

PRODUCTS

This chapter describes representative products in six areas: seating, workstations, workstation accessories, keyboards and keyboard trays, wrist rests and pointing devices, and lifting aids. Most of the products are available through local dealers in cities with populations higher than 250,000, but a few national suppliers are identified at the end of the chapter to assist potential purchasers who cannot find reasonably priced products in their area.

Use the Internet to look at pictures and product specifications before going to a local dealer. This chapter identifies Web sites for most of the companies.

Seating

Global makes one of the least expensive ergonomic chairs, the Ergonomic Task Chair. The back and seat angle can be adjusted independently, gas-lift control adjusts the seat height from 17.5 to 22.5 inches, and the back height is adjustable. The tilt of the seat and back cannot be adjusted. The seat measures 20x17 inches, so it is not suitable for extremely small (under 5 feet, 3 inches) or extremely large (taller than 6 feet, 4 inches) people. The arms can be adjusted to maintain the proper shoulder-to-elbow relationship. The price is about \$200.

Grahl, best known for chairs priced higher than \$1,300, also offers the Grahl DuoBack chair. This chair has a no-pressure-on-the-spine split back that makes it particularly comfortable. To keep the price down, it is shipped unassembled. The assembly directions are not clear, so the chair is a challenge to put together. Presumably, assembly gets easier if you buy and assemble several. Incorrect assembly can compromise the ergonomics. At \$242, the chair is a good value.

EckAdams, a chair manufacturing company, offers a relatively low-cost ergonomic chair called the EI Task Chair. The chair has a mid-size seat, meaning that it is designed for people between 5 feet, 3 inches and 6 feet, 4 inches. It is a standard office chair with an adjustable seat and back. The chair is designed to be used by one person as the adjustments are not as quick or easy to make as higher-priced models. The armless chair lists at \$239 and the high-adjustable arm chair lists at \$319.

Office Master stresses that its 24-seven chair, which has a mid-size seat, is designed for 24-hour, 7-day use in a multishift facility, meaning that different people will occupy the chair during the course of a day or week. It is designed to adjust quickly and easily to different sized individuals. It features an easy-reach seat slider to lengthen or shorten the seat, lift-and-lock seat back height adjustment, and simple paddle control levels. The chairs list at \$450 each. See next page for photograph of the chair.



**The EI Task Chair
from EckAdams.**

www.globaltotaloffice.com

www.grahl.com

www.eckadams.com

www.office-master.com

www.somaergonomics.com



The 24-Seven Chair from Office Master.

Soma Ergonomics Inc. offers the BioComfort chair, an ergonomic chair that comes in a variety of seat sizes, back styles, and armrests. The chair line has a model for each size person. The seat sizes are 16x18, 18x20, and 19.5x23 inches; the back options are low, mid-back, and tall—the latter providing neck support. There are armless and swing-away arm options. All the chairs feature adjustable backrest angle, seat angle, front or center hinge rocking, armrest height and width, and seat slider mechanism. Prices range from \$360 to \$475 for the armless models and from \$440 to \$555 for the armrest models.

www.bodybiltchairs.com

BodyBilt offers a range of options similar to Soma's but extends the line to include an executive chair. The small is for people less than

5 feet, 3 inches tall and less than 150 pounds; the standard is proportioned for fit people from 5 feet, 3 inches to 6 feet, 4 inches in height and up to 250 pounds; the big and tall is for people up to 6 feet, 6 inches tall and up to 500 pounds. The executive chair adds an adjustable headrest and a rocking feature to the big and tall model. All have a wide range of adjustments, including pneumatic seat height adjustment, three-way arm adjustment, and inflatable lumbar support. Prices range from \$849 to \$1,135, but significant discounts are available when three or more are purchased at one time.

www.humanscale.com



Freedom 3 chair from Humanscale

Humanscale's Freedom chair has no knobs, locks, or levers. The chair is engineered to adjust to the body once one sits in the correct posture with feet firmly on the floor and the back against the seat back, which is padded with gel cushions. The optional armrests glide up and down with a small wrist motion. The chair also features a headrest. The list price is \$1,155.

If a chair does not provide adequate lumbar support, an adjustable back-support rest can be used. It should have elasticized straps to hold the rest firmly in place, yet permit quick removal. Prices are \$110 to \$130.

