



KEAD6
USB Joystick Interface
and Keyboard Encoder
User Manual

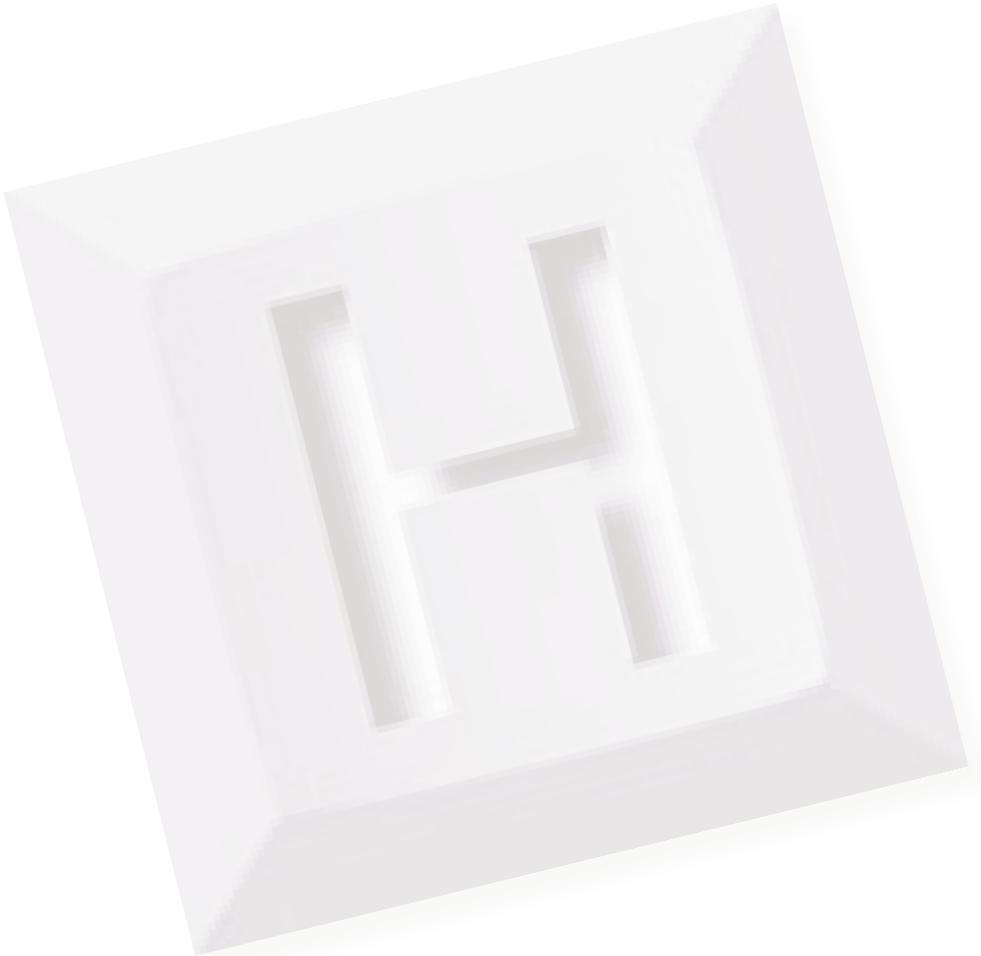


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Thank you for purchasing the
HAGSTROM ELECTRONICS, INC.
KEAD6. This product is configurable in a variety
of ways to meet your specific requirements.
Please take a few minutes to read this manual
before using your KEAD6.

Introduction to the KEAD6

Our KEAD6 Interface is a product designed to interface potentiometers to the computer's USB port. Potentiometers connected to the KEAD6 input channels produce joystick axis movement and/or keystrokes on the PC.

The KEAD6 is fully programmable by the user. This programmability feature allows the configuration of each input channel according to the joystick axis and/or keystrokes to be emulated by the potentiometer connected to that particular input. Each input of the KEAD6 may be programmed to emulate a joystick axis, send keystrokes based on the potentiometer movement, or both joystick and keystrokes from a single channel. The KEAD6 stores the user's configuration program in non-volatile memory so that the configuration information is retained on the unit even after power is turned off. The KEAD6 configuration may be changed using the included software as many times as required for various applications.

