



Newton Technology

An overview of a new technology from Apple.



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Addresses. Ideas from a brainstorming session. Your appointment with an associate next Tuesday. To-do lists and other reminders. Phone calls to return. A rough map to a friend's new house...

Our lives are a barrage of details—so many details that we find it almost impossible to manage them all. That's why we turn to a wide variety of tools to bring order to the information in our lives: notepads, calendars, yellow sticky notes, and personal organizers. Powerful personal computers. And an array of increasingly complex telephones, fax machines, pagers, and other electronic equipment designed to help.

More often than not, however, the simplest tools aren't powerful enough—and the most powerful ones aren't simple enough. Information written on scraps of paper, for example, can't be combined with other information, or rearranged, without being written down all over again. Computers are great at the tasks they were designed for, but they're too elaborate or too cumbersome for many situations. And other electronics products are becoming so complicated that they often make tasks more difficult, rather than easier.

What we need are products that are as easy to use as pen and paper, but with the ability to store, manipulate, and communicate information flexibly. These products should be designed to handle specific tasks, and to perform many of those tasks automatically. Ideally, they should know enough about the things we're doing to actively help us get them done.

Newton™ technology—a new software and hardware technology from Apple—will make these kinds of intelligent products possible.

Newton Technology

Apple has spent the last four years working on a new technology called Newton. Newton is a sophisticated set of software and hardware technologies that will result in whole new classes of intelligent products.

A new foundation for intelligent products

At Apple, we are dedicated to making products that are exceptionally easy to use. Our goal is to take complex technology and make it understandable, useful, and intuitive. Newton technology—a revolutionary software and hardware technology from Apple—takes this goal to the next level.

Newton technology was designed in full recognition of how people really work with information. We know that people want to be able to jot things down as they think of them. That they want to make quick sketches to visualize their ideas. That they want to be able to find a particular piece of information—such as a phone number—the minute they need it. And that people often need to exchange information with others spontaneously.

Newton technology will lead to products that help people to make better use of the information in their lives—and share that information with others.

Products that actively help you

Newton products will work more like assistants than just tools. They'll continually observe what you're doing to see if there are ways they can help, whether it's to format something you've written or send a fax for you. They'll anticipate what needs to happen next to complete a task you're working on. And they'll take the initiative to help you. They'll learn about the way you prefer to do things, and they'll change to accommodate your particular approach.

Products that let you record ideas and information the way you're used to

To begin using a Newton product, you can simply pick up the Newton pen and start writing on the screen. You can write and sketch just as you do on paper. As you write, these products will clean up your notes and rough sketches—transforming handwriting into text, and sketches into neat diagrams, charts, and graphics. Newton products will interpret what you write and determine what should happen in response. They'll even interpret actions such as crossing something out to erase it. And they'll be better than pen and paper, because they'll actually help you with your typing and drawing.

Products that let you organize information flexibly

Newton products organize and store the things you write down in a form that lets you use and reuse individual pieces of information in a variety of ways. The technology was designed specifically to support the information-related tasks people do most often—for example, making notes, keeping track of names and numbers, creating reminder lists, and so forth. You can work as you do with pen and paper, but with less effort, because a Newton product will file and look things up for you.

Products that let you communicate easily— anytime, anywhere

On their own, Newton products are great assistants. But they're also great communicators. They connect easily—through both wireless and wired connections—with one another and with printers, fax machines, pagers, computers, and other devices. This means that whether you're at home, in your office, or on the road, Newton makes it easy to access, distribute, and share information.

Newton products will be intelligent. They'll help you get your ideas down—and just as important, find them later. They'll help you organize your day, make the most of your time, and simplify your life. They'll be as easy to use as pen and paper—but far more versatile. They'll interpret the jumble of information in your life and help you bring order to it. They'll let you record information the way you always have—but you'll benefit from a whole new way of organizing and communicating it. The following pages describe some of the key capabilities and technologies that will make these intelligent Newton products possible.

Newton Intelligence

Newton products will be more than just tools, they'll be assistants. They'll know enough about what you're trying to do to actively help you do it.

More than a tool—an assistant

Newton technology is a turning point. It will enable machines to be more than just tools; they can be assistants. They can watch what you're doing and take the initiative to help you.

Newton technology—specifically, a capability we call Newton Intelligence—will make possible the development of smart products that actively help you get tasks done. It will result in products that adapt to your particular style of doing things—products that, over time, become both more personal and more helpful.

