History of USRobotics Modems

USRobotics was one of the first companies to offer high-speed dialup modems. The Sportster™ modem brand was just one of the company's many products designed to connect people to the Internet and each other. It is the USRobotics Sportster, and the Courier modem, that made USRobotics modems the modem of choice for the Internet revolution.

Throughout the years, modems have seen many changes, including the addition of such features as full duplex communications, error correction, adaptive speed leveling, and many other, now common features. The USR-310, one of the first USRobotics modems, allowed customers to connect to other computers using their existing phone (that's right, phone, not phone line) at speeds up to 300 Bps. Today's USRobotics modems operate at 56,000 bits per second, an increase of almost one hundred and eighty times.

Modems 101
The Basics

Most phone lines were designed to carry tonal (analog) signals. The Public Switched Telephone Network (PSTN) picks up these tonal signals, and usually converts them into digital signals to transfer them from one Central Office (CO) to another. On the other end, the digital signals are converted back into an analog signal.

How does a computer use a phone line?
"Modem" is an acronym for MOdulator/DEModulator. It converts the digital signal from your computer into an analog signal that can be carried by the phone line, and vice versa. It is also possible to get a digital line (ISDN) installed in your home, but you would need an adapter in order to resolve the different digital signals. ISDN is common in Europe and other areas where Cable or DSL access is not available.

How does a hardware modem work?
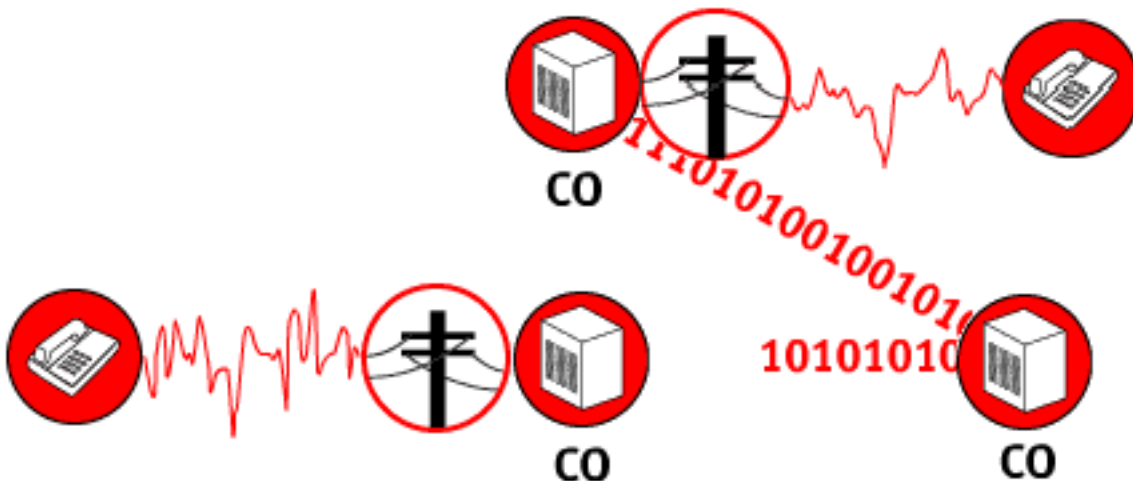
A hardware Modem will have three components: The Microcontroller Unit (MCU), the Data Pump Unit (DPU), and the Data Access Arrangement (DAA). The Microcontroller Unit checks data for errors and performs compression. It may also convert a parallel transmission into a serial transmission. It utilizes the AT command set to send and receive signals. It sends the data on to the Data Pump Unit.

What does the Data Pump Unit do?
When turned on, the Data Pump Unit gets instructions and settings from ROM, the unit's permanent memory. The DSP (Digital Signal Processor) uses RAM (Random Access Memory) while performing its calculations. If your modem has instructions in EEPROM (Electronically Erasable Programmable ROM), it may be possible to upgrade the instruction set in a modem, giving it new features. After processing, the output is sent to the Data Access Arrangement.