The KEAD6 Input Channels

The KEAD6 features six input channels with screw terminals to easily connect potentiometers. Three Joystick Buttons are also provided.

Power Requirements

The KEAD6 requires no external power source. It is powered directly from the USB port on the PC.

Supported Computers

All PCs with a standard USB port will work with the KEAD6. The KEAD6.EXE configuration program is for Windows based systems.

Hardware Requirements

The KEAD6 is designed to work with standard, commercially available cables for connection to the PC. A standard A-B Type USB cable is required for this connection.

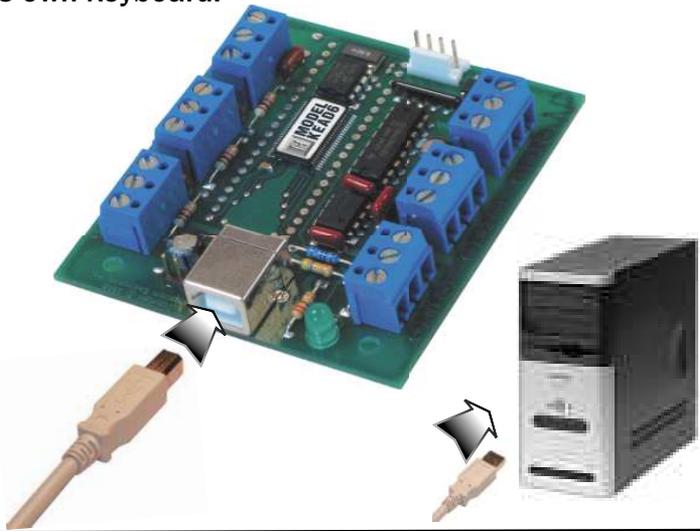
Default Settings

The KEAD6 is programmed and shipped with a default configuration with keystrokes from all channels disabled.

Computer Connections

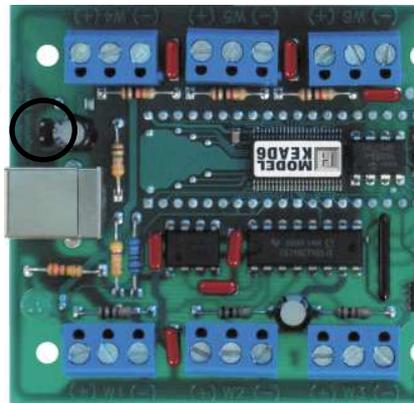
There is one USB connector located on the KEAD6. Connection to this port can be made with power on as the KEAD6 supports “Hot Plug” operation as a USB device. When the KEAD6 is plugged into a PC for the first time, the appropriate standard drivers are loaded by the operating system.

The KEAD6 emulates both a USB joystick and a standard USB keyboard. The KEAD6 may be used in addition to or in place of the system’s own keyboard.



