KE-USB36
PC Keyboard Encoder
User Manual

Thank you for purchasing the

HAGSTROM ELECTRONICS, INC.

KE-USB36. This product is configurable

in a variety of ways in order to meet your

specific requirements. Please take a few

minutes to read this manual before using

your KE-USB36.

NOTICE: The KE-USB36 product is designed for use by technically oriented computer users. When the KE-USB36 is in use, your Computer's signals and voltages are present on the unit. Prudent handling and packaging is necessary to prevent damage to your computer.

Great care has been taken during the assembly, testing, and burn-in of your KE-USB36 to ensure its performance. If you have any questions, please send us an email.
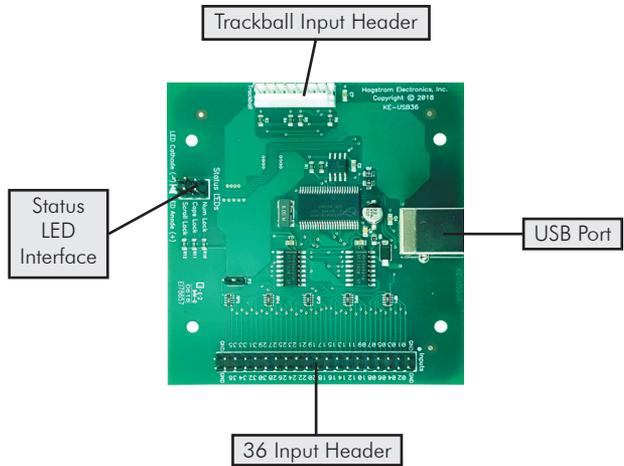
sales@hagstromelectronics.com

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Introduction to the KE-USB36

The KE-USB36 Keyboard Encoder is a product designed to interface switches or keypads to your computer's USB port. The KE-USB36 appears as both a keyboard and a mouse to your computer system. The header inputs on the KE-USB36 may be programmed to emulate any key from a standard keyboard. In addition, any of the inputs may be programmed to emulate the Left, Middle, and Right mouse buttons.

The KE-USB36 features a trackball interface port which allows connection of the optical signals from a trackball to the unit. The signals received on this port are converted into mouse movement on the PC.

Note that you are not required to use both interfaces on the KE-USB36. If you wish to use the device as a keyboard interface only, do not attach to the trackball interface connector. If using the device as a trackball only, do not program any inputs on the KE-USB36 input header as keyboard keys (you may still program inputs as Left, Middle, and Right mouse buttons).

Trackball Input Header

Status LED Interface

USB Port

36 Input Header

The KE-USB36 uses standard drivers for its functions. When using the unit for the first time on your PC, you will be prompted to load USB drivers for the device. Choose the default drivers that are already present in your operating system.

Connection to the Computer

Figure 2 - Connection of the USB cable to PC

The KE-USB36 attaches to your computer's USB port. Use a standard A-B Male/Male type USB connecting cable from the KE-USB36 to the USB port on the computer. The KE-USB36 may be connected directly to the USB port on the PC or through a compliant USB Hub.

Connect the type "B" end of the USB cable into the KE-USB36 and the type "A" end into the PC or HUB USB connector.

The KE-USB36 may be connected to the computer with power on or off. If "hot plugged," the unit will generally take several seconds to become fully active on your system.

Note: *The first time you use the KE-USB36 with a particular PC, you will be prompted to load the appropriate drivers for the device. Follow the default selections to load the standard drivers for the KE-USB36.*
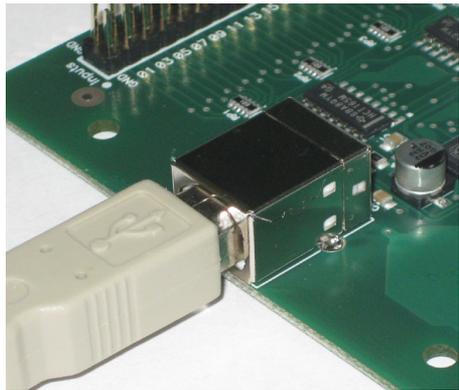

Figure 3 - Connection of the USB cable to KE-USB36

The KE-USB36 is powered directly from the USB port, so no external power is required.

