KE-USB36FS
USB Keyboard Encoder
User Manual

Thank you for purchasing the

HAGSTROM ELECTRONICS, INC.

KE-USB36FS. 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-USB36FS.

NOTICE: The KE-USB36FS product is designed for use by technically oriented computer users. When the KE-USB36FS 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-USB36FS 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-USB36FS

The KE-USB36FS Keyboard Encoder is a product designed to interface switches or other switching devices to a computer's USB port. The KE-USB36FS appears as both a keyboard and a mouse to your computer system. The 36 inputs on the KE-USB36FS header 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-USB36FS features an auxiliary interface port which allows direct connection of the signals from a trackball to the unit. The signals received on this port from the trackball are converted into mouse cursor movement on the computer.

The Auxiliary port may alternatively be used as a communication port to connect to our Relay-8 output board and/or our Rotary-5 rotary switch input product.

Auxiliary Interface Port

Status LED Interface

USB Port

36 Input Header
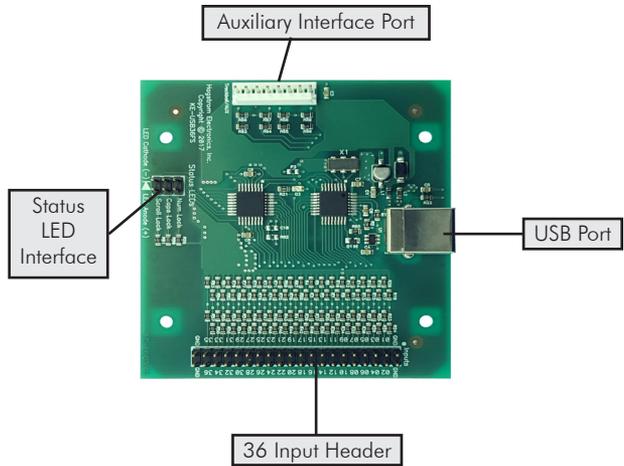
Using the Rotary-5 unit with the KE-USB36FS provides interface for five quadrature type rotary switches. Keystrokes can be assigned for movement detected on the Rotary-5 inputs for each direction.

Attaching our Relay-8 to the Auxiliary port provides control of the relay outputs through the USB connection. Samples of software are provided for integrating relay control into the user's program.

The KE-USB36FS uses standard system drivers for its functions. When using the unit for the first time on your computer, USB drivers will be loaded for the device.

Connection to the Computer

The KE-USB36FS attaches to the computer's USB port. Use a standard A-B Male/Male type USB connecting cable from the KE-USB36FS to the USB port on the computer. The KE-USB36FS may be connected directly to the USB port on the computer or through a compliant USB Hub.

Figure 2 - Connection of the USB cable to computer

Connect the type "B" end of the USB cable into the KE-USB36FS and the type "A" end into the computer or hub USB connector.

The KE-USB36FS 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.

Figure 3 - Connection of the USB cable to the USB port of the KE-USB36FS.

Note: *The first time you use the KE-USB36FS with a particular computer, the system will load the appropriate drivers for the device. Follow the default selections to load the standard drivers for the KE-USB36FS.*

The KE-USB36FS is powered directly from the USB port, so no external power is required.

The KE-USB36FS is compatible with all operating systems which offer full support for standard USB keyboard and mouse devices.

Interfacing to the KE-USB36FS Input Header

The KE-USB36FS 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 keyboard as well as the Left, Middle, and Right mouse buttons.

Inputs on the KE-USB36FS header are activated by shorting them to one of the provided logic grounds on the header. When activated, the

Figure 4 - The KE-USB36FS 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 computer's 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-USB36FS 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, the ground may be "daisy chained" to the common of all the switches. We also offer a breakout board (our part number IOX36) for interfacing to the KE-USB36FS. This interface board attaches to the KE-USB36FS 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

using switches with the KE-USB36FS.

