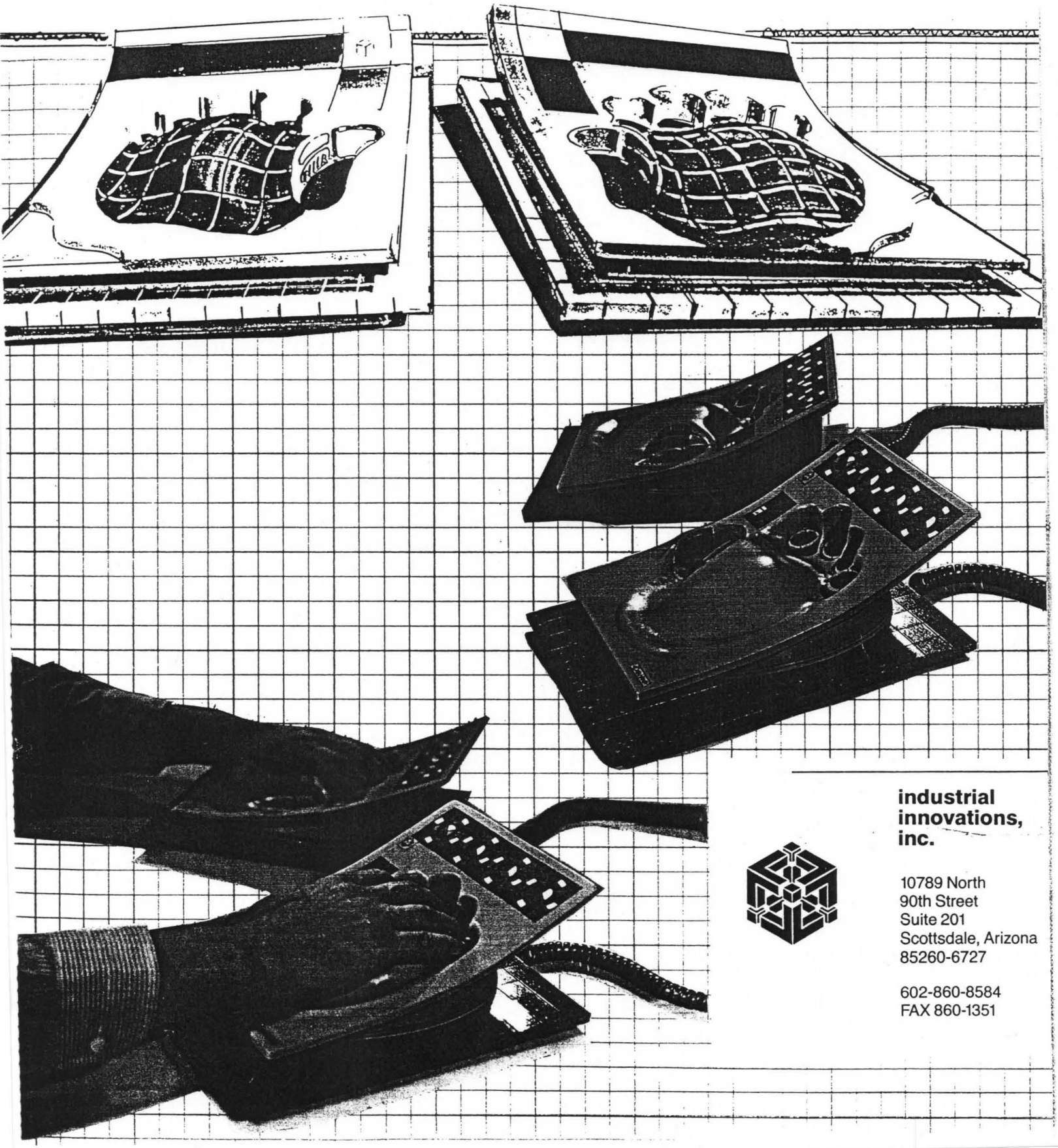
DATA HAND™



industrial innovations, inc.

