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THE APPLE II MAGAZINE

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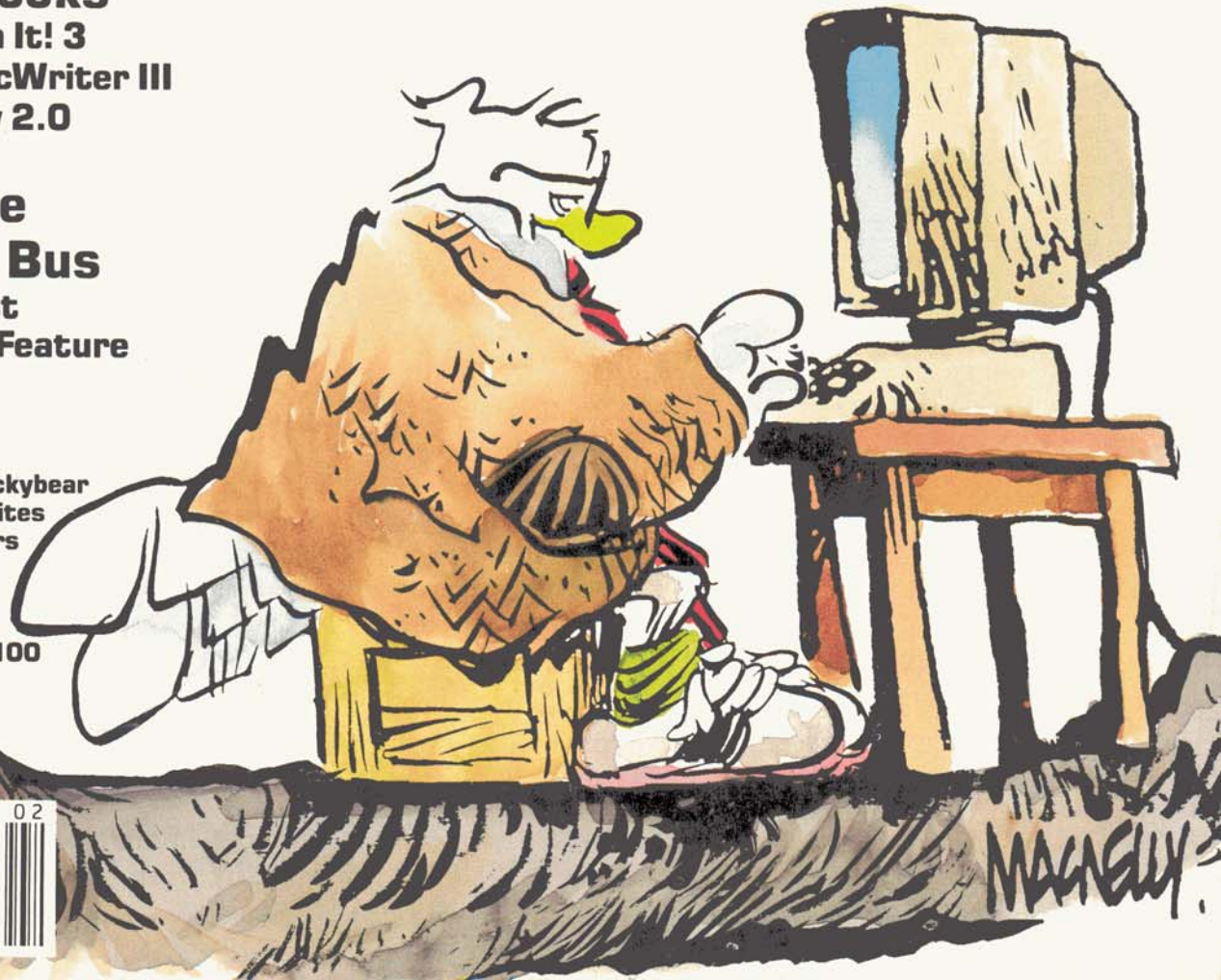
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The Apple Desktop Bus
The GS' Most Underrated Feature

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By OWEN W. LINZMAYER

Make the ADB Connection

Your GS' Apple Desktop Bus lets you plug in a series of input devices and switch from one to another at will. Whatever your interface needs, the ADB standard puts you on the road to customized communication with your computer.