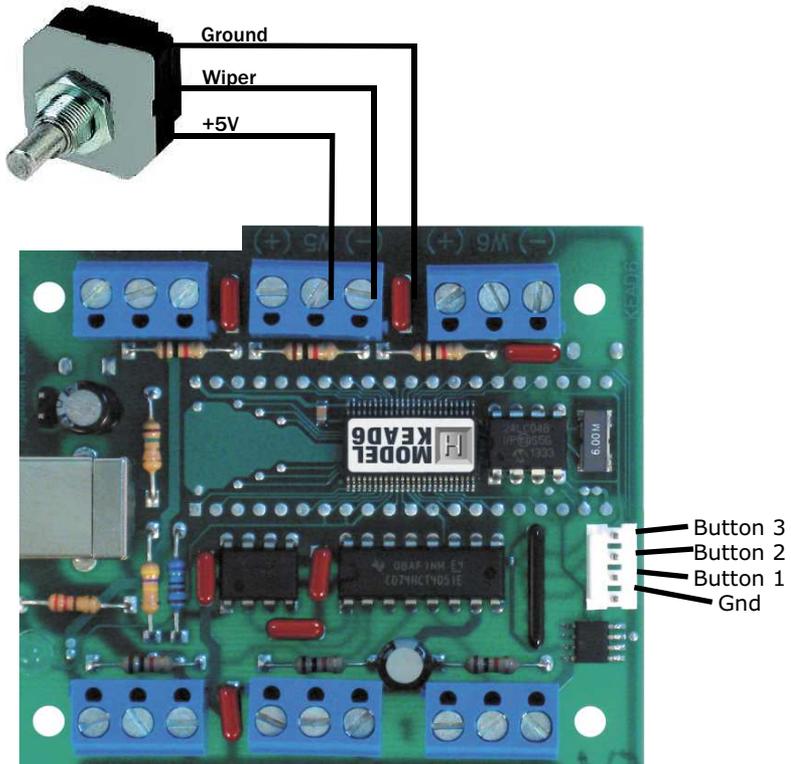
Device ID Jumper

Two KEAD6 units may be connected to the same computer and programmed independently. If using one unit, leave the Device ID jumper open (factory default). If using two KEAD6 units, leave the jumper open on unit 1 and closed on unit 2. This setup will present two different USB devices to the system that both work as USB keyboards.



Interfacing to the KEAD6

The three-position screw terminal blocks on the KEAD6 are used to connect potentiometers to the unit. The potentiometers used with each KEAD6 input can range in value from 500Ω up to 1MΩ. Potentiometers are connected to the +5V, Wiper input, and Ground as shown below.



Three Joystick Buttons

The four position header on the KEAD6 provides three inputs and a logic ground signal. To activate an input, short it to the provided logic ground through a switch. The activation of the switch will create a joystick button press on the computer.

The KEAD6.EXE Program

The KEAD6 unit is shipped with a CD-ROM containing the KEAD6.EXE utility program which is used for configuring the unit. The configuration program allows selection of whether the channel is to emulate a joystick axis, keystrokes, or both. Additional adjustable parameters include defining the number of response steps per channel, the keystrokes generated by each step, and other tuning options.

Getting Started

To use and configure the KEAD6, follow the steps listed below.

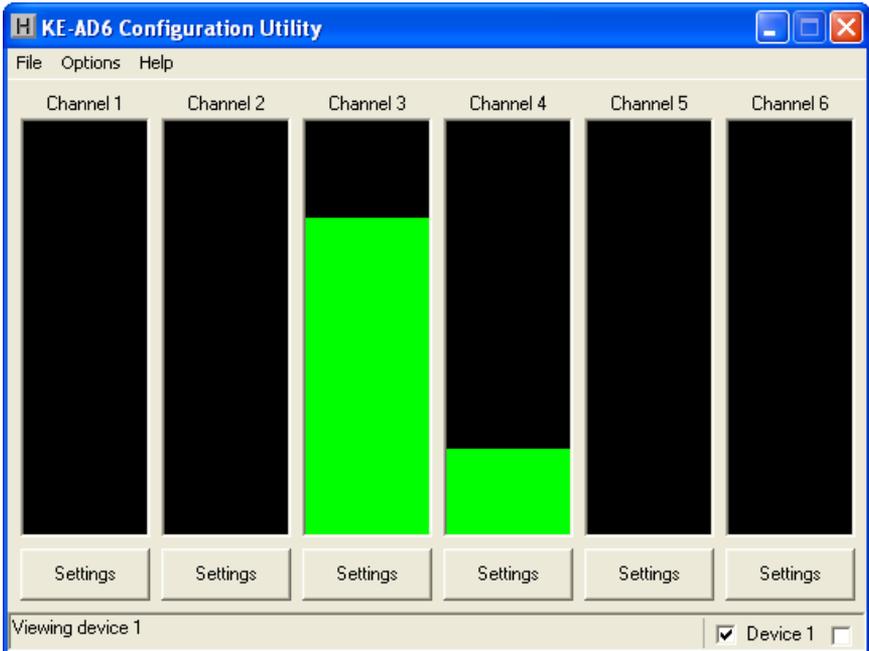
1. Attach the KEAD6 to the computer as described on page 2 under the section “Computer Connections.”
2. Insert the CD and save the content to its own folder on the hard drive. The CD may now be removed and stored in a safe location for future use.
3. Open the folder that was created in step 2 and start the configuration program by selecting the program file KEAD6.EXE.