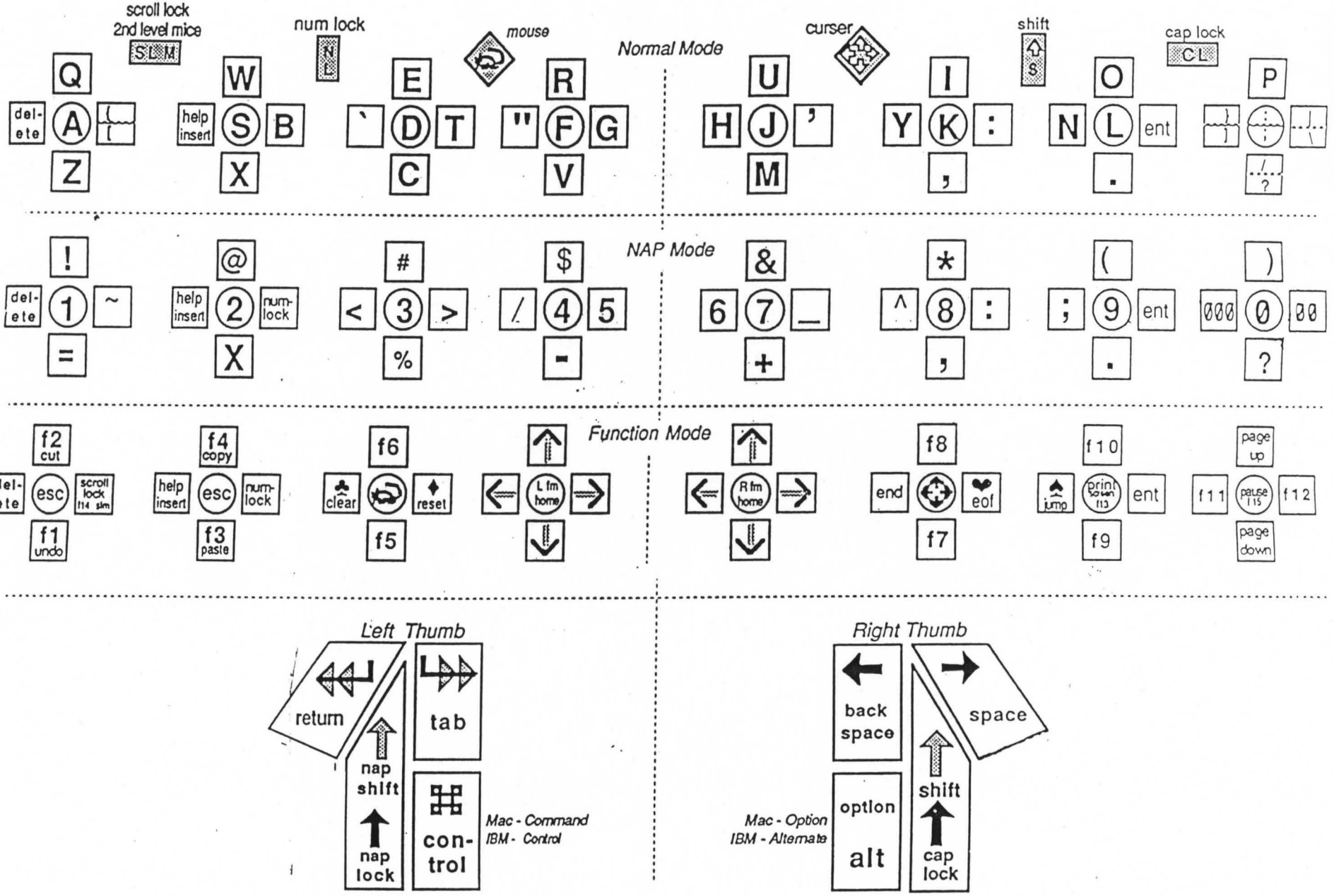
10789 North
90th Street
Suite 201
Scottsdale, Arizona
85260-6727

