
```

The 24000 can be modified to one of the other allowable carrier speeds. Allowable carrier speeds in V.34 are integer multiples of 2400 bit/s. Allowable carrier speeds in K56flex are integer multiples of 2000 bit/s. See the +MS command in the Executive series modem manual for full details. Check the signal quality (SQ) and line level (LL) using the same technique shown in "Basic Modem Test" above. If the SQ is above 40, reduce the carrier speed. If it is below 40 then that is satisfactory and it may be possible to increase the carrier speed.

## Testing for Optimum Carrier Speed

*Q. When I had an old E144FM my performance was better than with my new modem. What is going on? How can I improve the performance?*

A. What can happen is that the modem initially negotiates a carrier speed which is a little bit too high, then the signal quality is poor so there are a quite a few erroneous bits in the data stream. However, error correction is successfully established, so you do not see the errors. The error correction spends most of its time throwing away erroneous packets and relatively little time transferring useful data, resulting in poor throughput. This problem is much more likely to happen with new fast modems because higher carrier speeds are inherently more sensitive to telephone line degradations than the older slow carrier speeds.

The answer is to improve the telephone line quality and/or force the carrier speed down a little, then get better signal quality, less errors on the telephone line, less packets thrown away and much better throughput. To improve the telephone line quality, see the answer "Improving Telephone Line Quality". For a V.34 capable modem, the way of controlling the carrier speed and modulation type is to use the +MS modem command.

Perform a basic test, as given in the answer "Basic Modem Test". Then test again with the service you are having trouble with. Issue the dial command string "ATDnnn" where nnn is the modem phone number of the service. The OH light on the modem will come on, the modem will dial and connect. The connection report will look something like this.

```
CARRIER 28800
PROTOCOL: LAP-M
COMPRESSION: V.42BIS
SQ:020 LL:024
CONNECT 28800
```

That was got with an E336FM, by dialling a local Internet Service Provider here in Canberra. The significant thing is that the carrier speed is 28800 bit/s and the signal quality is 20. The signal quality of 20 is excellent for that carrier speed. The protocol line and the compression line indicate that the usual error correction and data compression have been established. Line level of 24 is good. Note that the connect line is reporting the carrier speed, not the port speed.

SQ and LL are defined in the section "Basic Modem Test". The Signal Quality number tends to increase as the carrier speed increases, so a higher SQ figure is tolerable at higher carrier speeds. Port speed and carrier speed are defined in the section "Port Speed and Carrier Speed".

After the connection report, the DCD (Carrier Detect) light will be on, the modem is in "data mode". There will be a "banner" from the remote system. The banner is a welcome line or lines which normally give the name of the service and maybe a few other details. Remote systems vary enormously in the friendliness of their banners. The unfriendly ones give no banner at all, they expect you to initiate the transfer of data. Try to get at least some response from the remote system,

pressing Enter often works. If you see something and it looks normal then data has been successfully transferred. Hang up, using the usual facilities of your software (normally, DTR is made false for a few seconds, the DTR, OH and DCD lights go out).

If the signal quality is poor (that is SQ > 40), you will need to reduce the carrier speed. For example, suppose you wanted to try a maximum carrier speed of 24000 bit/s. Issue the command string:

```
AT+MS=,,,24000
```

The modem should respond OK. Then reissue the dial command string and recheck the carrier speed and signal quality. You may need to try a variety of carrier speeds and modulations. For V.34 modulation, the valid carrier speeds are all integer multiples of 2400 bit/s. For K56flex modulation, allowable carrier speeds are integer multiples of 2000 bit/s. While you still have connection problems, keep reducing the carrier speed. Changing the modulation usually has a minor effect. Always use V.22bis modulation for a carrier speed of 2400 bit/s, V.34 is not well designed at that speed. If the connection is good, try going up one step. The optimum carrier speed will give you the best possible throughput and a reliable connection.

When you have an acceptable carrier speed then include the necessary +MS command in the commands sent to the modem when dialling the service. For example, say you were using Windows 95 and you had concluded that 24000 was an acceptable carrier speed, then put "+MS=,,,24000" (without the " characters) into Connection, Advanced, Extra settings.

It is a good idea to experiment with calling a variety of services and see what carrier speed and signal quality you get with each of them. What signal quality figure you are expecting will tend to get larger for higher carrier speeds. Variations in the quality of the telephone line will make the signal quality change. Large variations will make the carrier speed change. If signal quality suddenly goes bad one day, you know that something has changed for the worse. Your telephone company may do some work and improve your line or exchange, then your optimum carrier speed may increase. It is a good idea to keep a record the carrier speed, signal quality and line level you get. Repeat the testing every so often to see if the quality of your telephone line has changed.

The real parameter of importance is the actual throughput in bytes per second of useful data. That is often hard to measure on an ISP. On a BBS it is much easier, you just do a Zmodem download of a large zip file, say 1 or 2 megabytes, time the transfer with your watch and compute the throughput from that. Zmodem is such a beautifully efficient file transfer protocol that you can ignore the overhead with negligible error. Things are not so nice with the Internet, overheads are higher. Probably the best thing would be to use an FTP program and download a large file with that. Make sure the file exists at the ISP so there are no other links

involved. Use a zip file, which is already compressed, so any data compression -- in the Internet software or the modem -- does not confuse things.

## Port Speed and Carrier Speed

*Q. Why does my software say I am connected at 57600 bps when my modem speed is only 33600?*

The 57600 refers to the port speed. Modems are rated by the carrier speed. The term "connect speed" is vague, so I avoid it.

The port speed is the speed (in bits per second, bit/s) on the serial port between the modem and the computer. It is also known as the "Baud rate" in bps. The carrier speed is the speed out on the telephone line. These speeds are different with the port speed being the higher. This is so that the data throughput is only limited by what is happening on the telephone line and not the port. The error correction and data compression built in to the modem can mean that a port speed of more than double the carrier speed may be required on compressible data.