KEYBOARD NOT CUTting it? Mouse not accurate enough? Do you secretly long for trackballs, graphics tablets, jazzier mice, more elaborate keyboards, and other intriguing input devices? Climb aboard the Apple Desktop Bus and journey beyond the limits of the one mouse and one keyboard Apple provides as standard equipment. The Apple Desktop Bus, a four-wire cable carrying those millions of bits of data from your keyboard into a port on the back of your computer, is one of the GS' most versatile, and underrated, features.

What's so versatile about plugging in a keyboard? It's only the beginning of the input line, that's what—the keyboard isn't your sole mode of communication with the computer. The Apple Desktop Bus lets you *daisychain* your input peripherals—connect one device to another, similar to the way you hook up your 3½- and 5¼-inch disk drives to the SmartPort on the back of your GS. Not only can you connect a mouse on either side of the keyboard, but a multitude of more exotic input devices as well—up to 16 in series. Replacement keyboards and mice abound, as do ADB trackballs, joysticks, graphics tablets, and bar-code and magnetic-strip readers. The Apple Desktop Bus lets you mix and match these devices for a system customized to your individual ▶
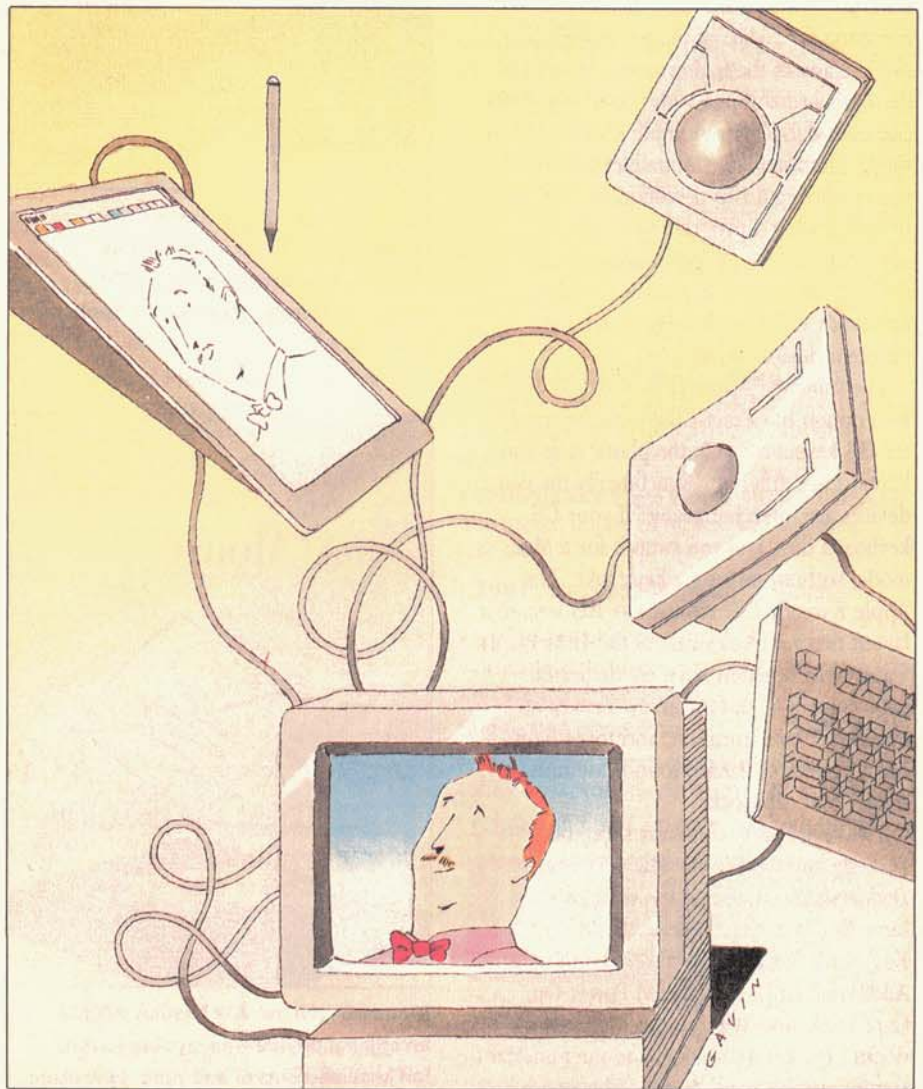
work style, needs, and preferences.