***Note:** *The programs must be copied to and run from its own folder on the PC's hard drive. The CD itself should be reserved for backup purposes only.*

***Note:** *When the KEAD6.EXE program is running, joystick movement and keystrokes will no longer be produced by the KEAD6 until the program is closed again. This disable mode prevents any conflicts that may arise between the KEAD6 programmed responses and the configuration program.*

The Program Screen

The main program screen displays graphs of the current positions of each of the six channels corresponding to the six potentiometers on the KEAD6.



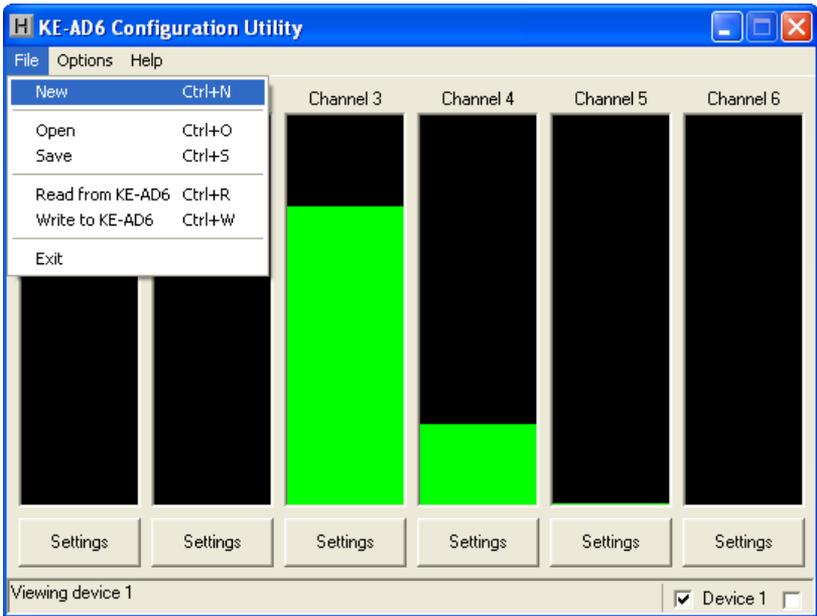
Switching Selected Device

If two KEAD6 units with properly assigned Device ID jumpers (see page 2, section “Device ID Jumper”) are both connected to the PC, then the KEAD6.EXE program must be set to which device to monitor. In the lower right corner of the main screen there are two checkboxes which are used to switch between Device 1 (left box) and Device 2 (right box). To change which device is selected, click on the corresponding checkbox. An alternate method is to select the Device ID under the Options menu.

If using a single KEAD6, the selection will be made automatically by the program.

File Menu Selections

The file selections, located within a drop-down list, are accessed by clicking on “File” in the upper left corner of the main program screen. This list provides several options that include creating and saving file configurations as well as reading and writing to the KEAD6. A list of these options, along with descriptions of how they pertain to the KEAD6 setup, are listed on the following page.



New: Creates a new configuration file by either clicking on “New” with the mouse or by pressing Ctrl+N on the keyboard. This option will also return the program screen to the default settings.

Open: Recall a previously saved configuration file by either clicking on “Open” with the mouse or by pressing Ctrl+O on the keyboard. Locate and select the name of the configuration file on the PC that is to be opened.

Save: Once a configuration setup has been created on the program screen, it is recommended that it be saved on the PC’s hard disk. Click on “Save” with the mouse or press Ctrl+S on the keyboard, then choose a location to save the file.

Read from KEAD6: This option will read the current configuration in the selected KEAD6 and display it on the screen. Click on “Read from KEAD6” with the mouse or press Ctrl+R on the keyboard to perform this operation.