The KE-USB36 is compatible with operating systems which offer full support for USB devices compliant to USB 1.0 specifications. Consult the operating system manufacturer for information on device compatibility and downloads.

Interfacing to the KE-USB36 Input Header

The KE-USB36 features a 2x20 header for interface to your input devices. The input header is arranged with grounds on the end pins of the header, and the 36 inputs between them. The board is labeled near each header pin, designating the input number that the pin represents. Each of the pins may be programmed to emulate any key on a standard PC keyboard as well as the Left, Middle, and Right mouse buttons.

Inputs on the KE-USB36 header are activated by shorting them to one of the provided logic grounds on the header. When activated, the

Figure 4 - The KE-USB36 Input Header

input will report the keystroke that it has been programmed to emulate. If held active, the keystroke will repeat (if programmed to repeat), based on the repeat rates and delays set within the operating system.

The inputs are intended to handle mechanical switch inputs and are debounced for that purpose. Logic drivers may be attached to the inputs as well, provided they are an active low, logic level signal. Refer to the Appendix A on specifications for the timing of logic signals. Never attach any external power to the Inputs.

The KE-USB36 input header is a dual row header with .100" spaced pins. This format is suitable for many readily available connectors on the market, including a typical IDE hard drive cable. Since all the inputs require the same logic ground reference, you may "daisy chain" the ground to all of your switches. We also offer a breakout board (our part number IOX36) for interface to the KE-USB36. This interface board attaches to the KE-USB36 header through an IDE cable (provided with the IOX36).   See the accessories page of this manual for details on the IOX36. Appendix B demonstrates connection techniques for switches on

the KE-USB36.

Note: *The KE-USB36 allows up to 6 keystroke inputs to be activated simultaneously. This limitation does **not** include inputs defined as Shift keys, Ctrl keys, Alt keys, Win GUI keys, or Mouse Left, Middle, or Right Buttons.*

Keyboard Status Light Signals

Keyboard status light drive is available with the KE-USB36. The unit provides a 6 pin header for connection of the Num Lock, Caps Lock, and Scroll Lock status LEDs. As shown below, the Anode and Cathode connections for these diodes are labeled on the board near the 6 pin LED header.
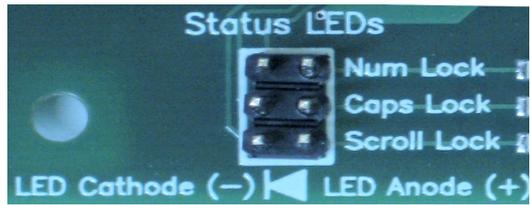
Figure 5 - Status LED connection

As with the input header, this LED header is .100" spaced pins, which is suitable for a variety of connectors. Soldering to the pins is also an acceptable way to attach wires for connection to your LEDs.
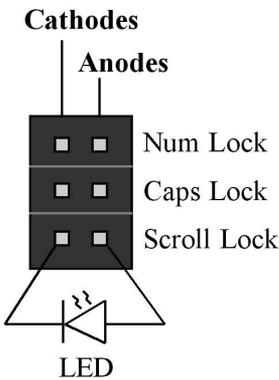
The KE-USB36 will drive on LED directly from each Anode/Cathode pair of wires. At 5 volts, the drive current is approximately 10 ma for each LED. The KE-USB36 has current limiting resistors on the unit, so connection to the user's LED may be made directly.

Figure 6 - Connection of LEDs to the Status LED Header

Interfacing to the KE-USB36 Trackball Header

The KE-USB36 features an interface connector which accepts optical signals from a device such as a Spinner or a Trackball.

Power is supplied to the trackball interface from the KE-USB36 for 5 volt operation only. This interface is compatible with the most popular active
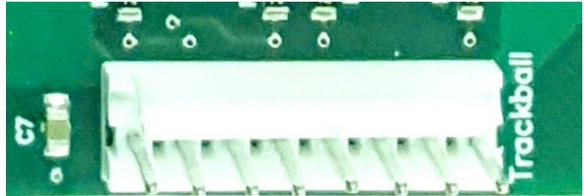

Figure 7 - The KE-USB36 Trackball interface connector. The connector features 8 pins spaced at .100" centers.

or passive Trackballs and Spinners currently on the market.