There's one additional benefit. ADB is also an electronics protocol, standard on both the GS and the Macintosh—common ground between the machines, so that theoretically you can use any ADB input device for the Mac on the GS. Manufacturers of such products don't often acknowledge the Mac/GS connection in their advertisements or packaging, however. For this evaluation we examined a variety of ADB peripherals designed for the Mac and, with a few caveats, most of them work on the GS, too. Here's the report.

TYPE IT IN

The GS comes bundled with an ADB mouse and keyboard, but if you buy a Macintosh, the keyboard is sold separately from the computer. Apple offers two types of ADB keyboards—**Standard** and **Extended**—and third-party manufacturers are vying for a slice of the pie as well. You can use any of these alternatives instead of the keyboard shipped with the GS—and you can even daisychain multiple keyboards to a single computer, to eliminate crowding if you're playing a two-person game, say, or demonstrating a program to a student. A whole new genre of application software could be developed to exploit the ADB protocol's ability to distinguish between different devices on the bus.

The standard Apple keyboard sold as a Mac option has exactly the same layout as the GS keyboard; only the plastic case and keycaps are different. Functionally the two devices are interchangeable; if your GS keyboard dies, you can swap it for a Mac model without missing a keystroke. The Apple Extended Keyboard has 105 keys in a layout that resembles that of the IBM PC. It features 15 function keys, six dedicated page-control keys, four arrow keys in an inverted-T configuration, and three light-emitting diodes (LEDs) to indicate number-, scroll-, and caps-lock.

Two third-party companies also offer PC-style keyboards. The **Mac-101** from DataDesk International has roughly the same layout as the Apple Extended Keyboard, but the keys have a bouncier feel. Additional LEDs are labeled Power On, Caps Lock, and Window Lock. DataDesk doesn't market its keyboard to the non-Mac community for good reason: The device

Kurta's IS/GS graphics tablet is an outstanding alternative to the mouse for tracing and freehand drawing.

The Mac's Standard Keyboard, shown above, is also compatible with the GS, thanks to the ADB protocol. (Photo courtesy of Apple Computer.)
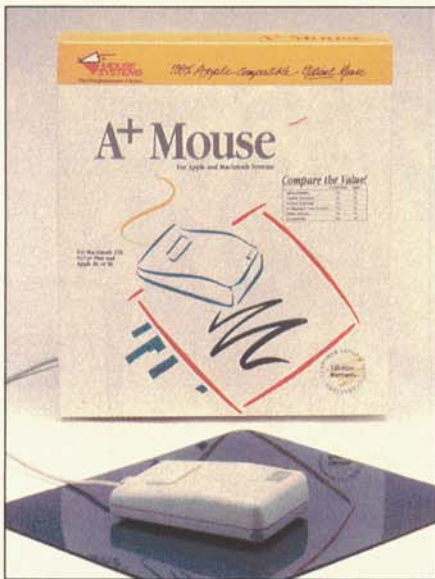
Mouse Systems' A+ Mouse ADB is an optical device—no moving parts, for precise control and fluid operation.

lacks the reset key required by the Apple II, rendering it all but useless on that series of machines. Ehman Engineering's **Mac-105** (distributed through Cutting Edge) is a lower-cost clone of the Apple Extended Keyboard, but its construction doesn't feel as sturdy and its keys make a pronounced clicking noise when pressed. Apple's unit still looks and feels the best of all, but it's the most expensive of the lot.

The Apple Extended Keyboard and its imitators—with their IBM-inspired layouts—were designed primarily as a lever to get Macs into corporate America. In practical workaday use, however, the extra features of these keyboards go largely unused by the majority of Macintosh and GS programs. Most of the indicator lights don't work on the GS, and even the function keys for standard operations don't work as labeled (undo, cut, copy, and paste). To program the function keys to do something useful, you need a macro utility that recognizes extended keyboards. At present, the only such package is Roger Wagner Publishing's **MacroMate**. This utility lets you assign a macro (an automated series of commands or keystrokes that serve as a shorthand substitute for a longer series) to any key on the keyboard. Nevertheless, the one-keystroke convenience the 15 function keys are supposed to provide is elusive—you must press the macro key in conjunction with a "modifier," such as the control, open-apple, or option key.