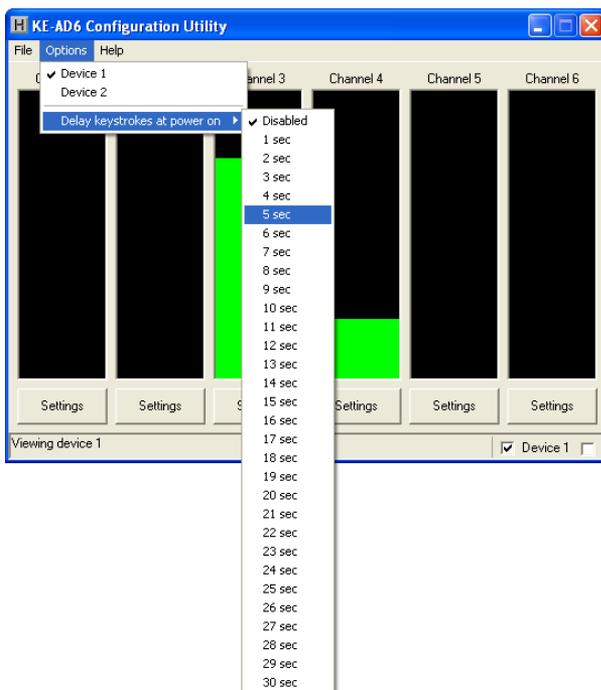
Write to KEAD6: This option will write the current configuration displayed on the screen to the selected KEAD6. The KEAD6 can be programmed and re-programmed as many times as necessary. Click on “Write to KEAD6” with the mouse or press Ctrl+W on the keyboard to perform this operation. After the KEAD6 has been loaded with the new configuration, it will scan according to this new setup upon exit from the program.

Exit: This option exits and closes the KEAD6.EXE program.

***Note:** *Make sure that the KEAD6 is connected to the PC before performing either the “Read to KEAD6” or “Write to KEAD6” operations. If the KEAD6 is not present, a “The KEAD6 was not Found” error will be displayed on the computer screen.*

Options Menu Selections

Option parameters, located within a drop-down list, are accessed by clicking on “Options” in the upper left corner of the main program screen. A list of these options, along with descriptions of how they pertain to the KEAD6 setup, are listed below.



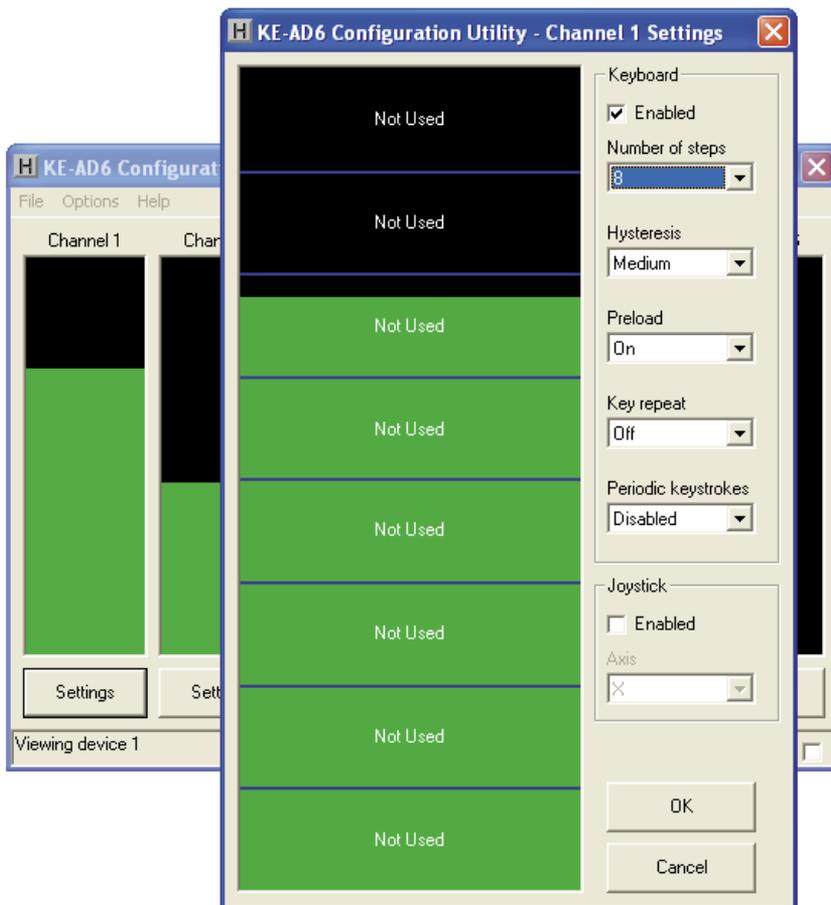
Device 1: Click this option to select the device with an ID of 1. See page 5, section “Switching Selected Device,” for details.