A few examples of Newton Intelligence in action

Here are some of the ways Newton products could provide intelligent assistance to users:

- *“Type this for me.”* Say you've used your Newton to write a short letter, and now you'd like it to be transformed into a business letter. You can ask your Newton to do that. It will recognize your handwriting and change it into neat text. Then Newton will turn the text into a formatted business letter: It can add the date, the return address, and “Sincerely yours,” and lay out the page in perfect form.
- *“Fax this for me.”* Say you'd like to fax that business letter to a coworker of yours, Bob. About all you have to do is write “fax Bob” on the screen of your Newton, and it will take care of the rest. Newton will recognize the command “fax” and know that you want to fax something. It will recognize the name “Bob” and know that you want to fax something to Bob. It will look up Bob's fax number in your address book, create a cover sheet, and place the fax in your electronic out box. When you connect your Newton to a phone line, it will automatically send the fax for you.
- *“Lunch with Ann, Friday.”* Suppose you write down that simple phrase. Newton is intelligent enough to make some assumptions about what you'd like to do. It knows that you'd like to add the date to your calendar. Based on the way you usually schedule lunches, it knows that you prefer to have lunch at noon. That you usually take an hour-long lunch when you eat with Ann. And that when you write “Friday,” you probably mean this Friday, not the next. Newton will take the initiative to mark the lunch date on your calendar, show you what it's done so you can approve or change it—and remind you about the date as it approaches.

How Newton Intelligence works

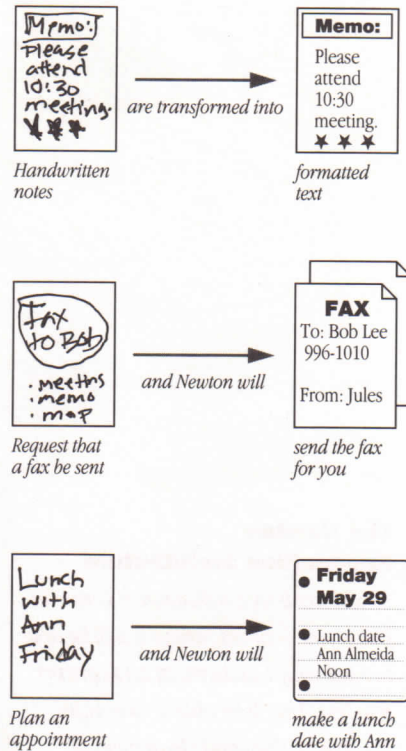
A Newton product constantly watches what you're doing and looks for ways it can help you. It also looks for incoming information, and assists you in sorting and acting on it. For example, Newton waits for you to write something or tap a button on the screen (such as the Find button). It looks for incoming electronic-mail messages and paging messages.

When something happens (say, you write "fax Bob"), Newton interprets the event, comparing it to previous events and situations. It comes up with a set of potential actions you might want to take. ("The user wants me to fax something" would be among those actions.) Newton ranks the possible actions and chooses one.

Once a choice is made, Newton initiates an action—in this case, by generating a fax. You can correct Newton if it misinterprets your intent, or if you'd like the task performed in a different way (for instance, you might want to send the fax to a different number than usual). After the task is finished, Newton makes note of what it has learned, so it can be even more accurate and efficient the next time.

This intelligence could be applied to a wide variety of situations. Newton products could handle many different tasks, from managing your calendar to searching electronic news networks for articles you'd like to read; from reminding you about your anniversary to automatically balancing your checkbook and telling you if you're about to overdraw your account.

Newton Intelligence could be built into everyday products and revolutionary products alike—freeing their owners from having to worry about the minutia of life, and letting them focus their activities on the uniquely human tasks of thinking and creating.



Newton Intelligence will enable Newton products to understand enough about what you're doing to actively help you.

The Newton Recognition Architecture

As you work with a Newton, it comes to know you. Newton products will be able to read your handwriting and convert it to text. They'll be able to take your rough drawings and clean them up. These capabilities will make using Newton products natural and intuitive. They'll be ideal for recording important information and getting your ideas down quickly and easily.

Recording important information and ideas

A typical scenario:

The phone rings and you pick it up. It's a friend who wants to discuss a project you're working on together. She starts talking, and you listen. She has a lot of great ideas; you throw in some of your own.

The conversation gets complicated, so you reach for a pen or pencil and paper to write down the key points. Together, you come up with a list of people you need to talk to about the project. You jot down the names. At the same time, you do some math to estimate what the project will cost.

Your friend continues to talk. You both think you're making progress, and agree to meet in person next week. So you pick a date that works for both of you. She gives you directions to her office; you sketch a rough map as she talks. And then you hang up the phone.

If you think about it, a lot of information comes to you in this way—in short, spontaneous conversations, quick bursts of inspiration, and brainstorming sessions. When you come across new information or think up an idea, the most natural course of action is to reach for pen and paper to record it.