I use the abbreviation bit/s rather than bps because (1) In the SI system the abbreviation p means "pico", / means "per". (2) I spell out "bit" rather than just b to avoid ambiguity between bits and bytes. Such ambiguity is dismayingly common amongst careless writers. I use B/s when I mean bytes per second, I expect alert readers to notice the capital B for byte.

The port speed is usually not of much interest, provided it is high enough and there are no flow control problems or missed interrupt problems. A missed interrupt is caused by the computer being too slow in answering an interrupt from the serial port, the result is a "data late error" whereby a byte of data in the serial port is lost. Check the modem documentation for the highest available port speed, usually 115200 bit/s. I normally recommend 57600 bit/s as a compromise between going as high as possible and avoiding missed interrupts.

Alas, Microsoft does not seem to facilitate the reporting of missed interrupts. The serial port chip is obediently setting the data late bit in its Line Status Register, but getting that information out of the operating system is difficult. You see, a missed interrupt is "shameful", things like that are not supposed to happen, so nobody wants to talk about it. It would be nice to set the maximum port speed, if there was any confidence that data late errors were not happening. It happens that one of the glorious features of Maestro internal modems is that there is a flow control link between the receive data register -- which is part of the built-in serial port -- and the rest of the modem, so data late errors cannot happen. I set the highest possible port speed on an internal modem with confidence.

57600 is always adequate for 33600 speed modems and below, provided highly compressible data is not being sent. For 56k speed modems, a port speed of

115200 is preferable, provided data late errors are not happening. In practice, data which will compress more than a factor of 2 is most unusual. Plain text files typically give a compression factor of about 1.7. Some ISPs permit you to turn off data compression in the modem and use software compression instead, if you can do that then 57600 is adequate under all circumstances.

Set RTS/CTS hardware flow control unless there is some overwhelming reason forcing otherwise. With very few exceptions, 8 data bits, no parity and 1 stop bit is used universally as the character format.

The thing which is really important is the carrier speed. A modem, as standard, will report the port speed when it connects to another modem, but it can be set to report carrier speed and other things. Look in the modem manual under the W command, \V command, register S91 and register S95.

K56flex, V.34 and V.FC modulations support asymmetric carrier speeds. The receive carrier speed can be different to the transmit carrier speed. On a modem connection there could be **four** different speeds involved, (1) the port speed at the originate end, (2) the transmit carrier speed, (3) the receive carrier speed, (4) the port speed at the answer end. What is reported in the CARRIER line in the connection report is the receive carrier speed. The signal quality (SQ) and line level (LL) figures also refer to the receive carrier. Your modem cannot find out the SQ and LL figures in the transmit direction, the remote end would need to measure those figures and report them to you.

The modem will report the transmit carrier speed in a "one line connection report", turned on by the \V1 command, which is only available in modems supporting V.34. When \V1 is set, the CARRIER, PROTOCOL, COMPRESSION and CONNECT lines in the connection report are suppressed. For example, the modem is in on-line command mode and you issue "AT%Q%L\V10", press Enter. The modem returns to data mode and might report (comments in parenthesis):

```
030
(SQ is 30 – quite good)
015
(LL is 15 – K56flex connections are usually quite
loud)
```

CONNECT

```
57600/K56/LAPM/V42BIS/31200:TX/44000:RX
(Port speed is 57600 bit/s, modulation is K56flex,
error correction is LAP-M (that is, V.42), data
compression is V.42bis, data transmit carrier speed is
31200 bit/s, data receive carrier speed is 44000 bit/s)
```

## Improving Telephone Line Quality

*Q. What can I do to make my telephone line as good as possible so I can get the best throughput available at my location?*

A. Other devices on the same telephone line can introduce distortion into a modem signal, even when they are not being used (that is, on hook). Then the signal quality is degraded which then results in lower throughput. Make sure your telephone line is as good as possible by unplugging all other telephonic devices from the telephone line which is being used by the modem. I regard all other telephonic devices as guilty until proven innocent. Things like extension leads, double adaptors and lightning arresters do not matter, telephones do. Old Touchfone 200s were particularly bad.

Test without the other telephonic devices, taking note of the carrier speed, signal quality and line level you are getting. Plug the suspect telephonic devices in again one by one and retest each time. You will find most of them do not adversely affect the signal quality, but some do. The bad ones must be disconnected every time the modem is used.

Make sure you know how far away you are from your local telephone exchange. The modem signal is digitised at the exchange, but the signal is subject to attenuation, noise and distortion on the way there and back. Most telephone lines are less than 10km long. More than 10km means you are in a rural area and all kinds of defects may occur. Your telephone company may be able to fix line defects, but you normally need a strong written argument with lots of facts, before they will do anything drastic.

Call waiting tones will cause an unexpected hang up. Turn off call waiting with #43#.

Avoid damage to your modem from lightning by installing a lightning arrester. There are ones which cover both power and the telephone line available from Dick Smith, Jaycar, Tandy, etc. I bought one years ago for \$60.00 and I have been utterly careless about unplugging my modem ever since and I have had no trouble.

## No Data When Connected

*Q. The modem dials out and appears to connect, making all the right noises, but then no data flows. What is wrong?*

A. Sounds like a flow control problem. As standard, the modem uses RTS/CTS hardware flow control (that is, &K3 is set). If RTS is off then no data will flow when the modem is in data mode. Check that RTS/CTS hardware flow control is on in the software. Check that the RTS light shines steadily.

## Some Brands Fail to Connect

*Q. We are an Internet Service Provider and we are finding that some customers have difficulty connecting to our service. They try to call, our modem answers but the two modems do not get connected. What can be done?*

A. Our modems conform to the latest international and Australian standards. It can happen that another brand of modem has difficulty connecting at a high carrier speed. What happens is that the two modems try to connect at the highest possible carrier speed, that fails, so they try the next one down, that fails too, they try the next one down and so on. Ultimately, if left long enough, the modems will connect. Alas, this process can take so long that the time for connection expires first. Then the modems hang up and the result is a failed call. The answer is to (1) make the quality of the telephone line as good as possible, (2) conduct some testing directed at finding a carrier speed with acceptable signal quality, (3) put the necessary modem command to restrict the carrier speed into the modem init string or dial string which is used when contacting your service.