Even Applied Engineering's **PC Transporter**—a plug-in board that lets your Apple II run MS-DOS programs—requires a custom input-device driver to take advantage of the IBM features of these ADB keyboards. Applied Engineering reports that it currently has no plans to write such a driver. In short, only users who are more comfortable with the IBM layout will benefit substantially from an extended keyboard.

CITY MOUSE, COUNTRY MOUSE

Apple pioneered the use of the mouse as an input device on the Macintosh, and it has since found a warm welcome in the Apple II community. Although a mouse is standard equipment on the GS, Apple's isn't the only model available, nor is it necessarily the best.

The Apple mouse is a mechanical device; a small rubber ball protrudes from a hole in the bottom of the mouse and rotates ►

internal rollers when you move the unit along a flat surface. Your computer translates the motion of these parts into digital signals it then uses to position the cursor on screen. The disadvantage is that mouse parts can slip or get dirty, and they'll eventually wear out. For best results a mouse pad and routine cleaning are required.

Mouse Systems has attacked the vulnerability of the mechanical mouse with an optical challenger. The **A+ Mouse ADB** is a good alternative to Apple's model; it has no moving parts, for more dependable operation. Mouse Systems backs it with a lifetime warranty. The device comes with a 7¾-by-9-inch reflective mousepad embedded with a finely ruled grid the mouse "reads" to register movement.

The A+ Mouse ADB offers precise control and a fluid feel. Its one drawback is that upon initialization, applications think the mouse's button is depressed. This minor annoyance is dismissed by tapping the button once, however. If the GS didn't come bundled with a mouse, the A+ device with its luxuriously smooth action would certainly be the mouse of choice for most folks. Mouse Systems also offers an identical, but non-ADB, version of the **A+ Mouse** for the Apple IIc, IIc Plus, and IIe with mouse card.

ROLL 'EM

Nowadays the mouse is only one of a growing number of pointing peripherals. One of the more popular alternatives is the trackball, a device that provides all the cursor mobility of a mouse in an extremely small space.

A trackball is like an overturned mouse. Instead of sliding the device across a pad, you spin a ball that sits on top of a small pedestal. Trackballs take some getting used to; some people are never truly comfortable with them. Nonetheless, the trackball is quite practical, especially in cramped quarters where flat space comes at a premium.

The Kensington Microware **Turbo Mouse ADB** (actually a trackball) includes a number of handy touches that make it an excellent alternative input device. Thanks to its two ADB connectors, for instance, you can have the best of both worlds by daisychaining a real mouse through the trackball. In addition, two large buttons, one on each

side of the ball, make the Turbo Mouse ADB easy to use for right-hander and southpaw alike. And by setting the DIP (dual in-line package) switches on the back of the trackball, you determine which button imitates the standard mouse button and which acts as a click-lock. Press the click-lock once and the trackball acts as though you're holding down the mouse button, freeing you

to spin the ball without actually keeping one finger on the button.

The Turbo Mouse ADB also has a unique *chord* feature that lets you choose one of seven command-key sequences (OA-S, save; OA-P, print; OA-O, open; OA-W, close; OA-N, new; OA-Q, quit; OA-Z, undo) you'll invoke whenever you press both buttons simultaneously. For example, select Open ▶

Talking to Your GS: ADB Protocol

In computer terms, a *bus* is a conduit through which devices pass information to one another. The Apple Desktop Bus is a standard method of connecting multiple input devices, such as a keyboard and mouse, to the GS. Physically, the ADB consists of a four-wire cable that terminates in a four-pin miniature-DIN *(Deutsche Industrie Normal)* jack. (See the accompanying *Figure* for pin assignments of ADB connectors.)

One handy feature of ADB devices is that, if properly designed with two ADB connectors each, you can daisychain them to one another. That is, you can attach a keyboard to the computer, a trackball to the keyboard, a graphics tablet to the trackball, and a mouse to the tablet, for example.

Although these devices are connected one after the other in serial fashion, the electrical connections to the Apple Desktop Bus are parallel. The benefit is that if one device fails, the other devices are unaffected.