The purpose of the Newton Recognition Architecture is to make working with Newton products as intuitive and natural as working with pen and paper—but far more versatile.

Transforming handwriting and rough sketches into clean type and graphics

Most people's notes are a complex collection of words, phrases, and brief sentences; rough sketches, doodles, charts, and diagrams; quick calculations; and reminders and action items.

Newton is designed to recognize all of these things.

Unlike other pen-based systems, which force you to write precisely within boxes, Newton products will let you write in a more free-form way. Using the Newton pen, you can write and draw on the screen of a Newton, freely mixing handwritten notes, sketches, and numbers, just as you would on paper. And like working on paper, you can add more information later, and cross things out when you make a mistake or change your mind.

One of the advantages of using a Newton product instead of paper is that the words you write can be converted to neat type, and the sketches you make can be transformed into clean graphics, diagrams, and charts. If you've ever wanted to share your notes with someone but felt you should type them first, Newton is your answer, because it does the "neatening up" automatically.

Because Newton products can recognize what you write, you can also use the pen to tell Newton what you want it to do. Write "file under expenses" and Newton takes your work and files it there. You can also take advantage of other features, such as the built-in calculation ability: Write down a column of numbers and draw a line, as you would on paper—Newton will automatically give you the sum. You can also divide, multiply, subtract, and perform more complex mathematical functions.

Recognizers: How Newton analyzes what you write and sketch

If you look closely at a page of your notes, you can begin to imagine what a challenge it is to interpret what you've written. The letter "o" looks a lot like a zero. A plus sign looks a lot like the letter "t."

The basic building blocks of Newton software that make accurate recognition possible are called recognizers, each of which is designed to analyze a specific type of information—characters (letters and other symbols), numbers, and graphics. There are also special recognizers that recognize the commands you write. The recognizers work as a team, simultaneously analyzing items on the page. Based on context, symmetry, and what's already been interpreted, the recognizers decide how to interpret what you've written. This approach results in a high degree of accuracy.

Because Newton recognition is based on a modular design, it is extremely flexible and adaptable. Special-purpose recognizers—for recognizing cursive writing, music notation, foreign languages, mathematical and scientific notation, electronic symbols, and even speech—can be developed and easily integrated with existing recognizers. Through the addition of recognizers, it will be possible to adapt Newton technology to a virtually unlimited number of uses.

Newton adapts to your particular style

Over time, Newton will adapt to you. It will learn your particular style of handwriting and bias the recognizers in appropriate directions. For example, if you always put a loop in your "q," the recognizers will learn to look for that, improving the accuracy of recognition. Newton is also capable of learning from mistakes, as you correct its misinterpretations.

Newton products will be perfect for recording information and ideas. They'll let you work in a fluid way, allowing you to jot down your ideas and easily refine and alter them as you go along.

A more intelligent way to deal with information

The Newton Information Architecture

Newton can help you make sense of all the information in your life—facts, phone numbers, appointments, notes, messages, and ideas. Newton stores information in a free-form way, letting you link, sort, group, and regroup it in the ways that are most meaningful to you.

You're barraged by dozens (if not hundreds) of new pieces of information every day: telephone numbers, addresses, reminders, quick notes, seeds of ideas, phone messages, names, dates, appointments—the list goes on and on.

The dilemma is how to organize and make sense out of the ever-growing collection of information in your life. You write a lot of it down on scraps of paper, backs of envelopes, 3-by-5 cards, and yellow sticky notes in an attempt to stay on top of it.

The Newton Information Architecture organizes information in a free-form, flexible manner that lets you record, store, and view it in ways that are significantly more valuable than you can achieve with paper, or even with a computer.

Two approaches to organizing information

As it turns out, a lot of the information you acquire is difficult to organize. At least, *how* to organize it isn't readily apparent at the time you write it down. Your notes may fall into this category: You don't always know how you're going to use the information contained in them in the future—which pieces will, in fact, become important to you and which pieces you'll never use again. It's only later that you discover that a particular piece of information is related to another piece you've written down, and you'd like to file them together. Or that something should actually be filed in several different places.

Other information is easy to organize as you write it down. A perfect example is your checkbook register. Every transaction you record takes more or less the same form. You write down the date, the payee, the amount of the check or deposit, and perhaps a short memo. You want to organize that information in the same way every time you write in your checkbook.

Newton products will deal intelligently with both types of information—information that you organize after you've written it down, and information that you categorize immediately.