## Touchfone Troubles

*Q. When my modem connects, everything is fine and throughput is good for about 15 minutes, then the throughput gets noticeably slower and the modem unexpectedly hangs up. My old Telstra Touchfone 200 on the same line has never given me the slightest trouble. What is going on?*

A. Old Touchfone 200s made before 1991 have a capacitor used to keep alive the internal memory for the stored phone numbers. There is a circuit which tries to keep that capacitor charged by taking some current from the telephone line. In doing this, the Touchfone introduces distortion into the telephone line signal about 15 minutes into a call on the same telephone line. If the call is a modem connection, this makes the modem signal quality go bad, then there will be many data errors. Modern modems will normally have error correction running, so those data errors will not be passed through to the computer, but they will drastically reduce throughput. The modem has to either train down to a much lower carrier speed or hang up. The hang up is unexpected.

Note that this happens when the Touchfone is not being used in any way. Normal operation of the Touchfone is quite unaffected. It is rather easy to not notice a Touchfone plugged in elsewhere on the same telephone line. For example, in a residential situation, there might be a telephone in the kitchen and another in a bedroom, wired to different sockets but on the same telephone line. A naive user could unplug the one in the kitchen but quite forget about the Touchfone in the bedroom, then wonder why there are still problems with the modem.

The answer is to completely unplug all telephonic devices on the line, other than the modem, including

all Touchfones. Alternatively, some sort of switching arrangement could be used, which isolates the other telephonic devices; for example, a message stopper.

## Message Stopper

*Q. Is there some way to have other telephones connected to the same telephone line as my modem without the telephones adversely affecting the modem even if someone picks up a telephone handset?*

A. Yes. Use a "message stopper". This is a small cheap telephone switching device, sold by Maestro and electronic suppliers (for example, Dick Smith, Jaycar, Tandy) for around \$10.00. It is intended for the case where there is an answering machine and a telephone connected to a telephone line, using the message stopper. Picking up the telephone cuts out the answering machine, thereby stopping its outgoing message. Hence the name "message stopper".

It is actually a general purpose accessory which can give one telephonic device priority over another telephonic device. In the original "message stopper" use, the telephone has priority over the answering machine. The most common type has one US modular telephone plug where it is plugged into the telephone line; it also has two modular sockets, one for the higher priority device (labelled "phone") and the other for the lower priority device (labelled "ans"). Internally, it is simply two back to back zener diodes (around 12V) in series with the lower priority device.

For use with a modem, plug the modem into the "phone" socket, or, just connect the modem directly to the telephone line. Plug the telephone (or telephones via double adaptors and extension leads as necessary) into the "ans" socket. Then, whenever the modem is using the telephone line, the telephones will be dead. No telephone will be able to interfere with the modem signal. The telephones should behave normally when the modem is not using the telephone line.

## Internal Modem is Slow

*Q. Using the same telephone line, an external modem will download a test file at 6.4kB/s, but with an internal modem (no IRQ or address clashing) the same file will only download at 2.2kB/s. Why?*

A. Check that the port settings and everything else was the same. Maybe the internal modem is experiencing electrical interference from the rest of the computer. Try moving the modem as close to the computer case as you can. Leave at least one spare slot between it and the other expansion cards. One exception to that rule would be a sound card; they are usually quiet. If you get desperate try shielding the modem with aluminium foil or tinfoil. Be careful that the shield is well insulated and does not contact anything not earthed.

On rare occasions, interference can adversely affect an external modem. If you suspect that might be happening, try wrapping the external modem in aluminium foil and see if things improve.

## Changing Transmit Levels

*Q. I have done a Telstra Faxstream TestFax Plus with my modem and it reported that the fax Transmit Level was low by 7 dB. How can I increase my Fax transmit level?*

A. It is not really a problem, receiving fax devices have lots of gain so a low transmit level is OK. The fax transmit level on our modems is set to -15dBm in accordance with Austel standards. Higher transmit levels may introduce distortion into the signal.

Should you wish to increase the fax transmit level, that is controlled by register S92. When bit 7 = 0, the fax transmit level is locked at -15dBm. When Bit 7 = 1, the fax transmit level is controlled by the least significant 4 bits in S92. Setting the fax transmit level louder than -10dBm is likely to introduce distortion.

S92 bit 7 also affects the data transmit level, set by the least significant 4 bits in S91. When S92 bit 7 = 0, the data transmit level can only be set to -14dBm or -15dBm, setting the least significant 4 bits in S91 to values between 0 to 13 results in a data transmit level of -14dBm. When S92 bit 7 = 1, the data transmit level is set by the least significant 4 bits in S91, as documented in the manual. Setting the data transmit level louder than -10dBm is likely to introduce distortion. In particular, setting it to 0dBm will result in a failed data connection every time.

Registers S91 and S92 are unusual in that they are inherently non-volatile. They are not stored in either of the stored profiles. They are saved immediately to the modem's non-volatile memory as soon as they are changed. Their values are unaffected by power cycles, the Z command or the &F command. They can be regarded as like a little bank of switches, once they are changed, they stay changed until they are changed again.

To change S91 and S92 sensibly, you will require a firm grasp of how to convert between decimal and binary. You will need to understand decibels. You will also need to know how to set and inspect the values of S registers. I recommend S91=14S92=15 as defaults.

For example, to set the fax transmit level to -10dBm, include in your fax transmit initialisation "S91=14S92=138" (without the ").

## 56k V.90 Upgrade

*Q. Could you tell me are there any plans to enable existing 33.6 Maestro Executive and Jetstream modem owners to upgrade to 56k? How about the new International standard for 56k?*

A. The International Telecommunication Union "determined" the new V.90 draft standard for 56k modulation on 6 February 1998. The technical details are now fixed, apart from possible minor corrections. A period of extensive interoperability testing occurs



after the determination. V.90 was previously referred to as V.pcm; that name is now obsolete. After possible editorial changes, V.90 is expected to be "ratified" by the ITU in September 1998, it will then be a complete, official standard.