Theoretically, you can daisychain up to 16 input devices to the Apple Desktop Bus port on the back of your GS. In practice, however, the number of devices is limited by the available current (+5 volts at 500 milliamps). None of the devices I tested for this article exhibited any signal-degradation problems working with the minimum configuration of a keyboard and a mouse.

All devices on the bus are able to "talk" to the computer thanks to some special components inside the GS. At the heart of the system is the ADB microcontroller, which works in

conjunction with the computer's GLU chip (general logic unit) to manage the interaction of the 65C816 microprocessor and the devices attached to the bus.

Because ADB cables have only one data line, your computer and the ADB devices must communicate asynchronously—in one direction at a time. The computer sends commands or data to a device, and the device then responds by sending data back to the computer. Your GS can address one specific device or all devices on the bus. A command sent by the computer's microprocessor is an 8-bit word consisting of a 4-bit command code and a 4-bit field that specifies the device to address. The 16-device limit of ADB protocol is a reflection of the syntax of this binary command byte. (Two possible values raised to the fourth power equal 16.)

The 4-bit address field uniquely identifies the device type as *encoded* (keyboard, for example), *relative* (mouse), or *absolute* (graphics tablet). Apple has reserved five other device types for future definition. The computer can distinguish among nine similar devices (or fewer), allowing a group of friends to control the individual members of a computerized baseball team, for instance, with nine joysticks connected to a single ADB port. If Apple were to rally developers behind ADB protocol, the incredible range of multiplayer games and tutorial applications that could be created has the potential to redefine the way we work and play with computers.□

—*O.W.L.*

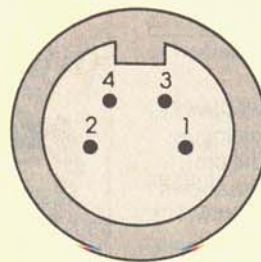| Pin	Description
1	data
2	reserved
3	+5 VDC at 500 milliamps
4	ground

Figure. Four-pin mini-DIN jack: pin assignments of ADB connectors.

apple-S as the chord command to save documents without moving your hand from the trackball to the keyboard. Early versions of the Turbo Mouse ADB had problems implementing the chord feature on the GS; you can exchange your device for a working replacement.

The ball in the Turbo Mouse ADB is made of hard plastic and is roughly the size of a billiard ball. A hint of friction is evident when the ball spins in its socket, but with an effortless flick of the finger the ball has enough momentum to send the cursor flying the length of the screen. And with a feature called *automatic acceleration*, the Turbo Mouse ADB senses the speed of the ball and moves the cursor accordingly. The faster the ball spins, the greater the distance the cursor covers.

This ability to jump freely around the screen makes a trackball excellent for programs that require a lot of pointing and clicking. And for those who are comfortable enough with the trackball to do detail work, the Turbo Mouse boasts resolution (fineness of movement on screen) that surpasses that of a mouse: 200 versus 90 dots (increments of movement) per inch, respectively. Kensington also sells a non-ADB version of the **Turbo Mouse** for the IIc, IIc Plus, and IIe equipped with a mouse card.

Like the Turbo Mouse, Abaton's trackball **ProPoint** also uses a billiard-sized ball and has a large standard button and smaller click-lock button, both located on the front left corner (not very convenient for lefties). You can't switch the functions of the buttons, nor is any chord feature included. Most damning, however, is that the ProPoint (at least in its current incarnation) doesn't work correctly on the GS. You can move the cursor around, but the device sends random button clicks to the computer, wreaking havoc on menu selections.

Asher Engineering rounds out the field with its low-priced **Lynx Trackball**. With two large buttons to either side of a small ball, the Lynx is practical for lefties and righties alike. On the left is the standard mouse button; the one on the right engages click-lock mode. You can't alter these designations.

The real difference between this device and its competitors is that the Lynx ball is embedded instead of resting in its own socket. As a result, the Turbo Mouse ADB

> "The Apple Desktop Bus lets you mix and match input devices for a system customized to your individual needs and preferences."

and ProPoint both offer free-spinning, smooth action, while the Lynx has too much friction and virtually no momentum. In addition, you can turn the Turbo Mouse or ProPoint upside-down and the ball drops out for easy cleaning of the rollers underneath. Cleaning the Lynx, on the other hand, requires disassembly. For these reasons we hesitate to recommend the Lynx over the Turbo Mouse ADB, but it *is* less expensive, and it comes with both a 30-day money-back guarantee and a lifetime warranty.