Workstations

Iceberg features a line of modular components called the Ergonomic Workmanager. It has built-in cable management and a pullout keyboard drawer, but all the work surfaces are the standard 28.5 inches in height including the corner keying unit. It is not truly ergonomic because it relies on the use of workstation accessories to make it work for people of differing heights. It is, nevertheless, typical of what is offered by most office

www.icebergenterprises.com

furniture dealers. Component prices range from \$100 to \$290 each. A typical configuration—desk, corner keying unit, file pedestal, and printer stand—is priced at just over \$1,000.



Ergonomic Workmanager from Iceberg.

Martin has a computer grouping that consists of an executive desk with a computer return (that is, the traditional L-shaped grouping) or a separate computer desk. Although each has an extra-wide pullout keyboard shelf with mouse pad and CPU tower space, the height of the work surfaces is not adjustable, so workstation accessories are essential for it to be useful for people of differing heights. Prices range from \$1,100 to \$1,600. The firm has no Web site. Its products are solely available from dealers. Searching the Internet under "Martin computer grouping" brings up several dealers' Web sites.

AliMed Inc. offers the Soho Single-surface Adjustable Workstation, a worktable that can be adjusted in height from 25 to 46 inches in infinite increments. Setting the dial to the desired height activates an electronic controller that automatically raises or lowers the table to that height. There is a large surface (48x30 inches or 60x30 inches) for keyboard, mouse, and other equipment. It is well-suited to work areas with many shift changes. The main drawback is that the unit contains no storage. Depending on the size of unit, the price is \$415 to \$500.

www.alimed.com



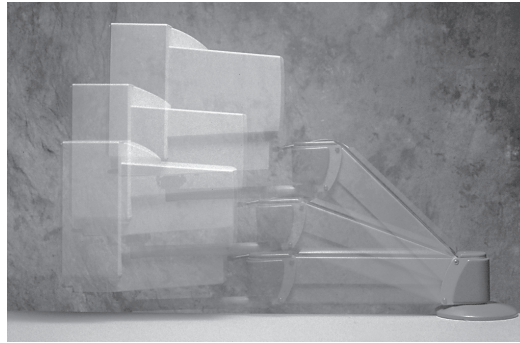
Soho Adjustable workstation from AliMed.

Workstation Accessories

Workstation accessories can help compensate for the fixed features of a workstation. Most are relatively inexpensive.

Monitor Support Arms

A monitor support arm makes repositing the monitor possible so the monitor is at the proper height and angle. Most use springs and cylinders and don't move smoothly. They cost \$50 to \$75. The easiest to use are those that function on friction. Typical of these is the Spider Arm introduced in 2000 by Humanscale Corp. and the VersaTech monitor arm distributed by AliMed. They are priced \$100 to \$199.



VersaTech Monitor Arm from AliMed.

Adjustable Keyboard Trays

An adjustable keyboard tray is designed to provide a full range of height and tilt adjustments to accommodate varying postures. The mouse platform slides over the keyboard's numeric keys to lessen the need to reach. There are several configurations available at prices ranging from \$199 to \$450. 3M is a major supplier. The least expensive is the FlexRest offered by AliMed at \$199.

Adjustable keyboard tray is designed to provide a full range of height and tilt adjustments to accommodate varying postures.

Mouse Pads

Although free mouse pads arrive regularly in the mail, they are not good choices because they provide little protection. A far better choice is a gel-filled pad that offers support, yet feels soft. They are priced at about \$15. 3M is a major supplier.

Arm Supports

Arm supports clamp to the front edge of a desk or bench. They support the forearm, relaxing the arm, shoulder, and neck muscles. One model, the ForeArm Rester from AliMed, can be adjusted to five vertical settings. The rester can be up to 3 inches over the desk or flush against it. It measures

26 inches in length and 12 inches in depth. It costs about \$100. At 30% more, AliMed offers the ErgoRest, a support that features an articulating arm.



The 3M gel-filled wrist rest.

Wrist Rests

A wrist rest is designed to protect the wrist while using a keyboard. It fits against the keyboard, and in some cases partially under it to keep it firmly

in place. It usually is made of a fabric designed to resist heat and moisture. Sponge rubber models are priced as low as \$5, but the gel-filled models are a better choice. They cost a minimum of \$15. 3M is a major manufacturer.