Note: *The KE-USB36FS allows all of the inputs to be activated simultaneously.*

Keyboard Status Light Signals

Keyboard status light drive is available with the KE-USB36FS. 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 has .100" spaced pins, which are 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-USB36FS will drive an LED directly from each Anode/Cathode pair of wires. At 5 volts, the drive current is approximately 10 ma for each LED. The KE-USB36FS has current limiting resistors built into the unit, so connection to the user's LED may be made directly.
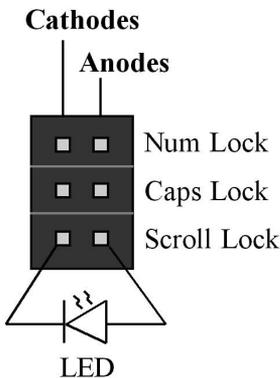
Figure 6 - Connection of LEDs to the Status LED Header

Interfacing to the KE-USB36FS Auxiliary Port

Trackball Mode - The KE-USB36FS auxiliary interface connector can accept optical signals from a device such as a Spinner or a Trackball. Power is supplied to the trackball interface from the KE-USB36FS for 5 volt operation only. This interface is compatible with the most popular active or passive Trackballs and Spinners.
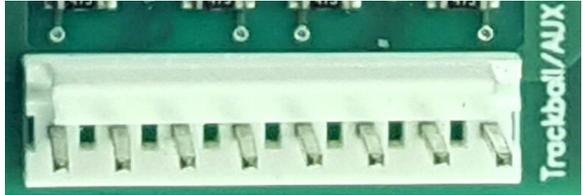

Figure 7 - The KE-USB36FS Auxiliary Port Trackball interface. The connector features 8 pins spaced at .100" centers.

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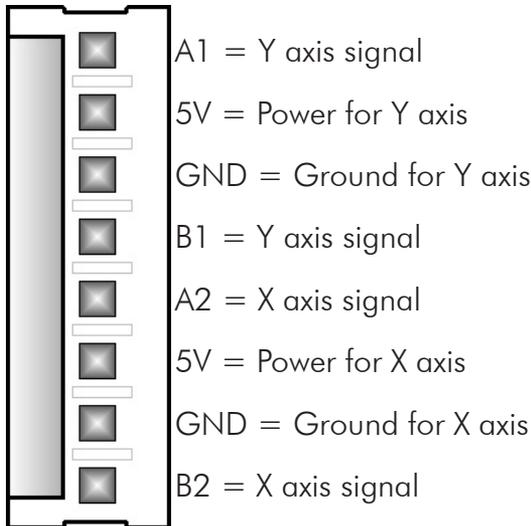
Figure 8 - Trackball Interface signal assignments.
Note: *Do not supply any power into the Trackball interface connector.*

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Rotary-5 Mode

Using the KE-USB36FS auxiliary port with a Rotary-5 unit provides 5 channels of rotary encoder switch interface. Each of the channels can be programmed to send a keystroke for each direction of the rotary encoder device attached to the Rotary-5.