602-860-8584
FAX 860-1351

DATAHAND™ Actuation Schematic v2

Left Hand

Right Hand



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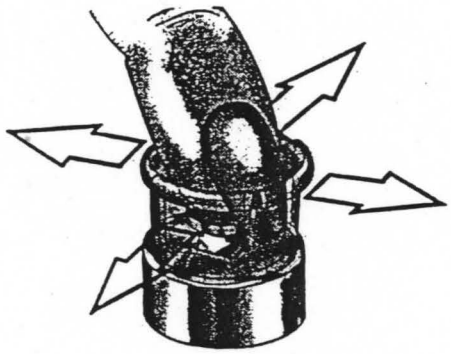
DATAHAND™

CNN has produced a short segment showing *DATAHAND*™ prototypes in operation. It includes a discussion with the President of Industrial Innovations, Inc. and Professor Leland Knight, together with user comments.

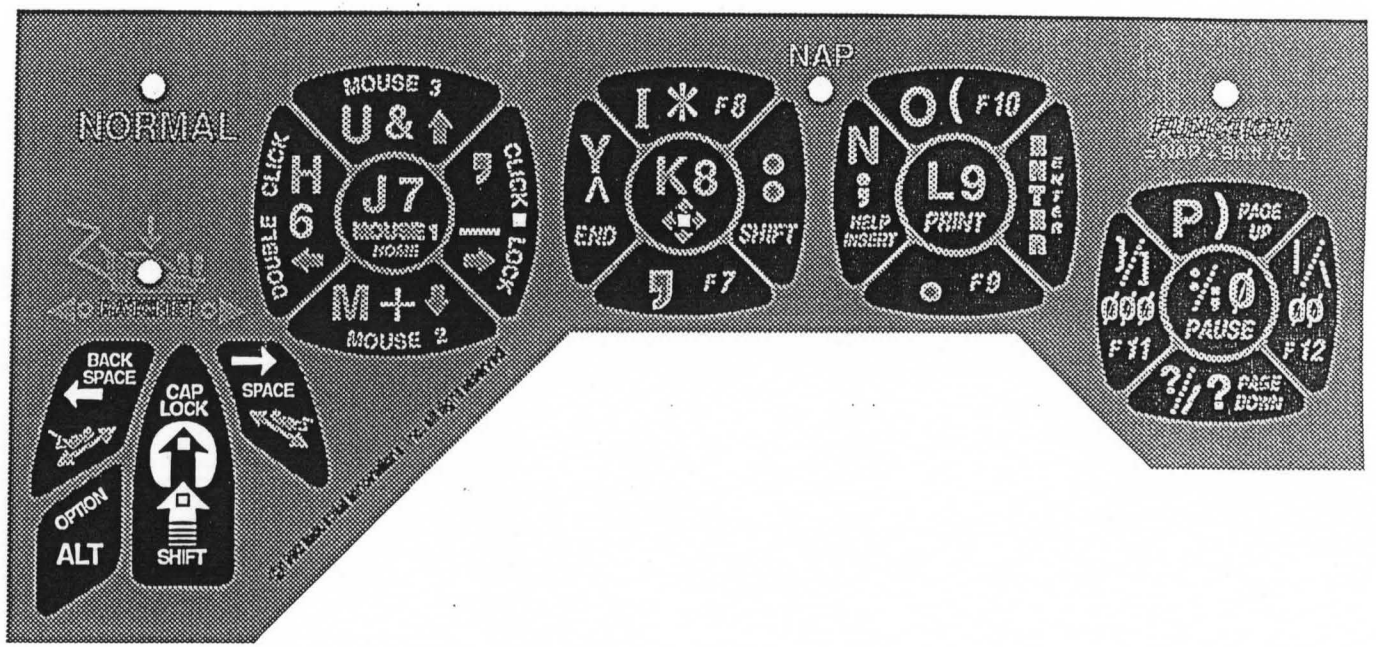
DATAHAND™, as the flagship product, is fully discussed. It is a plug-compatible, user substitutable replacement for both the conventional computer keyboard and mouse. It is faster, more accurate, and produces less user fatigue. It is easier to learn and allows mouse control without requiring the user's fingers to leave the data entry keys.