Ergonomic Gloves

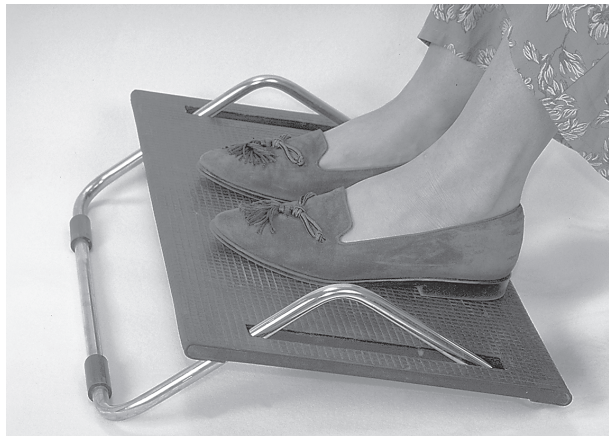
An ergonomic glove is designed to protect the wrist and hand. Most are finger-less gloves with padded palms. They were designed specifically for assembly work and high impact applications, not typing. Only the lightest weight should be used for typing. They cost \$30 to \$50 each when purchased directly from the manufacturer. Imperial Safety Products is the leading manufacturer. Local office supply stores are better sources.

Wrist Straps

A wrist strap is a better choice than an ergonomic glove for most typists. It provides support to the wrist without restricting the hand. The strap, which is usually made of heavy elastic, should be about 3 inches wide and should fasten with Velcro so it can be adjusted to the wrist. Imperial Safety Products is a major manufacturer, but its minimum shipping charge is almost equal to the \$10 to \$15 price of a strap.

Footrests

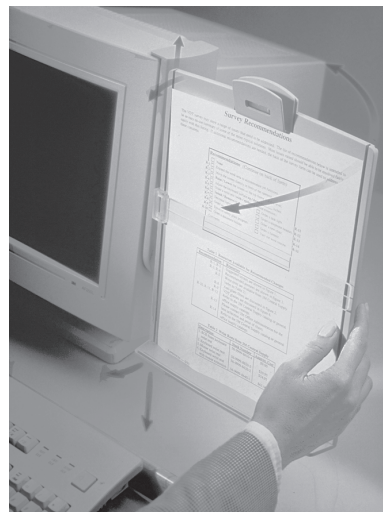
When the height of the workstation and adjusting of the seat does not result in feet being firmly planted on the floor, a footrest is the solution. The footrest should be adjustable, both for height and angle, and should have an antislip surface. The price is about \$90. The model illustrated is the 7129 from AliMed.



Foot rest from AliMed.

Document Holders

A document holder usually mounts tightly to either side of a computer monitor so that the material is at eye level and no turning of the head is required to read both it and that which is on the monitor. The holder can usually be adjusted in several ways. A holder costs from \$30 to \$60. Less expensive desktop document holders are also available. Of these, the models that have a weighted base are better choices. 3M is a major supplier of document holders.



One model of a 3M copy holder.

Personal Computers

Monitor

The monitor is ergonomically the most critical part of the PC because the eyes may

www.imperialsafety.com

www.alimed.com

be focused on it for hours a day. The greatest source of discomfort is flicker, the movement created by the painting of phosphors on the screen. The problem is unique to screens that use CRTs (cathode ray tubes). An electron beam paints phosphors with electrons, and the phosphors emit light. Although the object is to have the phosphors keep glowing until the electron beam gets back to paint (or refresh) them again, if they glow too long they will make the image too slow to keep up with changes such as moving cursors or video images. So the solution is to use phosphors that don't glow long, and then to repaint them quickly.

But there is no fixed rate for a flicker-free display because the eyes of people are different. Flicker is much reduced when the vertical refresh rate is between 70 and 75 Hz. At 85 Hz, flicker disappears, but running the monitor at that rate sacrifices image quality. To make a black pixel next to a white pixel, the electron beams in the monitor must go on and off in an incredibly short length of time. Without enough time for the change, the transition between the two pixels goes gray. So the best approach is to choose the lowest refresh rate at which the user of the monitor cannot see the flicker. Ensure each monitor user knows how to adjust the refresh rate. Be aware, too, that the larger the screen, the higher the refresh rate should be. That rule works because a larger image fills a greater portion of the field of vision, and human vision is more sensitive to motion in peripheral vision than it is to motion in the center of the field of view. Changing to a larger screen should result in the monitor user increasing the refresh rate.

Color is also a factor in eye comfort. Most people's eyes are not as receptive to the colors at the extreme ends of the visible spectrum: blue, violet, and red as they are to green, yellow, and orange. The latter colors are in the middle of the visible spectrum. In setting display colors, personal preference should be tempered with this knowledge.