All manufacturers may now make and upgrade modems to support V.90. Rockwell has stated that Rockwell-based V.90 modems will also support K56flex. Present Maestro 56k modems support Rockwell K56flex. V.90 is very similar to K56flex, 10 out of 11 major issues were decided in favour of K56flex. 3Com has stated that modems based on their x2 technology will be able to be upgraded to support both x2 and V.90. It is expected that all service providers will upgrade, as a matter of urgency, their central site modems to support V.90 as well as either K56flex or x2, depending on what they had before.

Maestro K56flex modem owners need not hurry to upgrade to V.90 if their service provider already supports K56flex. The performance of V.90 and K56flex should be virtually identical. If a service provider you want to connect to does not support K56flex, does support V.90, and you are bothered by being forced down to V.34, only then is there any urgency to upgrade to V.90.

Maestro policy is to examine new Rockwell code and not to ship those versions which are unacceptably buggy. Maestro also customises for Australian conditions, adds Maestro-exclusive features and tries to correct any bugs found. Alas, a side effect is that Maestro often does not have the latest firmware revision. However, this policy does mean that Maestro customers generally experience industry-leading reliability and functionality. We think customers prefer that.

Existing 56k Maestro modem owners will be offered very economical upgrades to the new V.90 International standard for 56k, when suitable firmware is available. Please check our Web site (<http://www.maestro.com.au/>) for available upgrade options. Click on Upgrades to see an explanation.

## Distinctive Ring and Adaptive Answer

*Q. Recently, Telstra introduced "Faxstream Duet" where a second phone number for a fax device is added to an existing single telephone circuit. The modem can be set to accept the ring cadence used to identify incoming fax calls, but will not respond to the normal ring used for the existing service. What is the difference between distinctive ring and adaptive answer?*

A. Two or more phone numbers can be allocated to the one telephone line. Which number has been called can be indicated by different "distinctive ring" cadences, easily distinguished by ear -- and by suitably made telephonic devices. Distinctive ring can be used to distinguish between different incoming call types, such

as voice or fax. There are two rings commonly used, DR0 and DR7. DR0 is the traditional Australian ring-ring sound, with two rings. DR7 is the ring cadence Telstra wants to use for fax, it consists of three short rings. Alas, Telstra's distinctive rings are different from the US equivalents. All Maestro 56k modems support distinctive ring. For 33600 speed modems, there will be an upgrade to support distinctive ring, available at some time in the near future. Please check our Web pages for an announcement when that upgrade is ready.

For example, to make the modem respond only to the fax ring cadence, three short rings, include "-SDR=4" in an initialisation string sent to the modem. The modem will ignore all ring cadences except those with three rings. It will report incoming three-ring cadences as "RING3".

Adaptive answer is where the modem (in conjunction with the software) works out what type of incoming call (voice, fax or data) it is, **after** the modem has answered. All modern fax devices produce fax calling tone (CNG) immediately after dialling. Data calls can be set (using the ^ dial modifier) to produce V.25 calling tone, which has a different frequency and cadence from fax CNG tone. Voice calls produce no calling tone. After the modem answers, it starts off assuming that the call is a voice call and begins the outgoing voice message. Meanwhile, it is listening for fax or data calling tone. If it hears fax calling tone then it switches to receive the fax. If it hears data calling tone, a data connection is negotiated and a host mode program is started, which looks like a BBS to the incoming caller. The caller can then upload/download files, etc. Naturally, all this stuff can be selectively turned on and off in the software. The host mode can have passwords to give a greater or lesser degree of privilege to various incoming callers. Instead of a BBS program, data callers could be given remote access to a LAN, or an Internet connection, or whatever other data service you feel like setting up.

Distinctive ring is usually used to indicate the call type, thus telling you whether it is a fax or voice call at the time of the incoming ring. That is convenient for people with an ordinary telephone on the same line as the modem (or a fax machine). However, the distinctive ring actually tells you nothing about the call type, it actually tells you which number the caller has dialled. That can be used with adaptive answer to do things like having the voice number for people who want to speak to you, but if they want to leave a message then they call on the fax number. It would be possible to have one telephone line with several different distinctive ring numbers, each one of which could do adaptive answering. Each number could have a different outgoing message and a different data service. All this would need just one modem. Alas, there is presently no software known to me which supports all that.

It is possible to use distinctive ring with modems which do not support distinctive ring, after a little testing, then suitably adjusting your software.

It is necessary to test the modem's response to incoming DR7 and see how many occurrences of the word "RING" happen for each occurrence of DR7. Connect a telephone in parallel with the modem so you can hear the incoming rings. Start communications software, check that the modem answers commands, check that there is one word "RING" occurring for each incoming DR0. Call in on the DR7 number. There are three possible situations:

(no RING happens) The modem responds normally to DR0 and ignores DR7. Use DR7 for voice calls, use DR0 for fax.

(one RING happens) The modem cannot distinguish between DR0 and DR7. You need an upgrade so that your modem will support distinctive ring. Alternatively, use an external switching box which has distinctive ring support, such as the National Communications Easy Connect Pro.

(two RINGs happen) Set your fax software to answer after 10 rings. Fax callers use DR7 and get an answer after 5 DR7s. Voice callers use DR0 and you have 10 rings to answer. After that the modem answers and your callers would hear fax answer tone.

## Handset

*Q. What is the handset feature?*

A. The "handset" socket on the back of Woomera modems, is where an ordinary telephone can be plugged in. It is correctly switched for that. However, full handset support would mean being able to record and replay voice messages through the handset socket, but that is actually a silly thing to do. That function is far better done using the sound card in the computer. So full handset support is also not an important feature. We do not offer full handset support on any Woomera modem at present. It is possible we may never do so.

## Speakerphone

*Q. Can I have speakerphone?*

A. Speakerphone allows you to use the modem as a hands free speakerphone. Alternatively, plug in a headset and it can be used as an ordinary telephone, but you still have both hands free. You happen to be speaking through the electronic circuitry of the modem instead of the electronic circuitry of a telephone. You are just doing a normal telephone call. No ISP or other modem is involved. The person you are talking to only needs a normal telephone.