The Trackball header mates with the Hagstrom Electronics KE-TBH3 interface cable (see Accessories page of this manual). In addition, the user may create their own cable using the pin assignments as shown below.
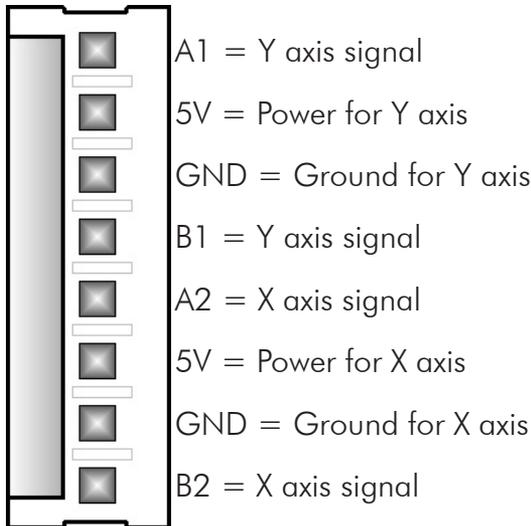

A1 = Y axis signal

5V = Power for Y axis

GND = Ground for Y axis

B1 = Y axis signal

A2 = X axis signal

5V = Power for X axis

GND = Ground for X axis

B2 = X axis signal

Figure 8 - Trackball Interface signal assignments.
Note: *Do not supply any power into the Trackball interface connector.*

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Configuring the KE-USB36

The KE-USB36 is supplied with a Windows utility program which allows quick and easy setup of the inputs on the unit. Run the KEUSB36.EXE utility program to start the configuration program. The menu for the program appears as shown below.


The keystroke definitions for each input are shown in the key definition box on the screen. The key definition box has the words "Not Used" when the program initially starts. When inputs are defined, the key definition box will then display the label for the key to which that particular input is assigned.

The scroll bar may be used to access the definitions for all 36 inputs of the KE-USB36. Information pertaining to an input's keystroke definition is shown on each horizontal row.

To define a keystroke for an input, simply move to the line that corresponds to the input number you wish to program, and select the definition box to the right of the input number. Once selected, an image of a standard keyboard is shown. Move your cursor to the key which you want that particular input to emulate, and select that key. The key you have selected will now appear in the key

definition box for the input number you have chosen.

Use this same technique to define each of the inputs that you wish to use in your configuration. In addition to specifying an input to emulate a keystroke, inputs may also be defined as either the Left, Middle, or Right mouse button. Select Left, Middle, or Right mouse buttons when the keyboard selection diagram is shown to define an input as a mouse button.
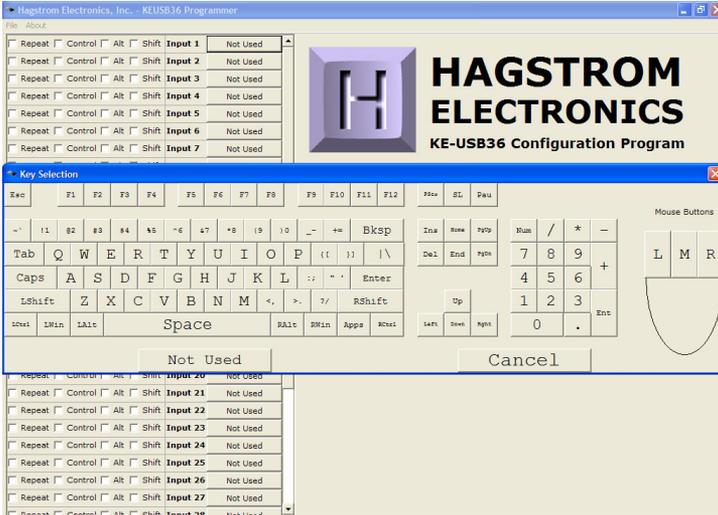
Note that a Trackball need not be attached to emulate the mouse buttons. The KE-USB36 runs as both the mouse and the keyboard at all times. If no Trackball device is connected to the unit, no cursor movement will be initiated from the KE-USB36, but the ability to emulate Left, Middle, or Right mouse buttons remains.