Keyboard

Much has been made of keyboard designs, but there is no evidence that any design is significantly more effective in reducing the risk of MSD than others. Users, however, are not convinced. One effective model, Microsoft's Natural Keyboard Elite, has a conventional keyboard layout but incorporates a wrist leveler under the palm rest so that the keyboard can be adjusted to assure typing is done with straight wrists. The price is about \$40.

Evidence shows that people who make a great deal of use of the numeric keypad benefit from an external keypad—one not attached to the keyboard. Numeric keypads typically cost a minimum of \$30.

Ergonomic Mouse

Scores of mouse designs are on the market. The ergonomic models are designed so the hand rests at a 45-degree angle on its side, rather than flat on the mouse. This positioning feels more natural and puts less strain on the wrist and forearm.



AliMed's adjustable mouse.

Microsoft and Logitech are the largest suppliers of mice. Each has a number of models, but none is represented as ergonomic. Microsoft offers a three-button ergonomic mouse that is properly curved. It is priced at \$12.

Micro Innovations offers three-button ergonomic mice that are properly curved. They are priced at \$12 to \$30. The GoldTouch Mouse, a product of GoldTouch Technologies has won several awards for its ergonomic design. It sells for \$50. Although these mice may be ergonomic in design, it is unlikely they will work equally well for right- and left-handed people, or for those with especially small or large hands. Everyone who is not right-handed with a medium-size hand should have a mouse fitted. Proergo.com offers a line of mice called the Contour Mouse that includes right- and left-handed models in three different sizes. There is an ErgoFit screen on the company's Web site to measure the hand. The price is \$99. AliMed offers an adjustable mouse that allows it to be fitted to the hand. It is priced at \$59.

Trackball Mouse

When a large trackball is imbedded in the top of a mouse you can move the cursor with the palm of the hand, reducing strain on the wrist. Typical of such products is the Expert 5.0 Mouse distributed by AliMed. It is priced at \$129.



Trackball mouse.

PC Magnifier

Bausch & Lomb introduced a personal computer magnifier in 1998. The magnifier enlarges the on-screen information by 175%. Called the Magni-Viewer, it can be adjusted so users are properly positioned in front of the monitor and the enlarger. The retail price is about \$250.

Headsets

People who spend a great deal of time on the telephone should use headsets to avoid cradling the phone on the shoulder, with the head tilted to keep it in place. That position cannot only result in shoulder and neck injuries but makes other activities more difficult, such as typing, while on the telephone.

Plantronics, a major manufacturer of cordless telephone headsets, makes models that fit in the ear or over the ear, and for one ear only or both ears. Prices for high-quality models begin at about \$100.

Lighting

Lighting in most offices and libraries consists of row after row of recessed or suspended ceiling fluorescent fixtures. A Cornell University study determined that an alternative form of ambient fluorescent lighting—indirect—cut the number and frequency of reported employee visual and health-related problems affecting job performance by about 50%. Because most ambient lighting isn't easily changed, the alternative is the addition of adjustable task lighting.

The two main types of task lighting are the portable type that sits or clamps on a desk or workstation, and the mounted type that is installed under a cabinet or shelf.

www.mic.innovations.com

www.goldtouch.com

www.proergo.com

www.bausch.com



3M task light

Portable Task Lighting

Typical of portable task lighting is Waldmann Lighting's Chrosu Uplighter, a clamp-on light that provides glare-free illumination on a desk or table-top. Another is One Tech's Eclipse Computer Light, a unit that supplies indirect light to minimize the effect of direct glare from a light source and reflective light from the computer screen. 3M also offers a task light called the 3M Polarizing Task Light. It is available through AliMed. Each sells for about \$60.

Mounted Task Lighting

Luxo, the company that introduced task lighting in the United States in 1937, produces a lighting product called 10/10, a glare-free, adjustable lighting system that can be mounted beneath overhead storage cabinets or shelves, or directly to vertical panels and walls.

Antiglare Filters

If glare cannot be reduced with task lighting, an antiglare filter may be useful. An antiglare screen, which usually is made of plastic, fits over the monitor screen and attaches with Velcro tabs or clips. Antiglare filters cost as little as \$30. 3M is the largest supplier.



3M antiglare filter.