Woomera modems have speakerphone capability available as a no-charge option at time of manufacture. Order model W+56FVESP-D at the normal price, direct from us and you have it. We do not advertise it

yet since we are short of speakerphone chipsets. Alas, the upgrade is so difficult that we do not offer it as an upgrade to an existing non-speakerphone Woomera modem. Dealers are unlikely to have the speakerphone version in stock. Buying direct from us is the best way. Please call Sales on our General number to make the arrangements.

## Distinctive ring

*Q. Can the modem be set so that it only answers the fax ring and not the voice, and can it be set to answer both?*

A. Yes. The standard software shipped with a Woomera modem, QuickLink Message Center III, supports that.

## Multiple Number

*Q. Can a modem also detect the third type of ring sent by Telstra as part of their multiple number service?*

A. Yes. The modem can distinguish between any two-ring cadence (such as DR0, the normal Australian voice ring) and any three-ring cadence. Multiple Number uses DR6 and Faxstream Duet uses DR7, which are both three-ring cadences. The modem does not at present distinguish between DR6 and DR7. However, if there was any significant customer demand for that feature then we would consider making it available in a later version of the firmware. That would then be available as a free flash upgrade from our Internet site. However, I am told by Telstra that they will not provide both Multiple Number and Faxstream Duet on the one telephone line, so the necessity to distinguish between DR6 and DR7 should not arise.

## Caller ID

*Q. What is Caller ID? Do your modems support it?*

A. Caller ID is where the exchange transmits the telephone number of the calling party when the phone is ringing. The called party can decode the number (with suitable equipment), recognise who is calling and answer appropriately. It is also much easier to call back the caller. The USA has had Caller ID for many years. Alas, the Telstra Australia method of implementing Caller ID is different from The American Way. The technique used is to send a little burst of V.23 modulation (Bell 202 in USA) with the data in it, between the first and second rings.

No Maestro modem presently supports Caller ID. Executive external modems will do so in the near future. The firmware must be modified to suit the Telstra Caller ID, then it must be tested. Alas, we are still waiting for Telstra to implement Caller ID in our area. Please check the Maestro web site for an announcement when upgrades to support Caller ID are available. There are no present plans to make Jetstream or Companion modems which support Caller

ID. When new Executive internal modems are developed, they will support Caller ID.

## Voice Features

*Q. What does a voice modem do that a non-voice modem does not do?*

A. There are five levels of voice capability:

1. Non-voice. A non-voice modem can only make modem noises, capable of being understood by another modem, but not by a human being. The modem can transfer data at speeds up to its rated data carrier speed. It can also send and receive faxes at speeds up to 14400 bit/s.

2. Voice. A basic voice modem has data capabilities, fax capabilities and can send and receive voice messages, just like an answering machine. You can set up a full voice mail system if you wish. The standard software shipped with the modem supports that. The voice messages are sent to and from the modem in digital form, through the normal serial interface (or computer bus interface, for an internal modem). The modem cannot be used as a telephone. All references to speakerphone capabilities in the software should be ignored.

3. ASVD. The modem has all basic voice capabilities plus AudioSpan Simultaneous Voice and Data. A data connection can be established such that some of the data speed is sacrificed to allow a simultaneous voice conversation, using an external microphone and headphones (or headset) plugged into the modem. There must be a similar modem at the other end. ASVD is liked by game players. Audio quality is poor.

4. Speakerphone. Voice, ASVD, plus the modem can be used as a telephone, either as a normal telephone with a microphone and headphones (or headset) plugged in; or, as a speakerphone using the internal microphone and speaker, or external microphone and speaker. The modem has a chipset with two analog inputs, with special provisions to avoid "howl round".

5. DSVD. Has everything: voice, ASVD, speakerphone, plus Digital Simultaneous Voice and Data (DSVD), whereby the voice is digitised, compressed, then mixed in with the data. The available data speed is adaptively shared between voice and data. Voice quality is much better than ASVD. To use DSVD, another DSVD modem must be used at the other end.

It would be possible to arrange an analog link from the modem's speaker output to an input on the sound card, thereby allowing the modem sounds to appear on your sound card's loudspeakers. That way you would not need an extra loudspeaker to hear what is going on at the modem's loudspeaker output.

The sound card is only used for voice conversations when using Internet voice software. It cannot be used for voice conversations during an ordinary phone call.

You could put a speaker-telephone in parallel with the modem and use the modem to do the dialling, then go off hook on the telephone and the call would continue as a normal voice call.

Use the command string "ATDTnnn , , ;H" to dial, where nnn is the desired telephone number. The modem will go off hook, dial the number (you hear the dialling happen on the modem's loudspeaker), wait 4 seconds then hang up. During those 4 seconds you hit the button on the phone to go off hook with speaker, or, lift up the handset.

Alas, some telephones adversely affect modem data signals, so you may not be able to just leave the telephone connected in parallel with the modem. Do some testing at the highest possible carrier speed and find out if the telephone adversely affects the modem throughput.

## No Audio Connectors on Internal Modem

*Q. My internal voice modem does not have a microphone input socket or an audio output socket. Am I missing out on anything?*

A. No. The speaker and headphone connections on an external voice modem are just connected to the normal modem speaker output, so there is nothing particularly remarkable about them. Most owners of internal modems are technically capable, so it is no great feat to solder a couple of wires to the speaker output and direct that to the sound card. For a basic voice modem, the modem microphone input is actually only used for recording voice messages. This function is better done through the sound card anyway, so not having the microphone input on the modem is no hardship either.