Any input defined as a keystroke may also be combined with a Ctrl, Alt, or Shift function, or any combination of those three modifiers. To initiate a Shift with the specified keystroke, simply check the box marked "Shift" on the same line as that input. For example, if you wish to emulate a Shift+F1 key, define the input as an "F1" keystroke, then check the Shift box on that line. An input with additional Ctrl,Alt, or Shift functions automatically has repeat disabled.

When configured as shown above, Input #1 would perform a Shift function along with the F1 keystroke. This combination would be the equivalent of holding down the shift key on your keyboard and then pressing F1.

Note that the Control, Alt, and Shift selection boxes are used in combination with a key. If an input is to emulate only a Control, Alt, or Shift, do not use these check boxes. Use the keys from the Key selection diagram to program an input as one of these modifiers keys (Control, Alt, or Shift).

If the input is to produce a repeated keystroke when held active, the check box for the repeat function may be selected. When active, the repeat function will perform a repeat of the selected key exactly how your standard keyboard would handle a key held down. The system settings dictate the repeat speed.

In addition to defining inputs, there are two check boxes for adjusting the Trackball movement. Based on the type of Trackball being used, one of the "Reverse Direction" check boxes may need to be selected to get the proper Left-Right or Up-Down movement from your Trackball.

Once the configuration has been created, it is recommended that the configuration be saved to disk. The program provides an option for saving the configuration as a custom disk file, so it may be recalled at a later time for loading or modification.

To save the configuration to disk, select **File**, then **Save As**, and specify a file name. Configurations saved at a prior time may be recalled by using the **Open** selection and choosing a file from the selection list.

To save the configuration to the KE-USB36, select **File**, then **Write to KEUSB36**. Be sure that the KE-USB36 is connected to the computer prior to this step. Once loaded, the new configuration will take effect on the KE-USB36.
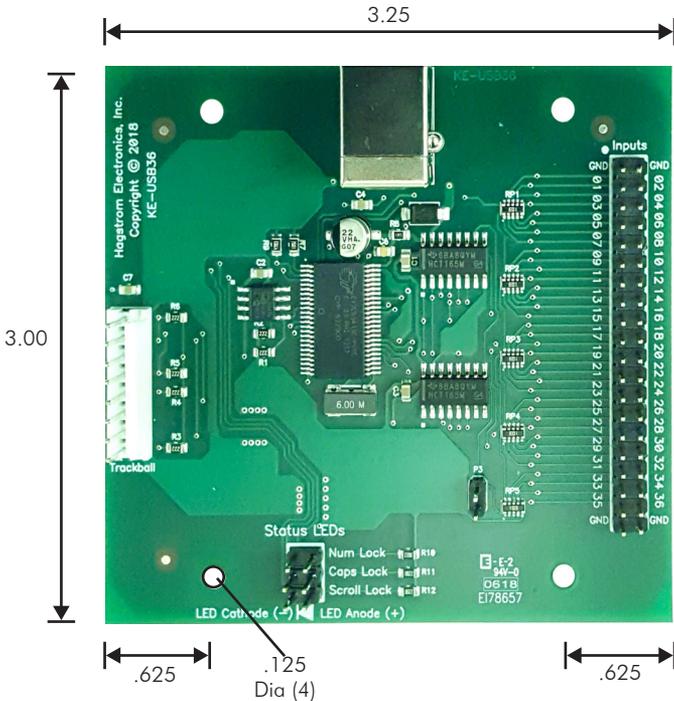
The configuration is stored on the KE-USB36 in non-volatile memory. Once a configuration is loaded into the unit, it will remain set (even during power off) until changed by the user.

To retrieve an existing configuration from the KE-USB36, select **File**, then **Read from KE-USB36**. Be sure that the KE-USB36 is connected to the computer prior to this step. Once loaded, the

program window will display the device's current configuration.