Device 2: Click this option to select the device with an ID of 2. See page 5, section “Switching Selected Device,” for details.

Delay keystrokes at power on: This option determines how long the KEAD6 waits upon being powered on before beginning to send keystrokes. This can either be set to “Disabled” or a value ranging from 1 second to 30 seconds. If this setting is enabled, the KEAD6 will wait the selected time beginning at power on before sending any programmed responses from the input channels.

Configuring the KEAD6

Each input channel of the KEAD6 can be independently configured. To edit the settings for a channel, click on the “Settings” button below the graph of a channel. For example, if changing channel 1 settings, the left most “Settings” button must be selected. The settings window for channel 1 will then appear as shown below (appearance may differ depending on potentiometer setting and prior channel 1 settings selections).



Channel Settings Window

Each input has a number of different options which can be set via the channel settings window. A list of these options along with descriptions of how they pertain to the KEAD6 setup are listed below.

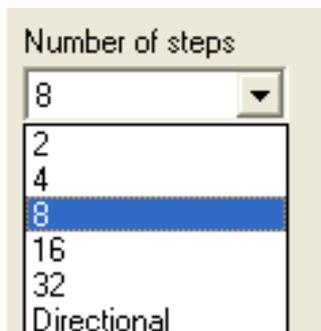
Keyboard Enabled Checkbox:

Checking this box enables the keyboard section and activates programming of number of steps, hysteresis, preload, key repeat, and periodic keystrokes as described below. If this box is unchecked, the keyboard section is disabled. If using the input as a joystick axis only, leave this box unchecked.



Number of steps: When the input is programmed to send keystrokes, each channel can be set into several different modes listed below.

- Under step mode, the channel becomes sectioned into a number of equal parts, where each section can be assigned a different keystroke. The number of sections can be set to 2, 4, 8, 16, or 32.



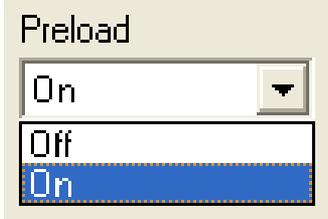
- Under directional mode, the channel has two different sections: up and down. When the potentiometer is increasing in value, the keystroke assigned to the up section is produced, and when the potentiometer is decreasing in value, the keystroke assigned to the down section is produced.

Hysteresis: This setting adjusts the size of the overlap between different sections. A keystroke will not be produced until the channel value reaches a certain distance past the border. This distance can be set to low, medium, or high. If the potentiometer used is very precise, this setting

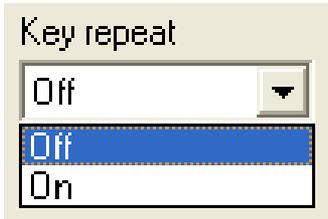


can be set to low. If, however, the potentiometer produces an unsteady reading, a setting of high should be used in order to keep unintentional keystrokes from being produced.

Preload: With this option on, the selected channel will not produce any keystrokes upon power on until the potentiometer for the channel is moved. With this option off, the channel will send out its current position as soon as it is powered on or, if set, after the power on delay.