## Serial Port Chips

*Q. I have slow serial ports in my computer, reported by diagnostic software as an 8250 UART chip. I am interested in upgrading to the faster 16550 UART. What is the difference between the 8250, 16450 and 16550 UARTs?*

A. A UART (Universal Asynchronous Receiver Transmitter) is the heart of a serial port. It is the chip which does the conversion between the parallel data format on a computer expansion bus, to the serial data format used with modems. Serial ports on the old XT computer used the 8250, which is now obsolete. The 16450 UART (referred to as a 450) is pin for pin and function for function identical to the 8250, so software often reports an 8250 when there is actually a 450 there. The 450 has shorter data read times than the 8250, so it is the chip always used instead of the 8250, in 286-class machines and above.

One characteristic of the 450 is that it generates one interrupt to the CPU for every character passed through the port. As the speed through the port increases, then the time available for the CPU to

service the interrupt gets smaller and smaller. Ultimately the CPU starts missing interrupts, thereby causing "data late errors".

The 16550 UART (referred to as a 550) was developed to deal with this problem. It has internal 16-byte First-In-First-Out buffers (FIFOs) on both the transmit and receive sides. But, it powers on emulating a 450, the FIFOs must be turned on by software. Provided the software enables these FIFOs, the CPU can transfer multiple characters on each interrupt and has multiple character times in which to service the interrupt. This greatly reduces the problem of data late errors caused by missed interrupts. Alas, it does not completely prevent missed interrupts because CPU intervention is still required for flow control, thus it would still be possible for a very long delay in servicing an interrupt to cause a FIFO overflow.

In most serial cards, the maximum port speed is limited to 115200 bit/s, regardless of which chip is used. The 550 is considered "faster" than the 450 because it allows the port speed to be safely set higher in typical machines. With correctly written driver software, a 450 could be used at 115200 bit/s in a 286-based computer. However, solving the missed interrupt problem is hard, so putting in a 550 is the practical solution. The 550 also reduces the amount of CPU time spent servicing interrupts.

There is a new 650 chip which has 32-byte FIFOs and facilities for hardware flow control without needing any CPU intervention at all. Provided it is correctly initialised and driven, this chip completely eliminates the missed interrupt problem. The 650 is still very rare and has little software support so far.

The four UARTs, the 8250, the 450, the 550 and the 650, are all 40-pin chips which are as pin compatible as possible. It is normally possible to pop a lower specification UART out of its socket and put in a higher one.

Maestro has two serial port cards with the 550 UART chip (one with a 450 and a 550, one with dual 550 chips). I would advise that you get one of our 450 + 550 cards. You can always put in a different chip any time you want to. For people in remote areas, where obtaining spare parts can take a long time, I advise getting a dual 550 card. That gives you two identical ports, so if you suspect one might be malfunctioning, you have another one there to try straight away.

You might also like to consider a new motherboard. Most recent motherboards have two 550 type serial ports built in. Motherboards and memory are readily available at amazingly low prices. Another possibility is a replacement multifunction card with 550 serial ports built in. These are widely available for prices of less than \$100.00.

## Simple Port Test

*Q. How do I test my serial port?*

A. 1. In your communications software, set your port speed to 2400 bit/s, 8 data bits, no parity, 1 stop bit, no flow control. Save the software configuration, exit the software and then re-run it (this re-initialises the port).

2. Unplug the data cable from the back of the modem. Put the end of the cable on the desk, with the pins pointing towards you, widest row of pins at the top. The pins are numbered from left to right, 1, 2, 3, etc. You may be able to see the pin numbers in tiny lettering next to the pins.

3. Check that the data cable is still attached to the COM port of your computer and your communications software is running. Using a small metal object (such as a ballpoint pen or small screwdriver), connect pins 2 and 3 together. Be careful that your small metal object does not touch anything else made of metal, only pins 2 and 3.

4. Type something (such as "abcdef") on the keyboard. Make sure your pin 2 to 3 connection is present when you do this. What you type should be echoed on the screen.

If when you perform the above test nothing appears on the screen, change the COM port for which the software is configured and repeat the test. If the characters you type now appear on the screen, then you have found the correct COM port for the modem. If still nothing happens, try all physical COM ports with every possible COM port setting in the software. When you change a COM port setting in the software, save settings, exit and re-start the software, to be sure the port has been re-initialised.

If still nothing is being echoed, then your serial port is probably faulty. Visit your computer dealer or repairer and get the port fixed. Do not accept the job back as done until your repairer can show you this port test succeeding.

This little test is not a comprehensive test. It is possible to imagine faults where this test would still succeed on a faulty port, for example, a flow control line not working. Alternatively, the test might fail on a good port, for example, the cable might be faulty. There is a better discussion of port testing in the Executive series modem manual.

Once the port test succeeds, plug the data cable back into the modem and test that the modem answers commands. If the modem then does not answer commands, the modem is probably faulty, send it back to Maestro for fixing.

## Testing Auto Answer

*Q. How can I test that the modem can automatically answer an incoming call?*

A. There are three methods of doing auto answer:

1. The software issues ATA. Register S0 is set to zero. The software counts occurrences of the word "RING" on the receive data pin, incrementing a counter. The counter is set to zero if there is more than 10 seconds silence between occurrences of "RING". When the counter reaches the predefined count (say, 2), the software issues the command string "ATA<CR>" to the modem. The modem answers, connects and produces its usual connection report. This method is the recommended way of doing auto answer. If the software is not running or crashed, incoming callers will simply encounter no answer and will not waste their call fee.

2. The modem answers. Register S0 is set to however many rings are wanted before the answer, for example "S0=2". DTR must be held true by the computer or &D0 must be set. The modem counts occurrences of "RING" and issues "ATA" to itself secretly behind the scenes. The modem answers, connects and produces its usual connection report. This method has the disadvantage that if the software is not running properly, incoming callers get an answer, get connected, then nothing happens. This is confusing and wastes the call fee.

3. Monitor RI. The software monitors the RI pin on the interface, counts occurrences of it going true and issues ATA. The RI pin was used before the days of smart modems, it is long obsolete. This method is now very rare.

You can also manually issue "ATA" (then press Enter) when you see the word "RING" appearing on the screen when you are running communications software.