Note: *Loading a configuration from the KE-USB36 will overwrite any existing configuration settings in the program window.*

Appendix A:
Specifications

Operating Voltage	5 Volts DC +5%, -13%, Supplied from USB port (Bus powered)
Operating Current	100 ma Maximum
Operating Temperature	0 to 70 Degrees C
Input Header	2x20, with 36 individual inputs and 4 Ground connections. .025" square pins spaced at .100"
Required Input Current	1.2 ma sink current typical
Input Active Time	The input must be active for at least 20 msec to be considered valid.

Appendix B:
Operating Tips

The KE-USB36 is configured as 36 individual inputs, which are activated by shorting them to the common Ground provided on the header. Since these inputs are individual, they are completely separate, and cannot produce "ghosting" as in a matrix application.
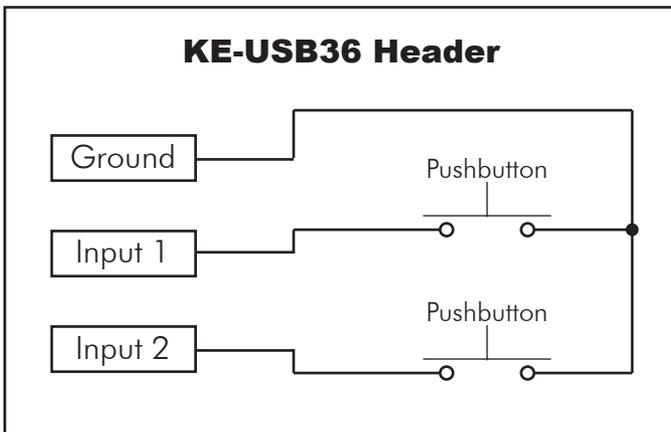

Figure 14 - Electrical connection example for switches to KE-USB36 header

Inputs may also be driven from logic gates, provided they do not drive voltage above the USB 5V supply on the unit. The logic signals must produce an active logic low signal for the appropriate amount of time as listed in Appendix A.

The recommended maximum cable length from the KE-USB36 input header to the input devices is 10 feet. The recommended maximum cable length of the USB cable from the PC or Hub to the KE-USB36 is 10 feet.

The Trackball header may be used for a Spinner instead of

a Trackball. Use the controls for either the X or Y axis for the Spinner, according to the axis on which the Spinner movement is to appear.

In order to accommodate the various brands of Trackballs, the KE-USB36 provides check boxes to reverse the Left-Right and Up-Down movements of the Trackball. If you find that one or both directions of your cursor movement from the Trackball are reversed, check the appropriate box in the configuration program.

The KE-USB36 uses the standard USB keyboard buffer length which allows for up to six keys being reported "ON" at the same time. This limitation only pertains to KE-USB36 inputs that are programmed with the repeat selection enabled. Use of the Left and Right Shift, Left and Right Alt, Left and Right Control, and Windows GUI keys, can be used in addition to the six key limitation.

The KE-USB36 has the option of repeating an input that is held on. If the input is selected to repeat, that input will count toward the six key limit. Keys that are set to not produce a repeat will not be subject to the 6 key limitation, provided there are no more than 5 repeated keys currently active. Note that inputs defined as mouse buttons do not figure into the six key limit.

Inputs on the KE-USB36 which emulate a multiple key sequence, such as Shift+F1, will automatically have repeat disabled.

Appendix C:
KE-USB36 Read/Write from the Command Line

In addition to the KEUSB36.EXE configuration program, the CD supplied with the KE-USB36 contains two command line programs for reading from and writing to the KE-USB36 device. For details, see the README.TXT file included on the CD.