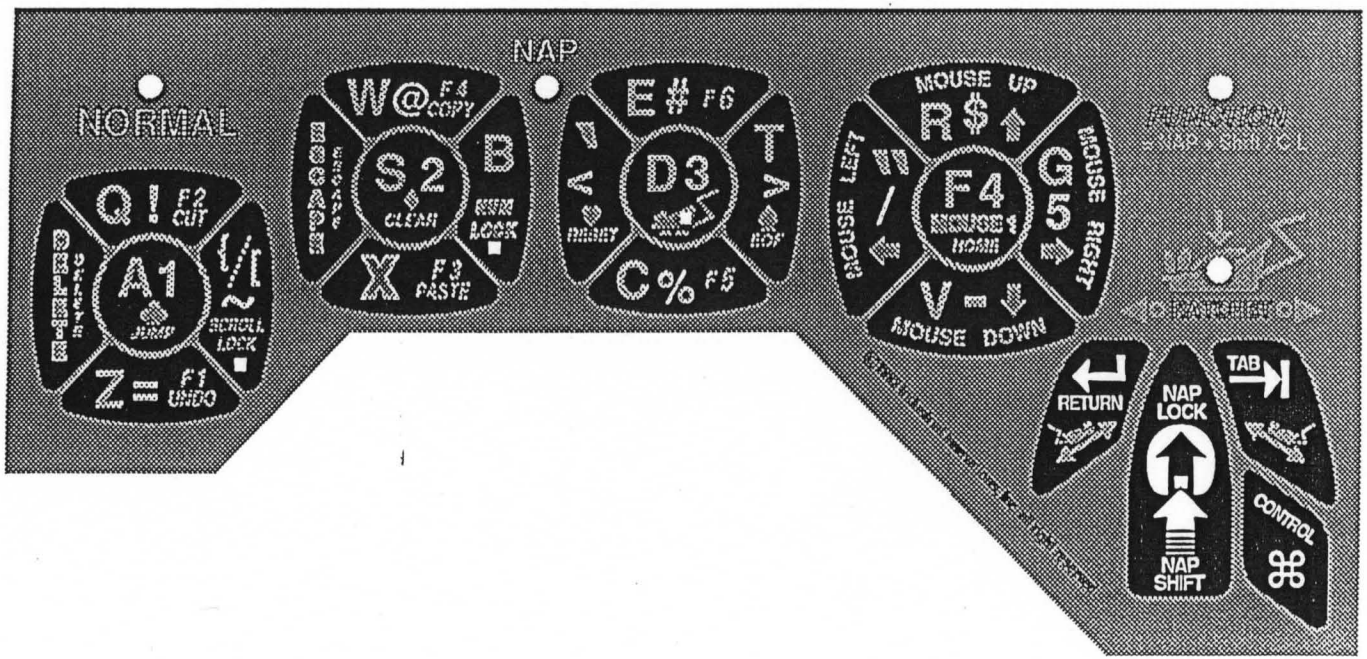
A computer user simply unplugs an existing keyboard and/or mouse device from most computers and plugs a *DATAHAND*™ device into the same plug socket. *DATAHAND*™ is hardware and software transparent. Neither the computer or the software will know that it is not being operated by a conventional flat keyboard and mouse device.

DATAHAND™ splits the keyboard into two separate components, one for the left hand and one for the right hand. *DATAHAND*™ three dimensionally wraps the keys around the fingertips. Every key is positioned within a few millimeters of the finger surface that operates it.



The illustration above represents the five keys surrounding each finger, comprising a single finger module. The arrows indicate the direction of motion required to activate each of the five separate key surfaces; specifically: forward, backward, left, right, and downward movement of that finger. There are four such finger modules for each hand and a larger, more complex compartment for each thumb.