STICK TO IT

Want to use a joystick as a mouse? If you do, you'll need the **Mirage ADB** from CH Products. This multifeatured interface box turns any Apple-compatible joystick with a DB-9 connector into a high-performance ADB mouse alternative. The unit features an absolute mode and five separate rate-of-movement modes to fine-tune the action to your taste. Absolute mode makes the joystick act and track like a mouse. Wherever you position the stick, the cursor follows. In rate modes the cursor moves in the same direction as the stick handle, with ever-increasing speed as you push the stick farther from the center.

The **Mach IV Plus ADB**, a controller also from CH Products, incorporates all the features of the Mirage ADB in a high-precision joystick. It plugs into an ADB port and the DB-9 hand-controller connector on the back of the GS. A small sliding switch on the bottom of the unit determines whether the Mach IV acts as a mouse replacement or a regular joystick. Turning the unit over every time you want to change mouse/joystick and rate/absolute modes is an annoyance I could do without. Get used to it, though, because in absolute mode you've got to flip a switch every time you move

between the two super-hi-res graphics modes of the GS.

The Mach IV Plus ADB has two large buttons on each side of the joystick, plus one positioned on the top of the stick like a firing button. They work like standard mouse buttons; there's no click-lock feature. Double-clicking is awkward, because you must hold the joystick steady so that the cursor's positioned correctly when you press the button. The Mach IV lacks a second ADB port, making it impossible to daisy-chain additional devices, so you'd better be sure you like the joystick enough to forfeit a real mouse.

Both the **Mirage** and the **Mach IV Plus** are available as non-ADB devices for the IIc, IIc Plus, and IIe equipped with a mouse card.

BACK TO THE DRAWING BOARD

Kurta, the company that first made graphics tablets available for personal computers, markets an ADB unit for the GS called the **IS/GS Input System.** This unit is made up of a small drawing board and an electronic pointing device. Anyone who has ever tried to do freehand drawing or image tracing with a mouse can attest to its inappropriateness for the task. By contrast, the IS/GS was built for it. Place your original artwork beneath the sheet of clear plastic covering the drawing surface, and move the pen to trace the image and to use all the familiar tools of your favorite paint program. Pulling down menus and making command selections are easy, too.

Kurta supplies alternative pens and cursor-pointing devices in both corded and wireless configurations. I tested a corded pen with the button in the point of the pen itself. Just push down on the tablet to click—very natural, and second nature in a matter of minutes. Some programs, however, the Finder among them, have difficulty recognizing when you're holding the pen's point to the tablet, making marquee selections and tracing impossible.

The IS/GS comes with PenWorks, a new desk accessory (NDA) that configures the tablet as either an absolute or a relative device. In absolute mode, the surface of the tablet corresponds directly to the graphics screen. Move the pen to the middle of the tablet, and the cursor is centered on screen—exactly what you want for tracing. ▶

In relative mode, the tablet acts like a mouse. If you pick up the pen and move it to another location, the cursor stays put.

PenWorks should let you switch between the two modes from within any program that conforms to the desktop interface. In practice, however, I couldn't change the setting to relative mode without removing the NDA from the boot disk. Kurta claims to be working on a PenWorks update that should fix these problems, but until it's released, test your IS/GS with any software packages with which you plan to use it.

MEMBERS OF THE BAR

Perhaps the most esoteric ADB device is the **PC-3850** combination bar-code/magnetic-strip reader from TPS Electronics. (Single-function readers are also available.) This small box has a slot on top through which you slide magnetic-encoded cards, plus a corded wand attached to the front to read bar codes. It's a self-contained unit that gets its power from the ADB port. Just plug it in and it's ready to go.

When you pass the wand over a bar code, the reader checks the validity and accuracy of the data automatically. If the scan is correct, the unit beeps once and the data contained in the bar code are entered into the active program as if you'd typed them on the keyboard. And because the computer

thinks the information is coming from the keyboard, the PC-3850 is compatible with all software. It can also distinguish automatically among UPC (universal product code), Code 3-of-9, Codabar, and Interleaved 2-of-5 bar-code standards.

