http://chordite.com/protophotos.htm

What is this?

It's a pocket-sized, wearable keyboard supported and operated with one hand. It produces all the usual characters with relatively few keys which are pressed in groups, i.e., chords. Production models would include (at least) a miniature joystick or other mouse-like abilities.

What is it good for?

The user need not sit at a desk. He can stand and walk around. This makes it a good input device for portable computers, especially ones with head-up displays. It's also good for presentations with large projection screens. There are a lot of other uses as well, e.g., palmtops.

Why not just use voice for input?

Voice technology is expensive and not accurate enough for general text entry. It's obtrusive, insecure, sensitive to noise and, of course, not private. Besides all that, computers with voice as the primary input would be even more annoying than cell phones.

How fast can you type on the prototypes?

I have never been much of a typist but as slowly as I type it's still faster than I can usually think what to say. Using the program "gtypist," with its default texts, I recently timed myself at 26.5 wpm seated at a desktop QWERTY board and 27.6 wpm, standing, with the prototype shown in figures 1-3. [update Nov 2002: my one-hander speed has accidentally climbed to 33 wpm]

How fast will I be able to type on it?

Probably faster than I can. Assuming that you too are not a touch typist on the qwerty, I would guess that you too will be about as fast on the portable one-hander as you are on the qwerty. I would expect that if you're really fast on the qwerty then you may lose some speed on the portable because you have freed one hand. Actually, since you can now stand up and walk away from the qwerty, one might say you have freed your whole body.

How hard is it to learn?

It's much easier to learn than touch typing on a qwerty but harder than two-finger hunt and peck. I think I had memorized all the chords after a week or so of intermittently playing with my first working unit. After that I quit using my qwerty all together and never missed it. Of course the chords soon became automatic and unconscious. I make a poor example because I was changing the prototypes and the chords as I learned them.

How many people have used this type of one-hand keyboard?

As I write this, I'm the only one. I like it but skeptics might reasonably question my objectivity. I'd like to get more people involved.

Previous chording keyboards haven't been very popular. How is this one different?

One big reason is that the typing fingers don't grip the unit and don't participate in retaining it within the hand. Trust me; this makes it much simpler to use. It's hard to type with fingers that must grip something at the same time. That's why the only portable one-hander you can buy at present, as far as I know, has a big, ugly, wrist strap. Another reason is that the fingers are never far from their relaxed positions. They don't have to curl tightly, which quickly becomes tiring. This keyboard is small enough to be mostly hidden by the hand so it's not so geeky. Since there's no strap, it can go in and out of a pocket quickly. When you actually get one in your hand you see it's great fun to type so casually and with so little effort.
Will it work with gloves?

Probably, if the gloves are thin. In cold weather it might be better to use a mitten or bag that goes around both the (naked) hand and the keyboard. Or just build it with key guards and keep it in a coat pocket while you use it.

*Does anyone have IP rights on it?*

I own US patent 6429854 and I am applying for others.

**Who are you?**

I am John W. McKown, a retired guy living in Arizona. Long ago I studied electrophysiology but I have worked mainly as an electrical engineer (signal processing and wireless networks).

**What's your plan, John?**

Along with many others, I think the absence of adequate input devices has been holding back a huge market for more portable computers. I'd like to see this kind of one-hander developed, productized, manufactured and available. This web site is part of an effort to interest enterprises which have those capabilities. If that effort fails I might start selling crude kits myself. I might even decide to invest in some engineering and sell finished units. I'd like to make a few bucks from this somehow because it has been a lot of work.

It's only when you get one of these units properly fit and in your hand that you experience their true beauty: the simple pleasure of typing so easily and casually. I want to make that experience easy for potential licensees. I want technical people inside big companies to be able to proceed without needing a lot of prior paperwork and permissions. This website goes further, however, and enables the whole world to duplicate my prototypes and, no doubt, improve them. I believe that today's hobbyist might well turn into tomorrow's advocate, co-developer or investor. Since my patent only applies in the US, someone somewhere else in the world might even develop and sell similar units without involving me at all. That's OK: it would help to demonstrate a market to potential investors. Sooner or later, I'm hoping, someone will want to license a product for sale or production in the US.

**When can I buy one?**

I don't know but when I do I'll certainly announce it here. Check the news link above.

**Suppose I want to evaluate a prototype like yours. What help do you offer?**

I've prepared a downloadable information kit which has everything you need to quickly duplicate the prototypes shown on this website. It includes a bill of materials, source and executable firmware, part numbers at Digi-Key, instructions, diagrams, helpful hints, etc. This kit is aimed at folks who have done a little soldering somewhere along the line. It should get techs and engineers off to a flying start.

**PLEASE NOTE:** I am not a lawyer but this is the legal situation as I understand it. If you do the work outside the USA, you can proceed as if my patent didn't exist until you want to sell within or import into the US; for that anyone would need a license which of course I would provide very affordably (unless I had already sold an exclusive license to someone else). If you are within the USA, its territories or possessions and you want to evaluate prototypes covered by the patent, then you need a license. This is not a problem -- I'll grant you a free license to build and use prototypes for evaluation purposes on your way to the download.