Appendix D:
Board ID

Two KE-USB36 devices may be connected to the same machine. Each KE-USB36 unit has a two position jumper which may be used to identify the unit as #0 (primary) or #1 (secondary). BoardID is 0 or 1 based on the 2 position jumper setting on the board. ID 0 = Jumper Open (default). This jumper is located near the middle of the KE-USB36 board and is the only 2 position jumper on the unit (see figure 15).
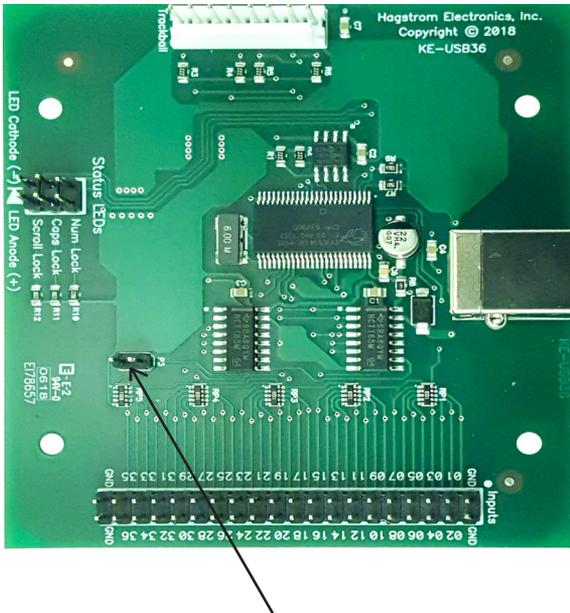

Figure 15 - Location of two position BoardID jumper.

Accessories

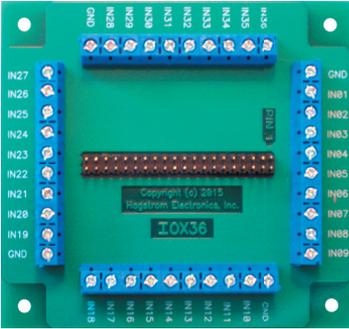We offer several accessories to connect to your KE-USB36.

KE-USBMM6

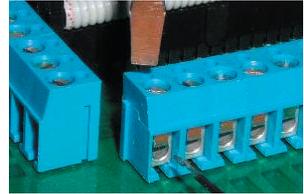6 ft. Male/Male Type A to Type B USB Cable

IOX36

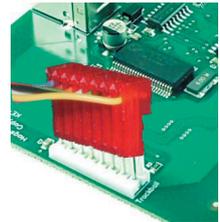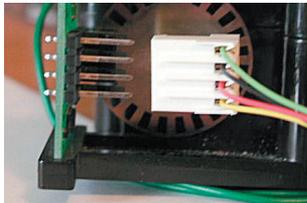Input Header to screw terminal breakout board. This product connects to the KE-USB36 input header through a standard IDE cable (included). Each input is brought out to a separate, labeled, screw terminal. Use for solderless connection to the KE-USB36.

KE-TBH3

Trackball interface cable. This cable attaches the KE-USB36 Trackball input to the Trackball itself.

Custom KE-USB36 Options

We offer custom modifications to our standard KE-USB36 unit to conform to your exact specifications. We can add special features such as matrix scanning, output controls, and display interfaces, just to name a few.

Matrix Scanning

Special Output Controls

LCD Interface

LED Interface

Rotary Switch Inputs

Serial Communication

Alternate Function Keys

Custom Machine Interfaces

Questions or Comments?
Please send us an email!

visit our website
www.hagstromelectronics.com

email: **sales@hagstromelectronics.com**

Warranty

HAGSTROM ELECTRONICS, INC. warrants this product against defects in material or workmanship for a period of ONE YEAR from the original purchase date. We will repair or replace (at our option) the returned defective unit at no charge during this warranty period.

No responsibility is assumed for any special, incidental, or consequential damage resulting from the use of or inability to use this product. In no case is **HAGSTROM ELECTRONICS, INC.** to be liable for any amount which exceeds the purchase price of the unit, regardless of the claim.

No other warranty, written or verbal, is authorized. This warranty is applicable only to units sold in the United States. Units sold outside the United States are covered by a similar warranty.

Depending on the state in which you live, you may have additional rights.

Great care has been taken during the assembly, testing, and burn-in of your KE-USB36 to ensure its performance. If you have any questions, please send us an email.

customer service email*:*   *sales@hagstromelectronics.com*

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