3M has a number of models that not only reduce glare, but block up to 99.9% of ELF/VLF E-field radiation. Monitors, particularly those using CRTs (cathode ray tubes), emit a wide range of electromagnetic fields. Studies are conflicting, but some research has identified potential health hazards from long-term exposure to nonionizing electromagnetic radiation in the extremely low frequency (ELF) and very low frequency

(VLF) range. The ELF frequencies of concern are those between 30 and 300 Hz and the VLF frequencies of concern are those between 3 and 30kHz.

3M makes a polarizing computer filter made of tinted glass that reduces glare substantially more than less expensive plastic filters. It also filters out E-field radiation. The polarized design also offers a degree of privacy, as people cannot read the screen from the sides. The price ranges from \$100 to \$170, depending on the size of the monitor to which it is to be affixed.

Computer-specific Eyeglasses

Eyeglass-wearers who use a computer regularly should request an eye examination that includes the use of diagnostic equipment that simulates a computer monitor. When a patient looks at the tester, typically one made by the Prio Corp., Portland, Ore., a doctor can determine where the patient actually focuses. The prescription can then be optimized for computer use.

Lifting Aids

The popularity of **back supports** is undaunted by conflicting scientific studies about their value and the disapprobation of NIOSH and OSHA. Although they may not prevent injury, they are useful in that they may remind the wearer to use proper lifting techniques. They may also help posture in the case of people who are on their feet all day. The back supports range in price from \$30 to more than \$100.

Portable lifts are hand trucks with foot pumps that can raise the platform 4 to 5 feet. They typically handle weights up to 750 pounds. The list price is about \$575 to \$625. Although portable lifts cost up to four times as much as a hand truck without lifting capability, they are a good investment as a single lifting injury is far more costly. Purchasing portable lifts via the Web is not cost-effective because of the high cost of shipping. The best place to look for dealers is under the heading "materials handling equipment."

Quick lifts are specially built lifts that cannot be used to move objects but are maneuverable in confined spaces. These lifts usually use an electric motor powered from a rechargeable battery. They can raise objects as high as 6 feet, but at that height the maximum weight that can be lifted is 125 pounds. They typically cost \$1,650 to \$1,800. Clark and Caterpillar are the major manufacturers. Many materials handling equipment dealers carry one of the two manufacturers' products.

Table movers are special sets of wheels designed to slip under portable table ends to roll them along the floor instead of lifting. Most folding tables require only one mover, but tables more than 6 feet in length should be moved with two sets of wheels. These devices also save labor because one person can move tables. At about \$30 each, table movers are a bargain. Many materials handling equipment dealers carry table movers, as do most dealers that sell folding tables.

Software

Considerable anecdotal evidence in the literature and interviews conducted by the author show that computer users using ergonomic software experience less stiffness and muscle aches associated with long hours at the keyboard, along with a reduction in their stress levels.

Ergomanager, a product of Management Information Systems, Inc., consists of a group of seven software products that can be used individually or together. One of the components, called Guardian, tracks keystroke frequency and mouse activity. This data is stored for analysis and can be

NIOSH is the National Institute of Occupational Safety and Health, www.cdc.gov/niosh.

OSHA is the Occupational Safety and Health Administration, www.osha.gov.

www.magnitude.com

www.officeorganix.com

There is a free 30-day demo at www.cyberstretch.com.

To learn more about **AliMed**, go to www.alimed.com or call 800-225-2610.

Office Organix can be reached at www.officeorganix.com or at 800-569-9236.

accessed by both the computer user and his or her supervisor. Guardian can be used to determine whether the person is taking enough breaks. Another component, Usernotes, allows employees to electronically submit information about symptoms they may be having. The user simply points and clicks to his or her area of discomfort on a figure of the human body. Ergosure Pro, another component, is designed to help evaluate an employee's posture by photographing him or her at the computer. The software is priced at \$159 per user.

Stretch Break, a product developed by Office Organix, has a virtual alert box that appears on the computer screen at intervals controlled by the user to signal a break time. The user has the option of canceling, delaying, or proceeding with the stretch break. One feature of the software is a series of illustrated exercises lasting 15 to 20 seconds. The software is priced at \$44.95 per user.

Cyberstretch by Jazzercise includes 26 timed stretches, action tips, vision and relaxation breaks, posture checks, and fitness advice. It costs \$70 per user.

National Suppliers of Ergonomics Products

AliMed is a major dealer in ergonomics products, including not only furniture and equipment, but supplies. It stocks more than 20,000 products.

Office Organix, a major competitor to AliMed, also carries a full line of ergonomics products.