What does the Data Access Arrangement do?
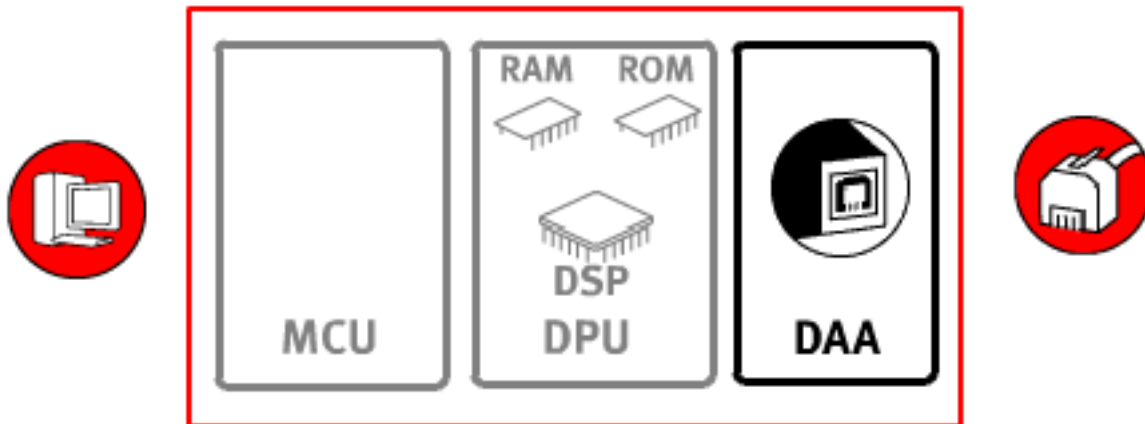
The Direct Access Arrangement (DAA) serves as the hardware interface to the Public Switched Telephone System (PSTN). A standard RJ-11 jack connects the modem to the phone line. The interface allows the modem to detect signals on the line: dial tone, busy signal, etc.

Modem Speeds

Modem speeds are typically measured in bits per second. For dial-up modems, due to the technology used to deliver normal phone service, the fastest rate available is 56 kilobits (one thousand bits) per second. Digitized information, be it sound, video, or data files are converted into a series of ones and zeros in order to be understood and interpreted by your computer. Your modem converts digital information into analog signals for transmission through the phone network, and from analog to digital from the phone network to your computer.

Over time there have been various standards developed to support 56k data transmissions; X2 and KFlex were early, non-standard technologies (developed by modem manu-

facturers), while V.90 and the current V.92 are industry standards (used by all modem manufacturers to assure compatibility).

Sending and receiving signals through the phone network requires electrical current. In the data communications world, the more information (bits per second) the more current you need. If you apply too much current, there is a greater chance of the network developing a problem called crosstalk, or the unintended leaking of signals from one phone line to another (if you've ever heard another conversation on your telephone then you are familiar with this phenomenon). The FCC (Federal Communications Commission), with that problem in mind, decided to reduce the range of current available for phone company equipment to use, and thus reduced the speed available to analog modems. So while the modem may be capable of 56K, to help prevent crosstalk the FCC limits the amount of current that phone companies can use to send signals over the network, limiting data throughput to a maximum of 53 kbps.

V.92 in Detail
An International Standard for Data Access

The V.92 standard enhances V.90 in three major ways. First, V.92 provides a faster, more balanced upstream to complement the 56 kilobits per second (Kbps) downstream rate found in x2 and V.90 technologies. Second, V.92 defines a mechanism for significantly shortening the dialup connection time. Third, V.92 provides a method for effectively sharing a data line with voice functionality.

V.PCM Upstream

The V.90 standard defined 56 Kbps as the maximum rate for transfers. Unfortunately, this rate was restricted to downloads (transfers from a server or service provider to an individual user). Uploads remained limited to the same maximum speed as V.34 (33.6 Kbps). For users who mostly receive data, this is a minor inconvenience, but V.90 offers limited benefit to users who need to send data to or interact with a service.

V.92 addresses this issue by providing a faster upload path. At the user's discretion, V.92 can be set for a more balanced data transfer rate, with both upstream and downstream

speeds up to 48 Kbps. This option allows users to transfer greater quantities of data to a server or service provider. The more balanced rates of V.92 make interactive data communication activities like videoconferencing run more smoothly with a higher level of quality than V.90. The new standard also provides improved download performance; any transfer that requires active acknowledgment will run faster with V.92.

Quick Connect

One of the hidden costs of modem use is the delay incurred by the "training session" modems normally do every time a data connection is established. USRobotics has long sought to minimize this delay, and V.92 continues this effort with its Quick Connect feature.