Free-form organization

Newton products let you store information in the way you're used to storing it: Little pieces of information are stored as exactly that—little pieces. Everything you write on the screen of a Newton is stored as an independent unit in a free-form collection of data. There are several advantages to this approach:

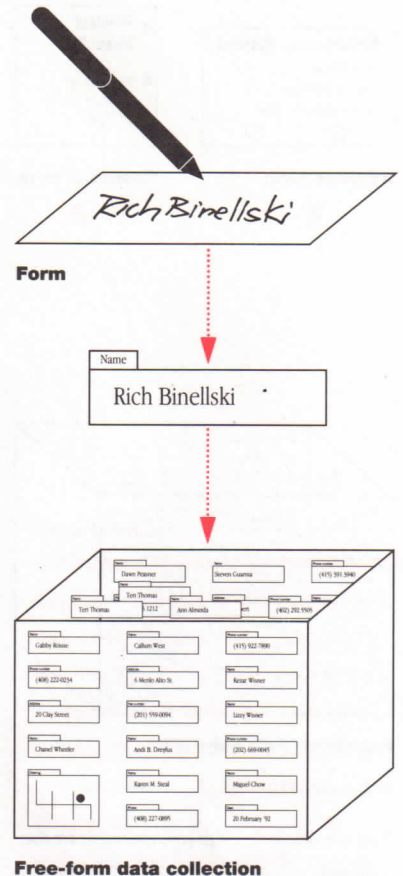
- *It's more flexible.* Newton is far more flexible than traditional databases, which require that you specify the structure of information *before* you write anything down. Newton lets you write things down—and decide later how you'd like to organize them. When someone says something you want to remember, you simply write a note. When you think of something you need to do, you simply jot it down.
- *It's more useful.* The beauty of storing information as independent pieces is that they can be linked, grouped, and regrouped in ways that are meaningful to you—in ways that would be virtually impossible with scraps of paper. Say you want to look at everything that relates to a particular project, or everything that relates to Bob, or everything you did during the month of April. Newton can sort through your collection of information and bring up all the relevant details.
- *It's more intelligent.* Newton automatically categorizes the information as you write it down: Notes are labeled as “notes,” drawings as “drawings,” phone numbers as “phone numbers,” names as “names,” and so forth. Labeling each piece of information in this way allows Newton to recall it later. Newton can also make links between pieces of information. It can associate the “Jane” in your calendar with the same “Jane” who's listed in your address book. So when it's time for your appointment with Jane, Newton can automatically bring up Jane's address and phone number and even a map to her office.

Newton forms—better ways to work with information

Your checkbook. Your calendar. Your address book. Your invoices.

All these items have something in common: They're forms. Their purpose is to structure the information they contain. You can create forms on your Newton that work like the forms you use every day. Newton forms serve two main functions:

- *Giving structure.* Newton forms give structure to information, labeling individual pieces as you write them down.
- *Giving you better ways to look at data.* Newton forms let you view or access the information in your data collection. A Newton form can access all the information that's stored in your Newton, not just the information that was stored by that form. It can also serve as a filter through which you can view the information, pulling up relevant pieces of data and ignoring others. Say you're writing up an invoice for a client. You could write the client's name on your Newton invoice form, and Newton could automatically fill in the client's address, by accessing the information stored by your Newton address-book form. These kinds of intelligent links let you recall and use stored information to accomplish a wide variety of tasks.



Individual pieces of information are labeled as you write on your Newton. These pieces of information are stored in a free-form collection of data—and can be easily retrieved.

Ellingson, Naomi 3411 Filbert Omaha, NE 68124 phone (402) 996-1010	● Friday May 29 ● Meeting at Naomi's house 3:00 p.m.
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Address form

Calendar form

Free-form data collection

Newton lets you view information in the way that's most useful to you. Anything that's stored in your collection of data can be viewed in a form. Newton can also help you make intelligent connections between pieces of information.

Custom forms and other possibilities

Newton forms can also be easily customized. For example, you may want to look at your calendar in a different way, or add a space for birthdays in your address book. Without having to know anything about databases or programming, you can easily do that, changing how these forms look and work. Furthermore, creating custom forms for everything from keeping track of inventory to billing clients is just as straightforward.

Newton forms can do more than retrieve information you've written down. They can also access larger or more specialized collections of data. Almost any body of information can be categorized and labeled so that a Newton product can read it. Imagine using your Newton to:

- Look at information about a foreign city while you're traveling. You could look up maps, addresses, and descriptions of restaurants, museums, and other attractions.
- Access the telephone numbers for the entire metropolitan area of Chicago.
- Look at important information about your company. For instance, as a salesperson, you might use your Newton to access product descriptions while on a sales call.

The possibilities are virtually endless. Newton technology will let you store, organize, categorize, link, and view information in a way that's far more flexible and useful than you could achieve with pen and paper, or even using a computer. The result, we believe, will be whole new classes of personal products that will help you better manage the information in your life.