The firmware included in the download lets an Atmel AVR '2313 microcontroller interpret chords and talk to a PS/2 port. It's about 900 lines of rough and ready assembler code that I'm releasing to the public domain with (hopefully adequate) disclaimers. Software professionals might be offended by it -- sorry -- but it works and it might even be useful for designs of your own. Take it, go and God bless. No promises. Note that US patent 6429854 is **NOT** being released to public domain and I reserve all rights under that and related patents.

If the download doesn't take you as far as you want to go, I'm available for consultation with your techs, M.E.s, industrial designers or whomever.
We see some possibilities here, John. We'd like to talk. How shall we contact you?

Please send me an email

I'm building one of these things just for fun and I have a question or comment for you, John. How shall I contact you?

Please send me an email

And please take the poll

The What & Why Of Wearable Computers

Most people, on first hearing "wearable computer," probably thought "who needs it," closely followed by "how goofy looking would that be." Nevertheless a huge market will develop as portable computing hardware becomes more portable, less obtrusive and takes on more of the functionality of desktops.

In some circles, mobile means roughly "works on a moving vehicle" and "portable" means "can be carried by a pedestrian." I'd rather say here that both refer to the continuum of motions and postures allowed to the user. Thus a device which requires the user to be seated may be considered less portable than one for which the seated posture is optional. The more things you can't do while using it, the less portable it is.

A (simple, non-smart) cell phone is more portable than a laptop computer because you can operate your cell phone with one hand, standing, walking or sprawled upside down on a couch and that's certainly not the case with your laptop computer or even your PDA. This isn't due to any limitation of the internal electronics. The problem is the I/O peripherals.

The conventional screen and keyboard have a natural scale determined by the dimensions of the human eye and hand. Shrink the keyboard or the screen too much and they become unusable. Many of today's devices are near the limits. And since the screen and keyboard can't be much smaller there's less pressure to shrink other parts. The way forward, of course, is to replace the conventional screen and keyboard with designs that are not subject to the same limitations.

In doing so we cannot avoid the all-important issue of social acceptance --- the geek factor. Few really want to look like a Hollywood cyborg. Besides being usable in any posture, the ideal wearable computer would be invisible, at least while stowed. The geekier a wearable looks the more social situations it will be denied. The wearables available today won't soon be appearing anywhere people are trying to impress one another socially. But that still leaves immediate industrial, military, academic and recreational markets --- if functionality more comparable to desktops can be achieved.

A widely shared vision of wearables is that the main output device should be a small screen or, better, a virtual display that can overlay rather than obstruct the user's view of his real environment. The main input device should be a one-hand keyboard and everything should be as small as possible.

Technical Details Of The One-hand, "Chordite" Keyboard

Briefly, the big ideas are

0. Relieve the typing fingers of any role in supporting the keyboard. Do this with a frame held between the thumb and palm rather than using a wrist strap.

0. Place the keys so that the typing fingers remain near their relaxed positions.

0. Use two keys per finger. Press one with the distal phalanx and the other with the middle phalanx.

Number three is, I believe, novel. Until you try it's not obvious that it works.
The human hand is a marvel of nature and has plenty of bandwidth and endurance for prolonged data entry if you interface with it on its own terms. Of course to be fast, the finger motions should be small and light. The hand also expects appropriate tactile feedback.

Not surprisingly, fit matters. Fit is important with almost anything that touches the body. Qwerty keyboards are a rare exception --- they don't need to be adjusted for hand size because the user can compensate for poorly placed keys by moving the entire hand relative to the keyboard, adjusting keystroke by keystroke. This degree of freedom is not available when the operating hand also supports the keyboard. Consequently the fit must be more precise for portable one-handers. I currently believe that one-size-fits-all one-handers are possible but will likely be table mounted. Most people, IMHO, will prefer units adjusted to fit their particular finger dimensions. Thus one-hand keyboards may come to be considered personal effects like eyeglasses or hats.

Experimentation has convinced me that the optimal switches for the stealthy keyboard would be soft (30 gf or less, like those on a standard qwerty board), have a short throw (a millimeter or less, like a metal dome tactile switch), life expectancy in the tens of millions (like a qwerty's) and preferably a tactile snap. So far I haven't found any keys with this particular combination but it's clear there's nothing undoable about it. I'm just not ready to order 50,000 switches to get exactly what I want.

The best switches I could find for my prototypes are of the type called "micro switches" or "basic switches" or "basic snap switches." The hinged levers aren't as desirable as a straight-down push action would be but suffice.

Among the biggest shortcomings of my prototypes are that they are not quickly adjustable and have no miniature joystick. A commercial product definitely requires both these features. A commercial product might also be wireless, have a display screen, etc.

My newest prototype (summer 2008) is here.

Below are my original prototypes. I also have a more adjustable version. See also the beautiful pictures sent to me by Stéphane Doutraux and Darcy J. Currey. Russ Nelson is also working on prototypes.