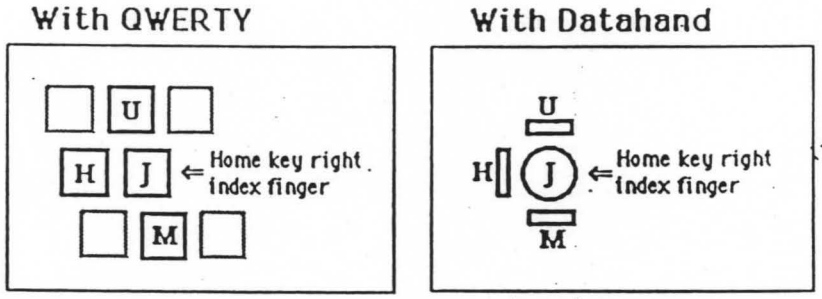




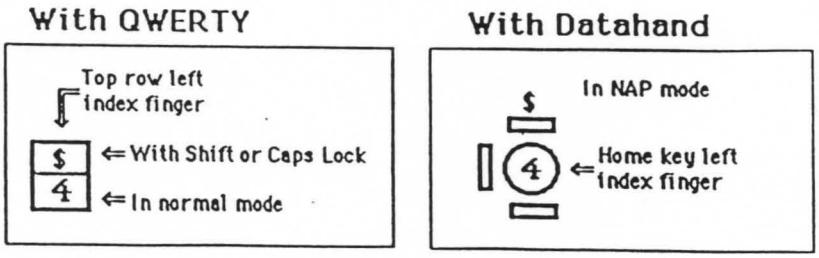
Key Disp. w M R&L v4

The *Actuation Schematic* (opposite page) depicts all the characters and functions available through the unenhanced operation of *DATAHAND*™. The circles represent the key surface at the bottom of each finger module and the four boxes surrounding it represent the four other key surfaces accessible by that finger. There are three major modes and the characters available within each of these modes is depicted in a different color.

DATAHAND™ employs finger movements almost identical to a standard flat keyboard, so that little relearning is required. Out of the middle three rows of keys on a conventional flat keyboard, only four of these keys require substantial relearning. The other keys are basically where a conventional flat keyboard touch typist would expect to find them. The illustration below indicates the close relationship of *DATAHAND*™ finger movement to the standard flat keyboard finger movement.



DATAHAND™ locates the standard keyboard's fourth row keys in a new mode called NAP (Numeric and Punctuation). In this mode, the number keys are the home, or bottom keys, activated by a downward motion of the fingertip. The keys above them become the punctuation keys. This is graphically depicted below.



DATAHAND™ has an ergonomically contoured palm and hand support making it more comfortable and also graspable, so that it can be easily moved. Both left and right units incorporate a mouse function. Mouse input is achieved by moving the entire top portion of each *DATAHAND*™ device right or left, forward or backward. This movement is obtained without removing the fingertips from the data entry keys.

We applied ergonomics (the study of the application of biology and engineering to the relationship between workers and their environment) to personal data entry and control. The comfort, stress reduction, and performance improvements we have achieved represent significant advancement in this sense.

DATAHAND™ units allow operators to individually adjust the most critical finger and thumb dimensions to best fit their particular hand size.

DATAHAND™ produces all of the standard ASCII characters produced by conventional flat keyboards. The function keys, depicted in the *Actuation Schematic,* include all of the keys on an IBM expanded keyboard with 101 keys. Similarly, when used with a Macintosh, *DATAHAND*™ provides all the keys on an extended Apple Macintosh keyboard. The mouse device is also plug compatible with existing mouse or serial ports.

The Display is an important element of the *DATAHAND*™ device. A large dynamic display is located above the fingers where it is always conveniently visible, especially when the operator's hands are positioned to utilize the device. Above each finger is a schematic (similar in form to the depictions used in the *Actuation Schematic*, opposite prior page) depicting the keys that each finger can activate.

In the normal mode, an indicator color matched to the letter labels is illuminated. In the *NAP* (number and punctuation) mode, a different indicator color matched to the number and punctuation labels will be visible. A third color indicator is used for the function mode. Because the indicator lights are differentiated by color and location, users are able to identify the current mode through peripheral vision. Additional indication of the activated mode is provided by tactile actuation of the appropriate mode change keys.