Communicating information— anytime, anywhere

Think about the ways you communicate with other people.

When you run into a friend you haven't seen for a long time, you pull out your business card and scribble your address on the back so you can catch up next week. If you're on the road and need to talk to a coworker at the office, you pick up the phone and call her. When you want to convince a group of people that your analysis is valid, you create a quick chart, print it, and fax it to them.

These everyday actions have a lot in common:

- *They're spontaneous.* We think of an idea, or come up with a question, or discover information we want to share—and we take immediate action. We write something down and give it to someone. We reach for the telephone. We send a fax. People want to share information with others quickly (often immediately) and without hassle.
- *They involve small pieces of information*—the kinds of facts, questions, and ideas that appear in memos, graphs and charts, and short reports. More often than not, people need to share a brief message rather than a long document.
- *They happen at all hours of the day.* Your need to communicate doesn't end when you're out of the office. No matter what time it is, or where you're located, people want to send and receive important information. As wireless and cellular technologies become more advanced (and more popular), "anytime, anywhere" communication becomes possible.

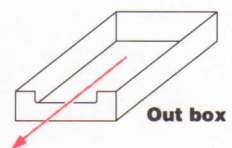
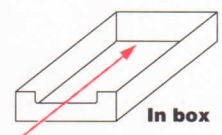
Our goal is to make Newton products as easy, intuitive, and commonplace as the telephone, fax machine, and mail. The Newton Communications Architecture—the software and hardware technologies that enable a Newton product to communicate with a wide variety of devices—was designed for spontaneous communication. Newton products will greatly enhance the process of communicating: You'll be able to use them wherever you want, whenever you want, to send and receive information.

Newton: Your universal in box and out box

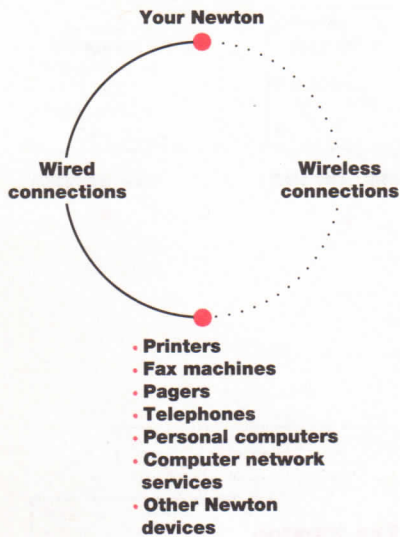
Personal, portable Newton devices will let users take advantage of both wired and wireless connections to exchange information with others.

On the screen of your Newton, you'll see an "in box" for incoming information (such as electronic-mail messages)—and an "out box," where outgoing information (for instance, a fax) is held until it can be sent. This gives you a single, easy way

The Newton Communications Architecture
Newton products will let you send and receive information no matter where you are. You can connect effortlessly to telephone lines, computer networks, and wireless networks. You'll be able to use Newton products to do everything from sending faxes to receiving paging messages, and from printing your ideas to sending electronic notes.



Newton can serve as your universal in box and out box, letting you easily receive, store, and send information—no matter where you are.



Newton devices will take advantage of wired and wireless connections to let you communicate with a wide variety of other devices.

to send and receive information. Your Newton will let you view faxes, paging and electronic-mail messages, notes, and drawings sent by other Newton users. And you can use your Newton to print to laser printers, send faxes and paging messages, and connect to networks to send electronic mail or use other network services.

Our goal is to hide the complexity of these connections. You can concentrate on creating what you want to send—and Newton takes care of the task of sending it.

Anytime, anywhere communication—some possibilities

Here are some examples of how Newton communications technology could improve the way you work:

- *Letters, memos, and notes.* Imagine a small, hand-held Newton device that lets you record important ideas and notes. You can print your notes easily—either by connecting to printers directly or by accessing them over a network. So, when you return to your desk, you could print your notes to look at or share with others.
- *Paperless faxing.* You can write a note on the screen of your Newton and fax it. Simply connect your Newton to a pocket-size fax modem and plug it into a regular phone line. While you're on the road, you can use your Newton to send faxes. You can even use a hotel fax machine to print the notes you've taken with your Newton.
- *Electronic notes and messages.* Thanks to advanced wireless networking capabilities, you can use your Newton to send information to other Newton users, without having to attach cables or connect to a network. For instance, you could “zap” an electronic note to a colleague during a meeting. Or you could compare electronic calendars with a coworker to schedule a meeting—available times to meet would appear on your Newton screens automatically.
- *Paging messages.* Newton products can be equipped with paging capabilities. You could turn your Newton into an intelligent pager—a pager that not only indicates that someone is trying to reach you, but also lets that person send you a longer text message. Say you're in a meeting, and you're waiting for some critical research you want to share with a client. Someone could send the information to your Newton, and you could view it on the Newton screen. You could also store the information and share it with your coworkers when you get back to the office. Or someone could schedule a meeting with you and send you a paging message to confirm it—Newton would automatically add the appointment to your calendar.
- *Other digital information.* Newton products can take advantage of wireless and cellular technology to give you access to digital information, such as news or up-to-date stock reports. And you can access that information no matter where you are.