As of February 2007, however, I have to say the lastest and greatest units are at Toby Gray's wearable PC blog. Toby has replaced the big screw I call the kingpin with a miniature aluminum extrusion called deck track, commonly used by model yachtsmen. This makes adjustments easier and much more independent.
THANKS to technology, it is possible to work or communicate from just about anywhere with a computer and modem. Yet regardless of locale, typing text into a laptop, personal organizer or e-mail device still requires a traditional keyboard; in many cases, it demands a table to support the keyboard, and generally both hands to type.

Mobility and portability are holy grails in computing and communications, generating high hopes for the emergence of ever-smaller, lighter computers, and for wearable models. Still, the keyboard remains a pesky hurdle. Wearable computers are already in use in industrial and commercial settings, where bulky keyboards strapped to a user's thigh
(and displays embedded in goggles fit for a welder) are not a deterrent. But a lightweight belt or wrist computer for the average person remains a challenge.

John McKown, an inventor in Scottsdale, Ariz., believed those obstacles could be overcome by abandoning long-standing ideas about how people input data and how computers receive it. He has won a patent for a wearable, one-handed keyboard that lets users type as they pace around an office, walk down the street, lean back in an airplane seat or are passing time standing around (in line at the driver's license office, perhaps).

In fact, even though his patent is named "Stealthy Keyboard," it is somewhat imprecise to call it that since it lacks the traditional "board." Rather, it fits inside a cupped palm, hooks around the thumb and forefinger, and is operated by using the fingertips and the mid-section of fingers to press the keys.

Mr. McKown is 55, an unassuming and soft-spoken former electrical engineer who worked many years at Motorola before retiring early. He traces his experiments with keyboards to his earlier interests.

"I was educated as a biophysicist, and that involves a lot of physiology," he explained last week, just a few days after his patent was issued. "I came to appreciate a lot about the body. The hand is a marvel of nature. It's unacceptable not to have a good, one-handed keyboard. The hand is obviously capable. You don't need two hands to type, or to be restricted to a table."

He is not the first to win a patent for a single-hand keyboard. But he points to some distinctions that he says make his design easier to use than earlier models.

"One thing people expect you to do is hold onto the keyboard with the same fingers that you use to type," he said of earlier inventions. "Other mistakes were designs that want you to curl your fingers more than is comfortable for a long time. You need to be able to flex, to back away from the board and wiggle your fingers to get the blood flowing," he explained.

With his device, he said, "If you straighten your fingers and thumb on my keyboard, it just hangs there and waits for you to go back to work."

A user doesn't have to grip Mr. McKown's device because two wide hooks curl around the thumb and forefinger to fix it in place. After slipping the thumb and forefinger into these hooks, the user would then cup a hand around the device so that the keys are aligned under the fingertips and knuckles. The whole unit is designed to be small enough to disappear into the palm.

Though there are only a maximum of eight keys, Mr. McKown says a user can generate up to 256 characters by pressing the keys using fingertips, the middle of the fingers, and combinations of those. He manages 256 characters by creating what he calls "chords."
"Every character has a chord, meaning a certain combination" of keys pressed, Mr. McKown explained. "With two keys per finger, you can use one finger to get four different combinations." The combination possibilities of four fingers add up to a potential 256 characters, he said -- more than enough to cover the alphabet and other elements of a traditional Qwerty keyboard.

"It's a full keyboard," said Mr. McKown, who uses his every day. "Just about anything you can do, I can do."

Because his keyboard has only one Shift key, computer games that distinguish between a right and left Shift could not be played with his device. And he admits that because it's not a Qwerty layout, the first reaction may be that it's hard to master.

"There are no skills transferrable," he acknowledged. "In spite of how it seems, it's actually easy, but you have to hold it in your hand to tell that."

He said he spent several weeks learning to touch-type with his invention.

"Within a week I had memorized all the chords," he said, "though I still had to think about them. Within two months I'd learned it all instinctively, and that was through purely accidental learning. I'd pick it up whenever I had a minute. Now I'd never go back to a Qwerty board because I like to stand up when I type."

While the wearable computer of the future might be an ideal partner for his invention, Mr. McKown said, "I'd be in trouble if I had to wait for the display" necessary to make such computers practical. He says his invention can already be used with laptops or palm devices, though he has not produced anything other than prototypes.

But his hope is that once mastered, the discreet keyboard tucked into a palm could be used anywhere, by anyone walking down a street, lounging in an airport terminal, or making a presentation with software like PowerPoint.

"If you had a regular laptop on a plane and plugged one of my things into it, you could put your elbows anywhere," he said.

Since the keys must be positioned under the fingertips and mid-finger bone, the device would have to fit each individual user.

"As I conceive it, it's adjustable in size," Mr. McKown said. "It takes long enough to adjust it that, once it's adjusted, you won't want anyone else to use it. I consider it a personal effect, like eyeglasses."

Photos of Mr. McKown's prototypes can be viewed on a Web site he set up last week, www.chordite.com. Anyone can download his engineering plans after agreeing to a free evaluation license.

But Mr. McKown also hopes to find companies that are interested in manufacturing and production licenses for his patent 6,429,854.