You can test the modem's auto answer by issuing "ATS0=2", check that the DTR light is on, then call in from another telephone line. You will see two occurrences of the word "RING" appear, then the modem will produce answer tone and try to get connected. If you are calling in with another modem, the two modems will normally connect, then you will see whatever connection report you currently have the modem set to produce.

The usual way of getting into trouble with auto answer is to have methods 1 and 2 both turned on. Then the modem answers as usual, but the software also issues ATA at an early stage of connection negotiation. The standard behaviour of a modem when unsolicited characters are issued by the computer during negotiation, is to immediately hang up. The modem answers then hangs up again straight away. Everybody is terribly upset and blames the modem. The answer is to set register S0=0 and let the software handle it.

A modem normally auto-detects the computer's port speed and character format from the "AT" characters at the beginning of every command string. The usual character format is 8 data bits, no parity, 1 stop bit. But, sometimes a modem answers and gets connected without having had an AT command sent to it between

it being powered up and answering. Then the default port speed and character format matter. To set them, plug the modem into a computer, start communications software, set the port speed and character format the way they should be when the modem is doing the auto answer, initialise the modem for auto answer, issue "AT&W". The modem saves the current port speed and character format in non-volatile memory, then uses those settings next time it is powered up.

## Using Modem Overseas

*Q. I am going overseas, and I want to take my Maestro modem. Will it work?*

A. Yes, but if the overseas mains voltage is not 230 to 240VAC, you will need a new plug pack for an external modem. If the mains voltage is suitable, then you may need an adaptor to suit the local power points, then you can use your existing plug pack. Such adaptors are available from Australian electronics stores (Dick Smith, Jaycar, Tandy, etc.). If the mains voltage is not suitable (for example, USA is 115VAC, Japan is 100VAC), you will want a 9V DC plug pack, 500mA capacity, 3.5mm plug, positive on tip, negative on sleeve. That should be readily available from an electronics store in the overseas country, around \$30 maybe. An internal modem is powered from the computer, so it does not have a plug pack.

Telephone systems are broadly similar all over the world, but there are a few local variations. The overseas telephone sockets are likely to be different from Australian ones. In the overseas country, purchase a suitable adaptor cable to go from the local telephone socket to the US modular telephone connector on the back of the modem. In USA, you would need a US modular extension lead, maybe you have one already.

The modem may not recognise the overseas dialtone, if so, turn off dialtone detection. One way is to use the dial prefix ATX3DT instead of ATDT. Things like ring cadence, busy tone, pulse dialling parameters and line impedance may vary from country to country, but that normally will not bother you. Things like DTMF dialling tones, the modem modulation, error correction and data compression are under the control of International standards, so are consistent worldwide.

Maestro modems have official approval from the local telecommunications regulators in Australia and New Zealand. Maestro modems would pass the testing regime in almost all countries, but Maestro has not submitted them for official approval. Whether the lack of official approval bothers you, is a matter for your own judgement.

## No 56k Modulation Works

*Q. I have a 56k modem but my maximum carrier speed will not go over 33600 bit/s. I know my ISP supports 56k. What is going on?*

Service Called	Carrier Speed	My Ph Line Sig Qual	Lin Lev	Other Ph Line Sig Qual	Lin Lev
Maestro Support BBS	21600	23	23	10	25
Maestro Support BBS	24000	35	23	21	25
Maestro Support BBS	26400	45	23	28	25
Maestro Support BBS	28800	53	23	30	25
Internet R Us	21600	23	23	10	25
Internet R Us	24000	35	23	21	25
Internet R Us	26400	45	23	28	25
Internet R Us	28800	53	23	30	25
etc.					

A. The possibilities include: (1) Incompatible 56k modulations, (2) Telephone line defects, (3) Extra settings string is wrong.

Both your analog modem and the digital modem at the ISP must support the same 56k modulation. Nearly all ISPs now support V.90 modulation. If your modem only supports K56flex, then upgrade it to V.90. For Jetstream and Companion modems, send it back to Maestro for the upgrade. The price of that upgrade is \$10.00 plus \$10.00 freight back to you. Executive 56k modems can be flash upgraded, for free. Send an e-mail message to Technical Support specifying your modem model and ask for the file to flash up to V.90. Woomera modems all have "dual" capability, so they support V.90 from the beginning.

56k modulation is very vulnerable to telephone line defects. Long, distorted or noisy telephone lines often cannot support any 56k modulation. Your telephone company may be willing to upgrade your telephone line, if you can convince them that the telephone line is at fault.

What may have happened is that there is some sort of pair gain scheme on your telephone line. No 56k modulation can stand going through two analog links. In the path from your modem, there must be only one analog link, namely your analog telephone line. Then there must be an absolutely perfect all-digital link back to the service provider's ISDN modems. If those constraints are not satisfied, there is no hope of getting any 56k modulation started. That follows from the laws of physics. However, V.34 or 33600 bit/s carrier, can stand going through multiple analog links.

Now consider the situation where Telstra happens to be having cable capacity problems in your area, and they have run out of wire pairs back to the exchange. What they might decide to do is put in a multiplexer somewhere near you which could take, say, 32 analog telephone lines, convert them to 2Mbit/s data and send that down two pairs to the exchange. Back at the exchange, they have a demultiplexer which gets them back their 32 analog lines. Then those lines go off to the other exchange equipment and are treated absolutely normally from then on. With this arrangement, they have got 32 lines back to the exchange in only two pairs, which would otherwise have cost them 32 pairs. They do not have to rip out

their existing cable and put in a bigger one. No customers are complaining that they cannot get Telstra to install a new telephone line. Everybody is happy -- except owners of 56k modems.

Is Telstra going to admit that their cables are too small? Are they going to confess that some subscribers have slightly degraded telephone lines? Certainly not, if they can possibly avoid it. Someone might start saying that some other company should put in some more cables. That is the last thing Telstra wants. Telstra's de-facto control of that last kilometre to the subscriber is the foundation of their huge profitability. They will defend that to the death.