In short, whether you're in your office or on the road, suitably equipped Newton devices will be ideal for viewing information from a wide variety of sources, and for sending information to a wide variety of devices—fax machines, telephones, pagers, printers, and other Newton devices. Newton products will let you use information effectively, and share that information more easily with your friends and colleagues.

High performance for revolutionary, mobile products

To make products intelligent and to make them powerful enough to process information, recognize your handwriting, and effortlessly transform rough sketches into graphics, you need a lot of processing power.

The ARM 610 RISC (Reduced Instruction Set Computing) chip, developed by Advanced RISC Machines, will provide the processing power for Newton products. This RISC chip offers exceptional performance—on the order of high-performance desktop computers—yet it consumes less power than a small flashlight. This combination of high performance and low power consumption makes it an ideal processor for intelligent, portable, battery-powered devices.

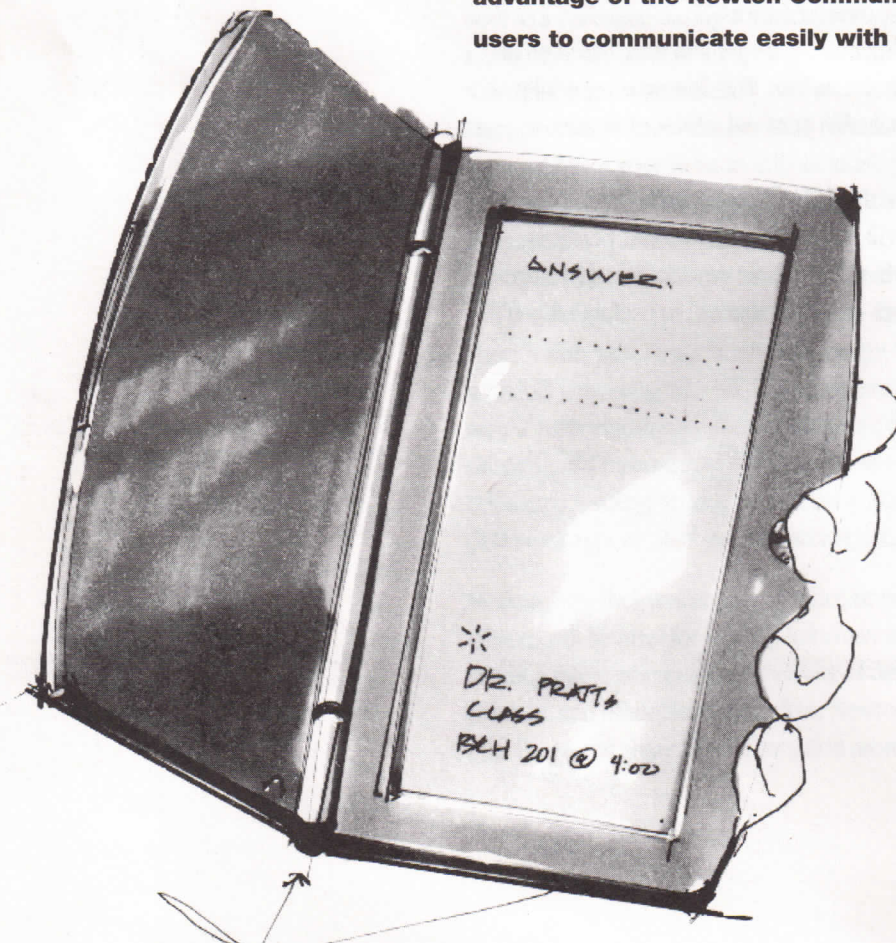
The ARM 610 RISC chip has a special memory-management unit, based on an Apple invention, that helps to protect against data loss. This feature is especially critical for Newton devices that will store valuable personal information, such as your calendar, address book, and to-do lists.

Because of its unique compact design, the ARM 610 chip can be manufactured at a low cost, making it possible to deliver 32-bit RISC performance in personal-electronics products. The result, we believe, will be whole new classes of intelligent products that fit in your pocket or briefcase—products that are so useful that you'll want to take them... everywhere.