A V.92 modem "remembers" the connection conditions each time it is used and tests for similar conditions each time it connects. If the conditions match those from the last time the modem was used, V.92 restores the previous connection, cutting 30 to 50 percent off the normal training time.

In the case of a typical desktop computer setup, which often dials the same Internet service provider (ISP) point of presence (POP) from the same phone line every time, this situation will be common. The Quick Connect feature makes occasional use of the Internet much more convenient.

Modem on Hold

The explosive growth of data communications has caused a subtle, but persistent challenge: sharing the phone line. Households have been forced to choose either the continuing expense of a second phone line or the inconvenience of losing access to incoming telephone calls while online. Phone companies offer voice mail services that intercept an incoming call while a user is online; the service indicates who called, but does nothing to prioritize the data-vs.-voice access decision. In short, users have little choice but to stay offline if an important call is expected.

V.92 addresses this issue directly by providing a mechanism to detect inbound calls. A V.92 modem recognizes the standard Call Waiting signaling provided by the phone company and indicates to the user that there is an incoming call. If the phone company provides Caller ID information along with the Call Waiting signal, then this information is also provided to the V.92 modem user. A user who is online can then determine, on a call-by-call basis, whether the inbound call is important enough to interrupt the current online session.

V.92 extends the convenience of this call detection mechanism further by permitting a user to suspend his or her current online session and answer the inbound voice call. This has benefits for both the user and the ISP.

The user gains the ability to answer a voice call while remaining online. When the Call Waiting indication comes on, the user simply opts to answer the call. The user's V.92

modem then negotiates with the Internet service provider's modem and switches the line to the incoming voice call. Once this call is completed, the user can attempt to reestablish a connection with the ISP. The ISP will permit the online session to be resumed as long as the voice call has not exceeded the time limit chosen by the ISP.

The benefit to the service provider is that now phone company signals are handled gracefully on the user's end. When the user wants to answer another call, the ISP is informed by the user's modem. The service provider's modem can either permit or deny the user modem's request. If it accepts the request, then the ISP modem provides a timeout to the user's modem. If the user does not leave the voice call and return to the data connection before the timeout period expires, the ISP modem terminates the call.

With V.90 and older modems, the reaction to a signal like Call Waiting was unpredictable. In many cases, the ISP modem would be forced to renegotiate a connection with the user modem. In extreme cases, the link between the user modem and the ISP would be lost. To a user who received no indication that a second call was inbound, this appeared as if the service provider had dropped the connection for no reason. V.92 offers a way to clarify, and in many cases eliminate, the confusion that phone company signaling can cause.

What are the different types of modems?

Controller-based modems

Modems are distinguished from one another by their architecture, that is, where the processing takes place: in the modem or in the PC. A hardware modem is a "Controller-based" modem, and it does all of the work. This type of modem provides the best power and performance, and it does not utilize the PC's processing power. All three components (MCU, DPU, and DAA) are in the modem itself. It can work with many operating systems, and functionality may be upgradeable through ROM uploads.

Controllerless or Winmodems™

Controllerless modems (or Winmodems™), as the name implies, do not have an onboard Microcontroller. As a result, data compression and the generation of AT commands are performed by the PC. Since most PCs sold today run the Windows operating system, the microcontroller program is usually written specifically for Windows, hence the name "Winmodem." They are useful in laptops, as they tend to use less power. Winmodems are usually software upgradeable.

Softmodems

Softmodems are, quite simply, Software Modems. All processing is done by the PC, and the "modem" is little more than an interface to plug in the phone jack. These modems require the PC to do all of the work, and they will only run in the Windows Operating System. Many PC makers put Softmodems in the PCs that they sell to consumers, as