Use the MTA100-8/5-36FF cable to attach from the KE-USB36FS to the Rotary-5. The supplied KE-USB36FS configuration program is used to enable the Rotary-5 function on the auxiliary port.
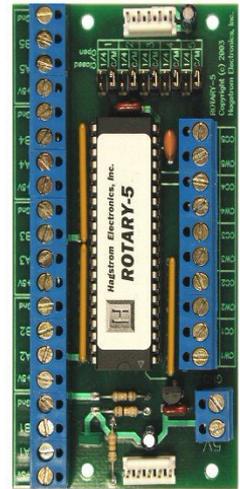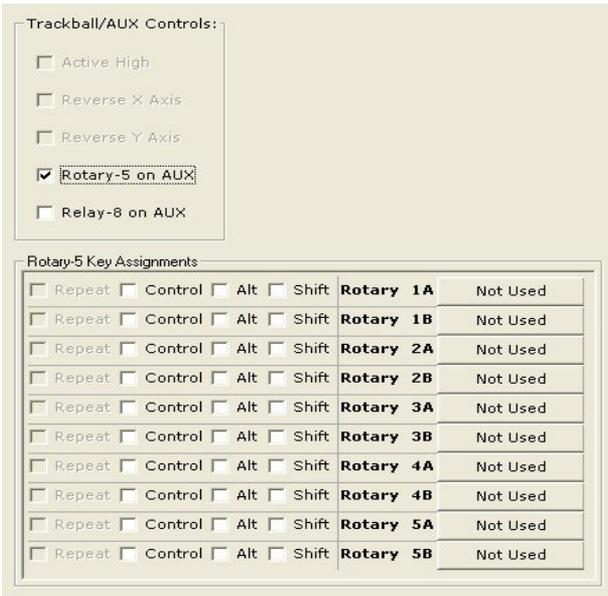
Select the checkbox to enable the Rotary-5 functions in the KE-USB36FS configuration program.

In this configuration, the KE-USB36FS delivers the required power to the Rotary-5 for operation. Refer to the Rotary-5 manual for instructions on connecting rotary encoders to the terminal block connections on the board.

Under each rotary encoder channel, the keystroke for each direction may be assigned under the "A" and "B" selections for each channel.

Relay-8 Mode

When the auxiliary port is used with a Relay-8 unit, this configuration allows for control of the eight relays on the Relay-8 through the use of a provided .dll. The CD supplied with the KE-USB36FS has a section which includes examples of integrating code into a program which controls the Relay-8 output states.

Use the MTA100-8/5-36FF cable to attach from the KE-USB36FS Auxiliary header to the Relay-8. The supplied KE-USB36FS configuration program is used to enable the Relay-8 functions on the auxiliary port.

To allow for Relay-8 control, the checkbox for "Relay-8 on Aux" must be checked.

Select the checkbox to enable the Relay-8 functions in the KE-USB36FS configuration program.

NOTE: It is permitted to use both a Relay-8 and a Rotary-5 unit at the same time. An MTA100-5-36-FF cable, in addition to the MTA100-8/5-36FF cable, is required to connect both a Rotary-5 and a Relay-8 unit to the KE-USB36FS Auxiliary port.
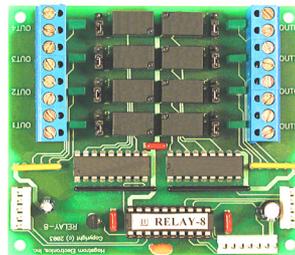
Refer to the Relay-8 manual for instructions on the use of the Relay-8 terminal block outputs.

All Relay-8 control in this configuration is commanded through the user's program and the supplied .dll on the enclosed disk.

Configuring the KE-USB36FS

The KE-USB36FS is supplied with a utility program which allows quick and easy setup of the inputs on the unit. Run the KEUSB36FS. 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.

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-USB36FS runs as both the mouse and the
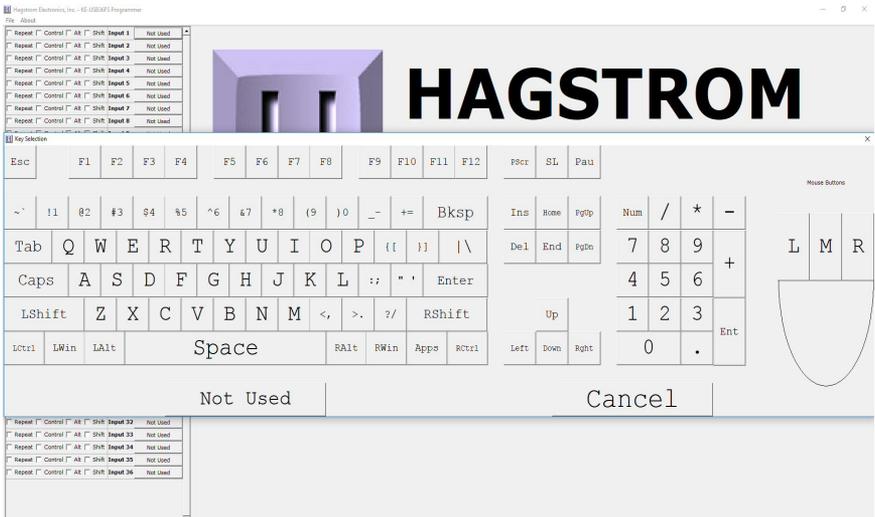
keyboard at all times. If no Trackball device is connected to the unit, no cursor movement will be initiated from the KE-USB36FS, but the ability to emulate Left, Middle, or Right mouse buttons remains.