WHY *DATAHAND*™ IS BETTER

1. *DATAHAND*™ allows operators to input keystrokes as much as 80 percent faster than a conventional flat keyboard. *DATAHAND*™'s overall productivity gains as a general computer control device will be even greater.

2. With *DATAHAND™*, mouse use does not require the fingers to leave the data entry keys because the keyboard and mouse are integrated in one unit. More frequent and faster mouse use will speed performance.

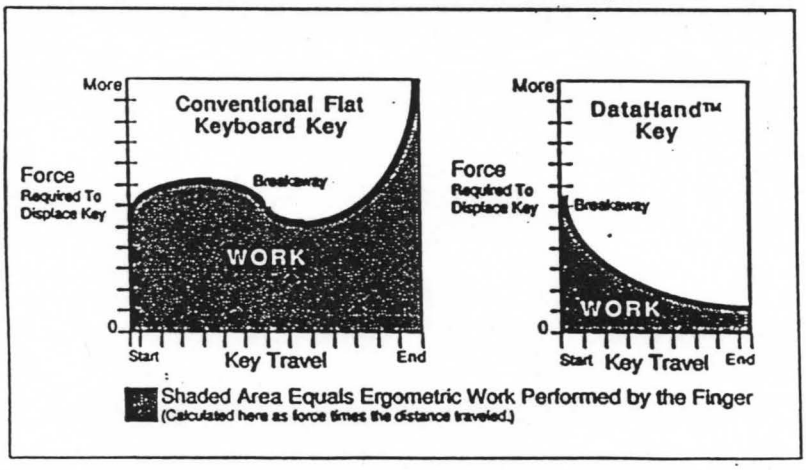
3. No hand travel and much less finger movement is required to operate *DATAHAND™*. All keys are accessible from one static hand location ,including the number and function keys.

4. Static hand location allows each hand to rest on a comfortable, padded, and ventilated palm support. This eliminates *float error* (moving the hands so as to access different rows of keys , the most common form of keyboard error, because the hands never float as on a conventional flat keyboard.

5. Immediate, differential, tactile feedback is provided because each key is activated by a different part of the finger moving in a different direction. The operator realizes that a key has been erroneously activated in a way that is impossible with a standard keyboard. This permits real time error detection and correction.

6. Switch actuation requires much less muscle (ergometric) work with *DATAHAND™* than with conventional keyboard technology. See graphic illustrations below:

COMPARISON OF CONVENTIONAL KEYBOARD AND DATAHAND™ KEYS



7. Left and right *DATAHAND™* units can be separated at a distance most comfortable to individual users. Text to be accessed during data entry can be placed between the operator's hands. The operator's hands may be rotated or moved to different locations during typing. Such changing of

position helps to further reduce user fatigue. Test subjects have found *DATAHAND*™ dramatically more comfortable to use see *DATATYST REPORT* in Product Performance Section 4).

8. *DATAHAND*™ fully utilizes the thumbs,the most able digits on the human hand. Each thumb controls up to seven different functions. This is in marked contrast to conventional keyboards where both thumbs control only the space bar.

9. Typists trained on standard keyboards already know how to find most of the keys on *DATAHAND*™. Out of the 26 letters, all but four are exactly where a typist would expect to find them. Flat keyboard speed can be equaled in as little as 15 hours. In as little as 50 hours, speeds 30 percent to 50 percent faster have been logged by a majority of subjects (see *DATATYST REPORT* in Performance Section 4).

10. Character labels are always in view. Unlike a conventional keyboard where correct hand position blocks the view of the keys and their labels, *DATAHAND*™ has an easily visible graphic representation of the keys directly above the finger wells. This key map is not obscured by the operator's hands. Color-coded indicator lights and logical key groupings reduce the number of keys operators must search in order to locate the desired one.

11. *DATAHAND*™ supports the relaxed hand in a comfortable *home* position so that incorrect hand or finger positioning is virtually impossible. The difficult, muscularly fatiguing, and disorienting art of floating the hands above the keyboard is eliminated.