they are extremely inexpensive. They are upgradeable.
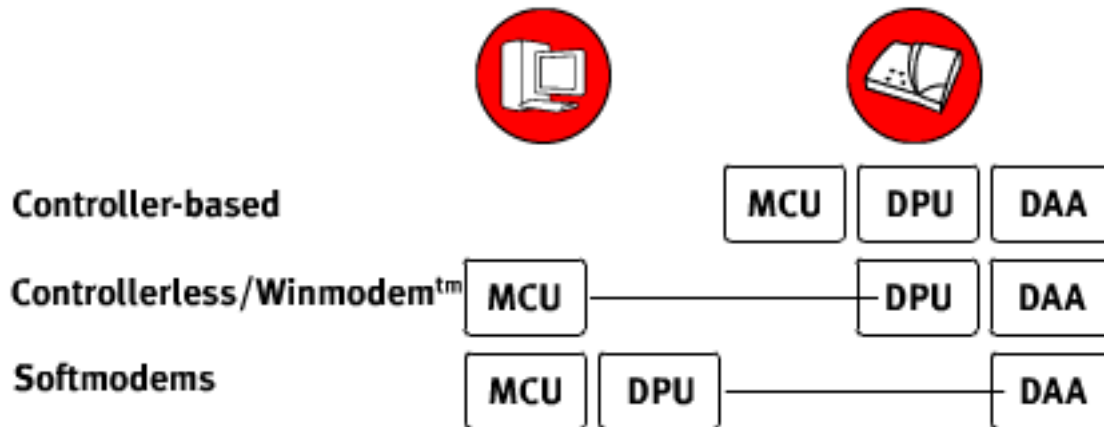
Getting online with Dial-up Modems
Internet Emergency!

Broadband went down? Traveling with no access? Sometimes ermergencies happen and you need to get online but you don't know how. All computers and laptops used to come with built-in dialup modems, they may not anymore but that doesnt mean you can't get one as a backup for internet access. Here are the basics of how to be prepared in case you are the one in need.

Getting a Dial-up Modem

Desktop with no telephone jackFirst check your system to see if a dialup modem is already installed. An easy way to check is to see if there is a telephone line port on the back of your desktop or on the back or side of your laptop. These typically are situated next to the ethernet or LAN port. Newer systems may only have an Ethernet port, such as the ones shown here.

- If you have a telephone line jack, you have a dialup modem installed! Check your system to see what software may already be installed and to verify that it is installed correctly.
- No telephone jack? You'll want to determine what kind of modem you will need: Controller, Controllerless or Softmodem, Internal or External. Once you've made

those decisions you can then choose a modem that is right for you.

Finding Dial-up Access

In order to get online using a dialup modem, you need to find an Internet Service Provider (ISP). If you already have broadband service, you should be able to contact them directly and inquire about alternate dialup options. There may be additional fees for this service, but it can usually be turned on and off as needed. If you are in need of a new provider, there are many available. Some of the more popular ISPs include, but are not limited to, NetZero, PeoplePC, and EarthLink.

Using Dial-up Access

Once an ISP has been found and an account has been set up, the ISP usually provides software to connect you to the Internet. This software typcially will have built in phone numbers to dial based on your area, but typically also allows you to choose if you are traveling and away from home.

Modem Applications

Modems were originally used for connecting users to the Internet or for sending faxes, but a majority of the modems in use today are used by businesses in a variety of different applications. Some of these applications include data transfers, remote management, broadband backup, Point of Sale, Machine to Machine among many others. Most of these solutions are hidden on the back-end but make our lives easier every day, below are some examples of these applications.

Point of Sale (PoS)

PoS is one of the most heavily used applications by the everyday consumer. Anytime you pay via credit card or debit card there is a modem (dial-up or broadband) behind it transferring that data and returning an approval or denial quickly and in the case of dial-up solutions with less costs associated.


Examples of Point of Sale

- Credit Card Payment Terminal in restaurants, movie theaters, or retail stores
- Ticketing machines in trains stations, bus stations, and airports
- Pre-pay gas pumps
- ATM cash machines