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 computer keyboard settings dictate the repeat speed.

Trackball Adustments

When the KE-USB36FS Auxiliary port is used for a trackball, there are several option sthat may be selected with checkboxes shown on the KE-USB36FS configuration program screen. These options allow for tailoring the trackball response to the type of trackball

being used as well as the type of signals the trackball is providing to the KE-USB36FS.

The "Active High" setting is left unchecked for most trackballs. If using a vintage type trackball that can only pull control lines high, check the box for "Active High".

Trackball/AUX Controls:
- ☐ Active High
- ☐ Reverse X Axis
- ☐ Reverse Y Axis
- ☐ Rotary-5 on AUX
- ☐ Relay-8 on AUX

Use the "Reverse X Axis" to transpose the left/right movement of the trackball. This setting allows for adaption of the trackball type and orientation in a particular application.

Use the "Reverse Y Axis" to transpose the up/down movement of the trackball. This setting allows the trackball movement to be adjusted for different types of trackballs and mounting.

The trackball adjusment selections only apply when the Auxiliary input header is used for a trackball. If either the Rotary-5 or Relay-8 checkboxes are selected, the trackball checkboxes are disabled.

When a Rotary-5 and/or a Relay-8 unit is attached to the KE-USB36FS Auxiliary header, be sure to check the appropriate boxes to enable the function for the device.

Refer to the manual sections for the Relay-8 Mode and Rotary-5 Mode when using those options.

Saving the Configuration

Once the configuration has been created, it is recommended that the configuration be saved to disk. The KE-USB36FS 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-USB36FS, select **File**, then **Write to KEUSB36FS**. Be sure that the KE-USB36FS is connected to the computer prior to this step. Once loaded, the new configuration will take effect on the KE-USB36FS.

The configuration is stored on the KE-USB36FS 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.
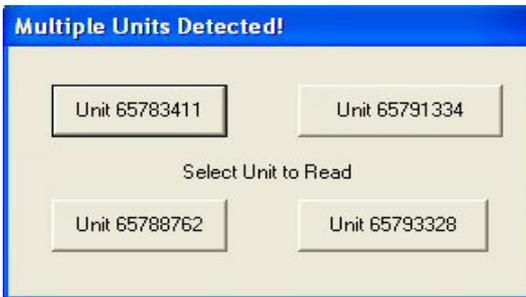
To retrieve an existing configuration from the KE-USB36FS, select **File**, then **Read from KE-USB36FS**. Be sure that the KE-USB36FS is connected to the computer prior to this step. Once loaded, the program window will display the device's current configuration.

Note: *Loading a configuration from the KE-USB36FS will overwrite any existing configuration settings in the program window.*

Multiple KE-USB36FS Units

Virtually any number of KE-USB36FS units may be attached to the same computer. The configuration program for the KE-USB36FS will recognize up to 4 units on a system and allow for them to be programmed individually.

If multiple KE-USB36FS units are detected when writing a configuration to, or reading a configuration from a device, the program will display a list of the individual serial numbers of the units. The program will show anywhere from two, up to the first four KE-USB36FS detected on the same computer system.

Multiple Units Detected!