Newton Hardware

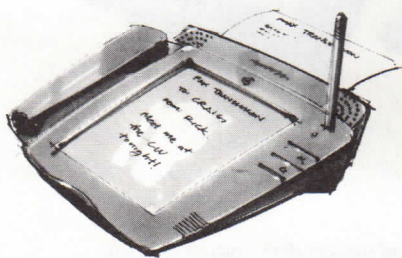
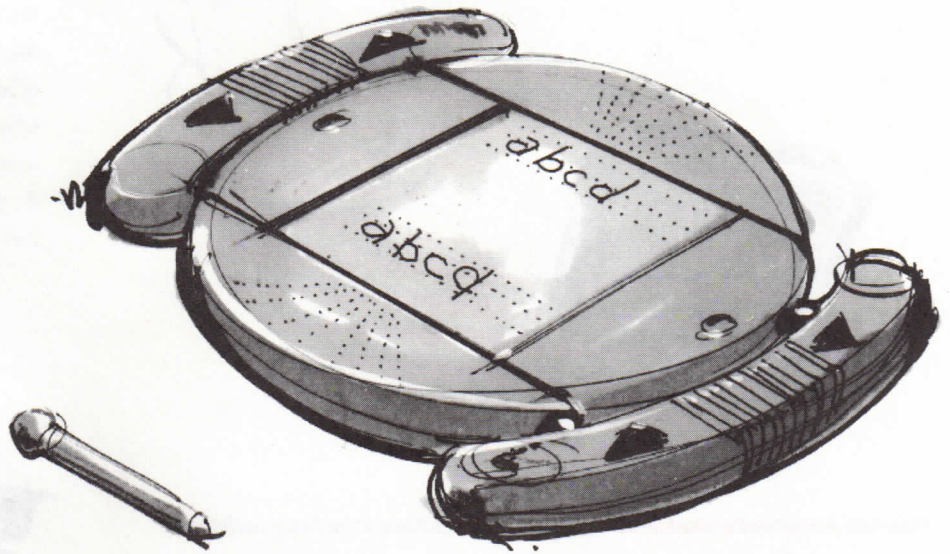
The ARM RISC processor will provide the processing power for whole new classes of powerful, mobile products.

In the following pages, you can see how Newton technology could change your world. Here are a few Newton product concepts—products that take advantage of Newton technology to offer users whole new ways of working and living. These potential products would use Newton intelligence to actively assist users. All would rely on the Newton Recognition Architecture to transform handwriting to text, and rough sketches to neat drawings, charts, and diagrams. All would use the Newton Information Architecture to store, organize, and retrieve information. And all could be built to take advantage of the Newton Communications Architecture, allowing users to communicate easily with other people.



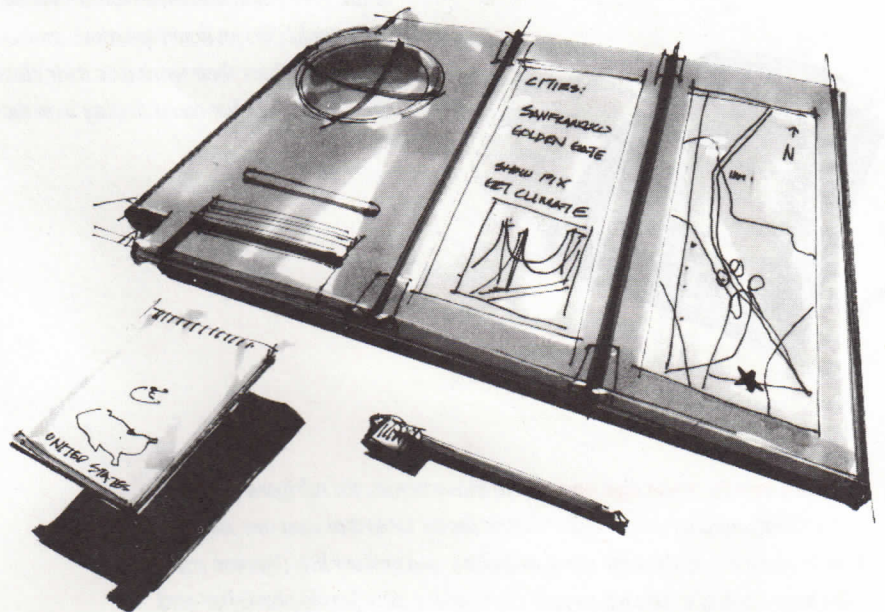
Newton 3-by-5 notetaker. With the notetaker, you could record notes and ideas effortlessly; it would clean up what you write and sketch. You could use it to create "electronic flash cards" to test yourself on the subject at hand. It would come with a built-in grammar checker and dictionary, and let you easily print your notes on any laser printer.