The magnetic-strip module works just like some of the public telephones that accept credit cards. Simply slide the card through the device so that it can read the magnetic strip on the back. Like the bar-code reader, the magnetic-strip unit performs some logical-consistency checks on the data and transmits them only if valid. The current application accepts the incoming information as if it had been typed on the keyboard. The reader can recognize ABA Track 2, ANSI × 4.16, and ISO 3554 magnetic-strip formats.

EXTRAS

The four-pin mini-DIN connectors Apple uses for its ADB ports are manufactured exclusively by **Hosiden America**. Only one U.S. firm distributes them: Advanced Electronic Support Products. AESP will sell individual connectors to hobbyists who want to build their own ADB devices, but if you don't feel comfortable with a soldering iron, the firm also offers two finished ADB products—the **ADB Dual Extender** and the **ADB Keyboard Extension**.

The Dual Extender is a small box that turns the one ADB port on the back of your GS into two. Instead of plugging the mouse into the keyboard, and the keyboard into the computer, both devices plug into the ADB Dual Extender. Among other things, this arrangement lets you place the keyboard in your lap and leave the mouse on the desk without its cable getting in the way.

If you find that the standard keyboard cable isn't long enough to reach your lap, there's always AESP's ADB Keyboard Extension, a 6-foot ADB cable. (Kensington Microware offers a similar 7-foot **Extra-Long ADB Cable**.) Keep in mind that the total length of cable connecting all ADB devices shouldn't exceed 5 meters (16 feet 5 inches), or signal degradation may occur.

Take advantage of Apple's Desktop Bus standard—check these alternative input peripherals to find the arrangement that meets your needs most precisely, the interface that feels most natural for the task at hand. For work or play, your GS was designed with ease of use in mind; when ADB devices help you talk to your computer, they make that partnership grow.□

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PRODUCT INFORMATION

ADB Dual Extender, $29
ADB Keyboard Extension, $25
Hosiden America Mini-DIN Parts, variable pricing
Advanced Electronic Support
1810 N.E. 144th St.
North Miami, FL 33181
(800) 446-2377
(305) 944-7710

Apple Standard Keyboard, $129
Apple Extended Keyboard, $229
Apple Computer
20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010

A+ Mouse ADB, $119
A+ Mouse, $99
Mouse Systems Corp.
47505 Seabridge Drive
Fremont, CA 94538
(415) 656-1117

Bar-Code Reader, $595
Magnetic-Strip Reader, $525
PC-3850 Combination Reader, $745
TPS Electronics
4047 Transport St.
Palo Alto, CA 94303
(415) 856-6833

IS/GS Input System
Kurta Corp.
3007 East Chambers
Phoenix, AZ 85040
(800) 445-8782
(602) 276-5533
$395

Lynx Trackball
Lynx Computer Products
Asher Engineering Corp.
15115 Ramona Blvd.
Baldwin Park, CA 91706
(800) 824-3522
(818) 960-4839
$99.95

Mac-101 ADB
DataDesk International
7651 Haskell Avenue
Van Nuys, CA 91406
(800) 826-5398
(800) 592-9602 (CA)
(818) 780-1673
$194.95

Mac-105
Cutting Edge
97 S. Red Willow Rd.
Evanston, WY 82930
(307) 789-0582
$189 w/ MacroMate

Mach IV Plus ADB, $89.95
Mach IV Plus, $89.95
Mirage ADB, $39.95
Mirage, $39.95
CH Products
1225 Stone Drive
San Marcos, CA 92069
(800) 624-5804
(800) 262-2004
(619) 744-8546

MacroMate
Roger Wagner Publishing
1050 Pioneer Way
Suite P
El Cajon, CA 92020
(619) 442-0524
$49.95

PC Transporter
Applied Engineering
P.O. Box 5100
Carrollton, TX 75011
(214) 241-6060
$499 (768K)
installation kit, $49 GS,
$39 IIe/II Plus

ProPoint
Abaton
48431 Milmont Drive
Fremont, CA 94538
(800) 444-5321
(415) 683-2226
$140

Turbo Mouse ADB, $169.95
Turbo Mouse, $169.95
Extra-Long ADB cable, $39.95
Kensington Microware
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New York, NY 10010
(212) 475-5200