Unit 65783411	Unit 65791334

Select Unit to Read

Unit 65788762	Unit 65793328

Select the device to write or read from the Multi Unit box by matching the serial number on the screen to the serial number of the device to be written or read. Each unit has a serial number tag located on the top of the board near the Auxiliary input header.

Appendix A: Specifications
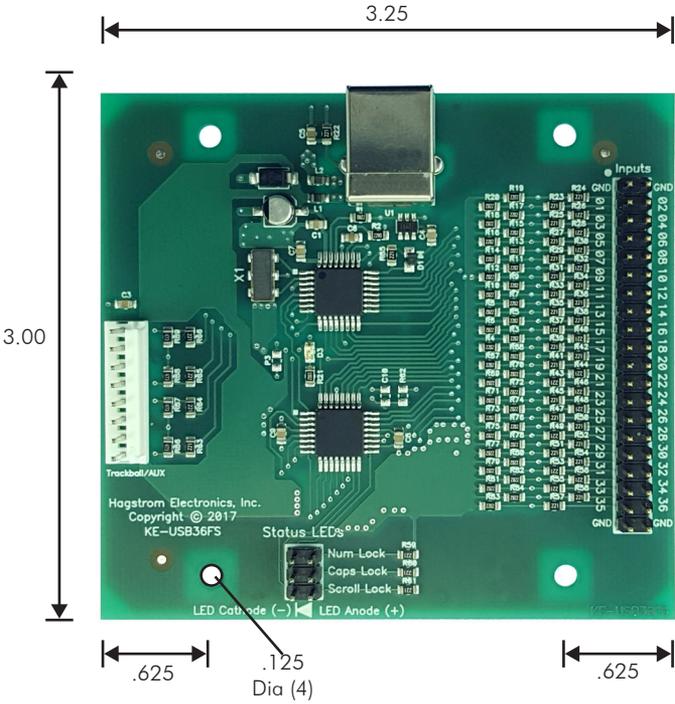
Note: All dimensions are in inches.

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 (Debounced)	The input must be active for at least 20 msec to be considered valid.

Appendix B:
Operating Tips

The KE-USB36FS is configured as 36 individual inputs, which are activated by shorting them to the common logic Ground provided on the header. Since these inputs are individual, they are completely separate, and cannot produce "ghosting" as in a matrix application.
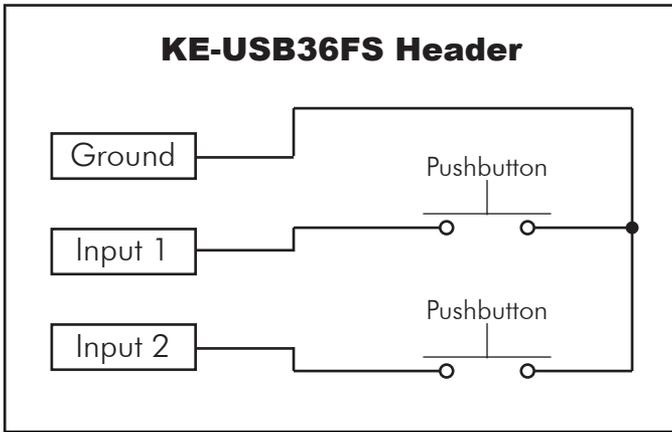

Figure 14 - Electrical connection example for switches to KE-USB36FS header

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-USB36FS input header to the input devices is 10 feet. The recommended maximum cable length of the USB cable from the computer or Hub to the KE-USB36FS 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-USB36FS 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-USB36FS 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-USB36FS 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-USB36FS 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-USB36FS which emulate a multiple key sequence, such as Shift+F1, will automatically have repeat disabled.

Appendix C:
KE-USB36FS Read/Write from the Command Line

In addition to the KEUSB36FS.EXE configuration program, the disk supplied with the KE-USB36FS contains two command line programs for reading from and writing to the KE-USB36FS device. For details, see the README.TXT file included on the disk.