12. All the keys, including the number, punctuation, and function keys, are operated from a single *home* hand and finger position. With *DATAHAND*™, touch typing every key is no more difficult than touch typing the home keys on a flat keyboard.

13. Logical spatial relationships to the key's function and parallels between the operation of the right and left hand makes learning faster and more intuitive. For example, the right thumbtip key pushed right activates the *space* key; the right thumbtip pushed to the left activates the *backspace* key and it moves the cursor left. On the left hand, the left thumbtip controls the *return* key; the left thumbtip moved right activates the *tab* key. Alpha-numeric keys are all finger operated, and primary function keys are all thumb actuated.

14. When computer usage requires frequent or prolonged pauses between keystrokes, *DATAHAND™* allows a much more comfortable resting position from which tactile operation of the keys may be resumed without requiring the hands to be visually repositioned.

15. *DATAHAND™* presents a uniform hardware device that will remain constant from one computer system to another. For example, IBM and clone users will not have to adapt to a new keyboard configuration to use a *DATAHAND™* with an Apple Macintosh or vice versa.

16. *DATAHAND™* has more function keys available than the existing flat keyboard. All these keys may be located by feel without the need for visual inspection.

17. Operations performed by the function keys may be logically or intuitively assigned to a particular key or group of keys. This is possible because all the *DATAHAND™* keys are uniquely activated by only one finger moving in one particular direction. For example, the extreme left finger moving to the left in a word processing program could actuate the function key that moves the left margin left; movement of that finger to the right could move the margin right. The right little finger could then similarly control movement of the right margin by actuating the function keys to its left and right.

18. The operation of the key switches is significantly quieter than those of conventional flat keyboards. *DATAHAND™* use is almost silent compared to the constant clicking produced by conventional keyboards.

19. *DATAHAND™* has fewer mechanical keys...only 54, which is fewer than any other normal computer keyboard. For example, the IBM Enhanced or (E style) keyboard has 101 keys and is the industry standard.

20. *DATAHAND™* has fewer moving parts than a conventional keyboard. A unique switch technology operates with only one moving part. All the mechanical characteristics of the switch are produced by magnetic interaction not subject to wear.

21. *DATAHAND™* will be more appropriate than a flat keyboard when voice has grown more important. This is because the hands can be comfortably rested during speech input. In the resting position, the hands are ready to intermittently operate keys to facilitate computer control. With a flat keyboard, maintaining the hands in a *ready* position is uncomfortable and fatiguing.

22. *VERNIERMOUSE*™ control is added to all current mouse applications with no software or hardware alteration. This is accomplished by making one hand motion a *coarse* mouse control and the other a *fine* mouse control. This two-mouse system provides a better mouse input system than conventional one-mouse technology.

23. For predominantly number or formula data entry, such as spreadsheet work, fewer key strokes are required. This is because with *DATAHAND*™, operators are able to enter the NAP™ mode and access all the numbers and punctuation required for most number-based work without the frequent up and down shifting that is required by conventional flat keyboards.

DATAHAND™ supports the hands in a comfortable, resting position and operates better at desktop height.

The following two features may be available in an enhanced mode of operation which may be supported by some software applications:

A. Simultaneous three-dimensional control for 3D, graphics, CAD, and other applications could easily be achieved with *DATAHAND*™'s two-mouse system. The left hand can input a *Z* axis coordinate while the right hand manages *X* &*Y* axes. With this system, three-dimensional input is easy and intuitive without additional hardware.

B. Simultaneous two-point screen control is possible with *DATAHAND*™. For example, each of two diagonally opposite corners of a rectangle could be separately controlled by left and right mouse devices. This would give simultaneous control over both size and location in a graphics or CAD application. This same selection method could enhance text selection in a word processor or field selection in a spreadsheet application. Presently, all popular word processors employ an insertion marker and a cursor bar; when a single mouse device controls these two markers, the operator must alternate mouse control from one to the other. With *DATAHAND*™ one hand could control the insertion marker and the other the cursor bar, eliminating the present need to alternate control.