Well, you might say, if having two analog links makes a problem, why not keep the signal in the digital domain all the way from the multiplexer and keep owners of 56k modems happy? Answer: That is too hard. Telstra has got a lot of old exchange equipment which was never designed for a digital interface on the subscriber side. Nobody has a digital "line card" for this old equipment. Even if there was such a thing, it would be expensive. Going in on the network side of the old equipment is also too hard because it was never designed to share its network connection with something else. So the switching problems are ugly. As time goes by, old equipment gets replaced with new stuff and hopefully the designers have thought about those unhappy 56k modem owners. Ideally, Telstra has bought the version which supports digital line cards and remote multiplexers. But getting all the old stuff out is going to take a l-o-n-g time.

You need to be able to convince Telstra that you know enough about your modem to be able to test satisfactorily and document your results. Learn how to do a basic modem test. You have to be able to fire up communications software and do a basic modem test, with casual ease. You must be an authority on the +MS command. Check that your modem really can do 56k modulation by trying it on another telephone line, preferably one to a different telephone exchange. Try it to several ISPs. Collect carrier speed, signal quality and line level figures. All this testing must be most carefully documented. Please see the section "Dissatisfied With Carrier Speed" below for details on how to do that.

Tell Telstra that you have a 56k modem and you are deeply unhappy that it cannot get a 56k modulation started on your existing telephone line. Try to persuade them to give you your own pair back to the exchange into new exchange equipment. It could help considerably if you were to express a willingness to change your telephone number. You could add a new telephone line for your modem, on the strict understanding that 56k modulation must work on it.

Your local MP might be able to help. You are probably going to have to be fairly pushy. Good luck. I would be interested to hear how you go with your political machinations.

Another reason 56k modulation would not start is that the modem has been initialised not to do so. For example, say you have been playing with your Extra settings string in Modem Properties (in Windows) and you have the Extra settings string set to:

```
+MS=11,0,,24000
```

That would have the effect of limiting the modem to V.34 modulation at a maximum carrier speed of 24000 bit/s. It is recommended that you initially check that V.34 at 24000 works reliably, albeit slowly. Then try to get 40000 bit/s with:

```
+MS=,0,,40000,1,,24000
```

Check your modem documentation for details of the +MS command. Try several ISP dial-up numbers for test purposes. In difficult cases, you need to test carefully using repeated basic modem tests, including issuing +MS commands to the modem. You may also need to change your ISP. Try to find an ISP dial-up number which will give you an acceptable carrier speed and signal quality. Then use that ISP for your Internet connection.

Later firmware might just help. Send an e-mail message to Technical Support if you want that.

## Dissatisfied With Carrier Speed

*Q. I have been testing for carrier speed, signal quality and line level. I have optimised my carrier speed but it is still too low. What can I do?*

A. If your telephone line is electrically quiet then that leaves distortion in the telephone local loop connections or at the exchange. The local loop connections are usually good, but you could ask Your telephone company to check them. Also ask them to remove any "tags" from your phone line. A "tag" is some length of wire pair attached to a telephone line, but which is not part of the path from the exchange to the subscriber. A tag is a consequence of the way telephone lines are built, however, it adds stray capacitance to the line, for no purpose. Assuming, as I would expect, that your local loop is fine, then the problem lies at the exchange. Alas, there you are likely to find much greater resistance to doing anything about it, because you may be asking them to spend

significant amounts of money replacing equipment which works fine for voice but is giving you a problem with your modem.

You will need a letter of complaint and a technical document. The document should have a strong clear argument and a test report comparing two telephone lines, yours and another one which works well, but keeping everything else the same. That is, same modem, computer, software, service called, carrier speed, etc. If you have a friend with a modem and a good telephone line then that would be the way to go.

Your test report should have a table (or tables) something like the table shown at the top of this page.

(I have just made up the figures in the table, you will need to be able to produce accurate reproducible figures from actual measurements which can withstand scrutiny. You will probably need dozens of measurements to convince them.)

Then observe in the letter that everything is the same except the telephone line and what are they going to do about it. Maybe you can express it a bit more tactfully than me. Administrators will read the letter but not the document. Technical persons will be given the document but probably not the letter. Ensure you phrase both suitably. Keep copies.

Warning: their standard tactic is to blame the modem. If you could repeat all the measurements with another modem then that would strengthen your case. Their other standard tactic is to state that they only guarantee 2400 bit/s, and you are getting much better than that, so aren't you lucky. You are then forced to resort to political machinations in order to get some action. A good solid document will help there too.

Make quite sure you are accurate with the carrier speed. That is the speed reported by the modem in the CARRIER line of the connection report. They will immediately dismiss you as a fool if you get confused between carrier speed and port speed. Conduct all measurements using V.34 modulation and state that clearly. It is invalid to compare figures got with V.FC with those got with V.34, even if the carrier speed is the same. State the numbers dialled for each service, so they can do their own testing.

They might be a bit hazy on what carrier speed, signal quality and line level mean, so it would be wise to include the definitions of those things given in the "Testing For Optimum Carrier Speed" answer, above.

A delightful feature of the Alcatel-Bell System 12 exchange is that it can "train" itself to the line and thus get better signal quality. The procedure is to make the modem go off hook but silent (with the ATH1 command), then the exchange sends a series of tones and measures responses. The exchange remembers the results of the test from then on. This test must be organised in advance in consultation with your telephone company. Do not assume that your

telephone line is connected to a System 12 exchange, if it is not then that is too bad.

A fascinating little V.34 feature is the one line connection report. Turn it on with \V1 instead of S95=45 in the init string. It overrides any S95 setting. I like to leave S91=30 in (but not for 56k speed modems, alas), so it actually ends up being a two line connection report. Try it. The modem reports port speed, modulation, error correction, data compression, transmit carrier speed, receive carrier speed. This is all in one line, with no explanation, so it is not for beginners. Turn it off with \V0.

I hope this helps. Good luck. I would be interested to have a copy of your document. Sorry about all this trouble, it is all caused by the analog link between the exchange and the subscriber. The sooner that gets replaced by a properly engineered high speed Digital Subscriber Line (DSL), the better it will be for consumers.