Accessories

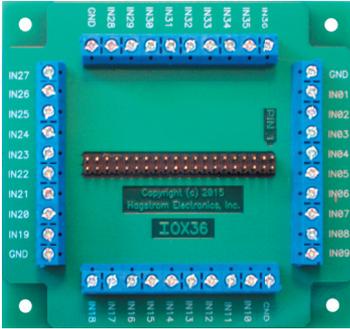We offer several accessories to connect to your KE-USB36FS.

KE-USBMM6

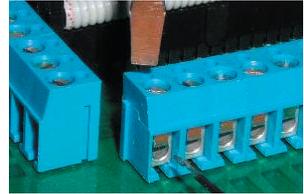6 ft. Male/Male Type A to Type B USB Cable

IOX36

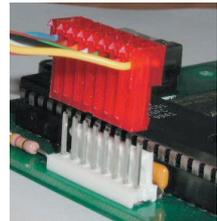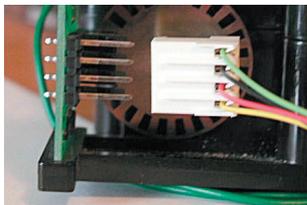Input Header to screw terminal breakout board. This product connects to the KE-USB36FS input header through a standard IDE cable (included). Each input is brought out to a separate, labeled, screw terminal. Use for solderless connection to the KE-USB36FS.
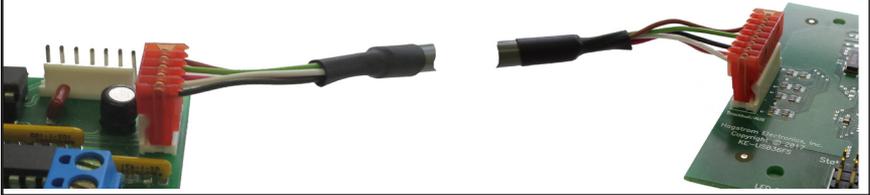
KE-TBH3

Trackball interface cable. This cable attaches the KE-USB36FS Trackball input to the Trackball itself.

Accessories

MTA100-8/5-36FF

8 position MTA connector to 5 position MTA style connector. Use to connect either a Rotary-5 or a Relay-8 unit to the KE-USB36FS Auxiliary connector. 3 ft Standard Length.

MTA100-5-36-FF

5 position MTA connector to 5 position MTA connector. Use to daisy chain a Relay-8 and Rotary-5 board together when using both with the KE-USB35FS and an MTA100-8/5-36FF. Provides the power and communication from the KE-USB36FS when both a Relay-8 and Rotary-5 are used. 3 ft Standard Length.
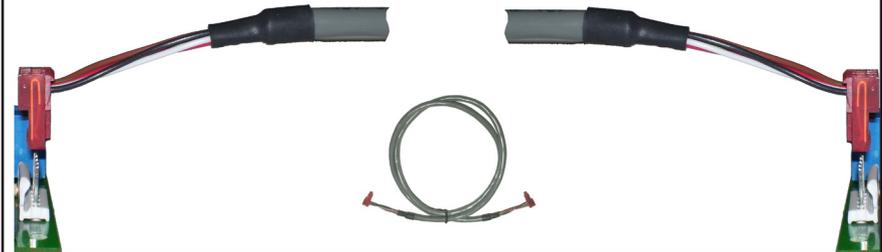
Custom KE-USB36FS Options

We offer custom modifications to our standard KE-USB36FS unit to conform to your exact specifications. We can add special features such as matrix scanning, display interfaces, and alternative connectors, just to name a few of the options. Send us an email to discuss your custom requirements.

Matrix Scanning

LCD Interface

LED Interface

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-USB36FS to ensure its performance. If you have any questions, please send us an email.

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

NOTICE The KE-USB36FS product is designed to be used by technically oriented computer users. When the KE-USB36FS 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.

HAGSTROM
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