Remote Management, Maintenance, & Logistics

Modems can be installed in remote locations at off-site locations, tight enclosures, or inside sensitive locations. Certain applications can be controlled remotely via the modem without having to make a visit to the actual location. This can save time and money in travel costs, but can also prevent accidents or issues due to the possibility for quick reaction times and instant configuration changes if needed.
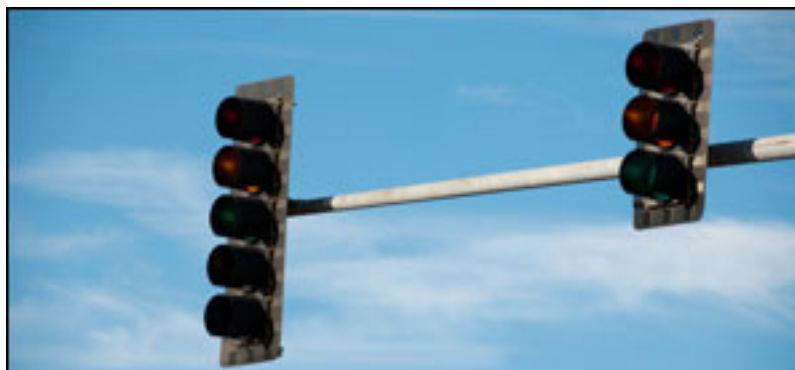
Examples of Remote Management, Maintenance or Logistics

- Stoplight Timing Control - ability to alter signal timing from headquarters to regulate traffic flows
- Roadside Digital Signs - ability to change messages from headquarters
- Grocery Store Freezer and Cooler Call Center - ability to monitor temperatures and status as well as receive alerts automatically
- Safe company - ability to check temperature, etc. to verify interior of safe is secure
- Golf Course Irrigation system - control timing and usage of sprinklers as well as monitoring consumption
- Vending machine inventory and status- determine what needs to be replaced before arriving on site
- Gas/Petrol station maintenance - when a credit card operated pump is down an alert is relayed to a central point 24 hours a day

Out of Band Access, Broadband & Server backup

Many small, medium, and large companies depend on constant communication connections to run their businesses. Many companies rely on broadband connections for their employee connections, but need a reliable backup if the broadband or server connections go down (commonly known as Out of Band Access). Brown outs aren't unknown and can affect clients as well as employees, and with a dial-up backup data can always be retrieved and servers can be configured remotely no matter what the status is of the broadband connection.

Examples of Broadband backup

- Backup for VPN dial in connections
- Server backup - backup for broadband as well as remote management of configuration and diagnostics
- Backup for ADSL connections in DVD rental or car washes

Data transfers

Many large companies have a headquarter location where all data is centrally located. Normally this means that the other locations need to send the data in to HQ on a daily basis. Dial-up modem solutions are ideal due to the fact that they can be programmed to dial in each night and efficiently transfer the data with secure connections, redial functionality if the call is dropped - to start up where it stopped, and utilize the non-peak call time for cheaper long term costs.

Examples of Data transfers

- Synchronization of data at a headquarter location from other branches
- Daily Sales information sent to a headquarter location from other branches


Machine to Machine (M2M)

Machine to Machine solutions typically have a communications link connecting 2 machines (computers, electronic devices) that are capable of transferring data on demand between the 2 machines without any human interaction required.
Examples of Machine to Machine

- Medical devices transferring test results to a computer at a doctor's office
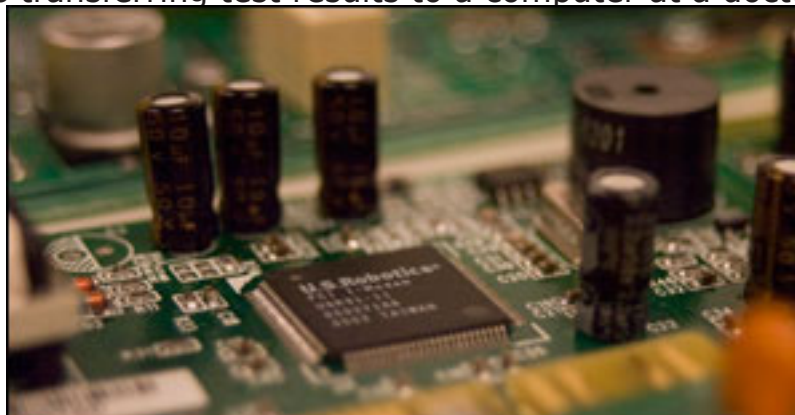
Other Applications

There are many other applications that use modems for a variety of functions most include the use of the dial-back and remote management features.

Examples of Other Applications

- Cell phone tower maintenance on circuits etc.
- Gasoline vapor containment system
- Home security monitoring - A modem is used to send a voice message to a telephone/mobile when an alarm is set off
- Property listings
- Cinema screening approval - a serial port modem is used to send a coded key to authorise a cinema to screen a particular film.