Newton draw and spell. *This Newton learning device could help children learn how to write by bringing up words to be traced. As children print, Newton could inspect their writing, and point out which letters were done well and which need work. It would serve as a sketchpad and could store other games and lessons.*



Newton fax/phone. *The Newton fax/phone could store your entire personal phone book, as well as local telephone listings. You could jot down notes while you're talking on the phone. And if the person you're talking with also has a Newton fax/phone, you could share notes with each other. Your phone would identify who is calling you and bring up information about the person. Say you've jotted a reminder to ask Bob about your project—when Bob calls, the reminder would appear on your screen. You could send notes and messages to fax machines (Newton would look up fax numbers and dial for you automatically). You could also receive faxes and view them.*

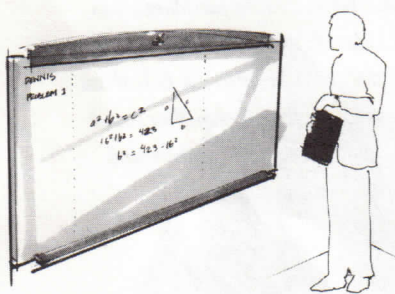
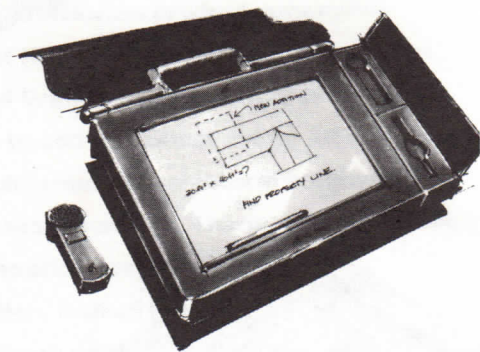
Newton portable map. *Using Newton technology in conjunction with global-positioning technology, this portable device could help you find your location—anywhere on the globe. And by inserting a card that contains information about the region, you could also find out more about the area around you. In fact, this device could intelligently assist you, by pointing out things it knows you'd be interested in—restaurants, museums, and other attractions—based on the types of places you usually visit.*



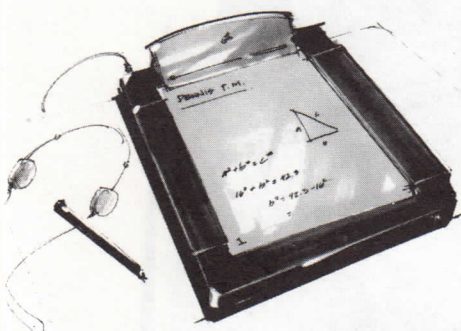


Newton inventory watch. This small Newton device could be worn on your wrist. It could store vast amounts of inventory information and communicate wirelessly with the company's computer. You could use it to update the inventory or locate a particular item in your store.

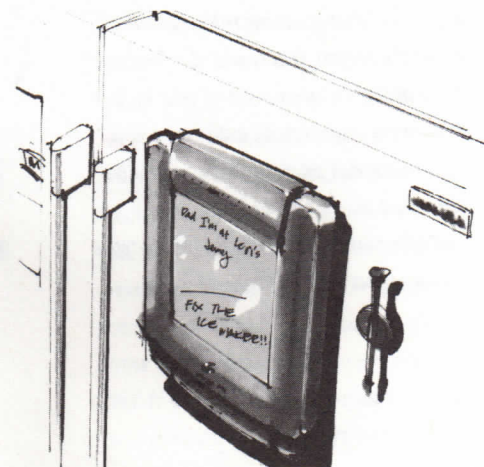
Newton architect's sketchpad. This Newton sketchpad would help architects do their work. It's portable enough to take to a site. Special Newton recognizers would understand architectural formulas and symbols. In a very fast and fluid way, an architect could sketch a site, begin a drawing of a floor plan, calculate square footage, and even estimate costs based on formulas stored in the device.



Newton classroom. The Newton white board and student desk units would help teachers and students work together. Teachers could use the white board to teach a lesson, jotting down notes and formulas and bringing up stored examples. Wireless networking technology would enable students to see the teacher's notes on their desk units. They could add their own comments to those notes, and store or print them. They could also jot down questions and work on problems. They could instantly and effortlessly share their work with their classmates by "zapping it" to the front of the class, so the teacher could display it on the white board.



Newton family message center. In many homes, the refrigerator serves as the family message center. This Newton device takes that idea one step further. Family members could write notes, to-do lists, and grocery lists (Newton could even keep track of what's left in your cupboards), store family phone lists and emergency numbers, and more.





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