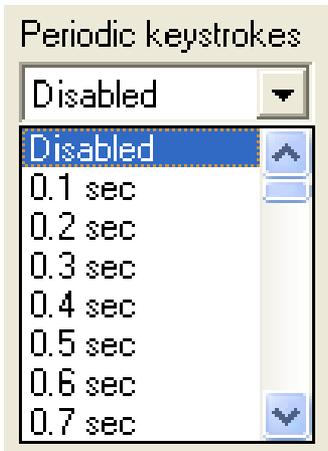


Key repeat: With this option set to off the keystrokes generated by this channel will produce one keystroke per step. In most cases this setting should be set to off. Setting this option to on causes the keystroke for the current step to be held down as if a key on a typical PC keyboard were being held. The rate at which the key will repeat is the same as your PC keyboard settings on the PC.



Periodic keystrokes:

The channel can be set to produce a keystroke corresponding to the current position of the channel at a specified period of time. For example, if set to 5.0 sec., a keystroke corresponding to the current position will be sent out every 5 seconds. If, however, the potentiometer position changes from one section to another such that a different keystroke is produced, the periodic keystroke timer will be reset, and another periodic keystroke will



not be sent out for another 5 seconds afterwards. The time between the sending of each keystroke can be set between 0.1 seconds and 10.0 seconds. When set to disabled, no periodic keystrokes are produced.

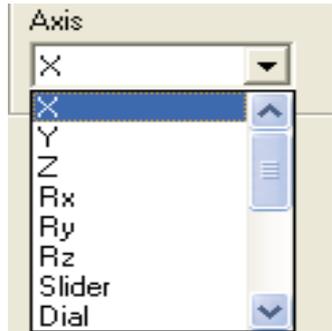
Joystick Enabled Checkbox:

Checking this box enables the joystick section and activates programming of joystick axis. If this box is unchecked the joystick is disabled for this channel. The joystick should be disabled for a given channel if it is not to emulate an axis.



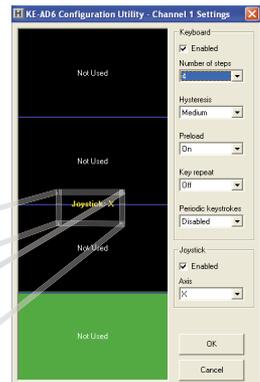
Axis: Each channel can be set to one of several different axes or controls as listed below.

- X, Y or Z axis.
- Rx, Ry or Rz axis.
- Slider.
- Dial.
- Wheel.
- Vx, Vy or Vz axis.
- Vbrx, Vbry or Vbrz.
- Vno.



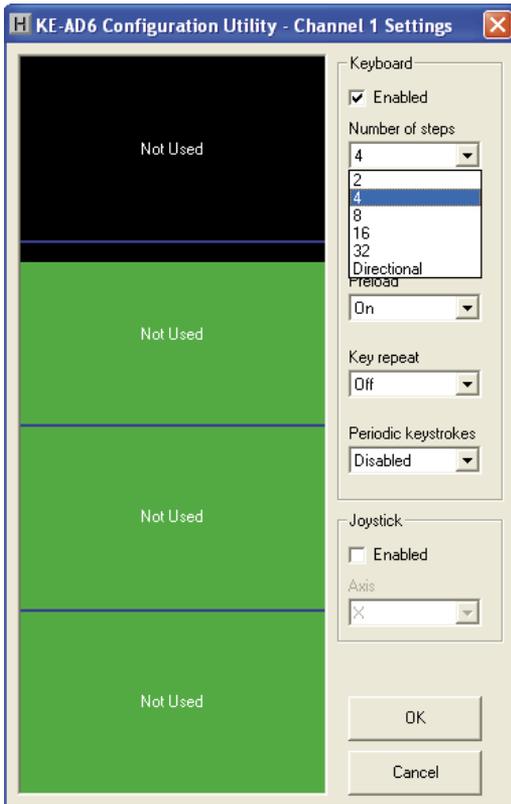
To make a selection, open the drop down list by clicking on the down arrow next to the current selection and click on the new choice of axis or control. A particular axis from the list may only be used in one channel and will not appear in the list if it is used in another channel. For example if in channel 1 settings the joystick is enabled and the X axis is selected then the X axis selection will not be available in the axis drop down list in the other channels.

When a joystick axis or control is chosen, the selection will be displayed in yellow text in the middle of the channel settings window. For example if the X axis is selected the following will be displayed.



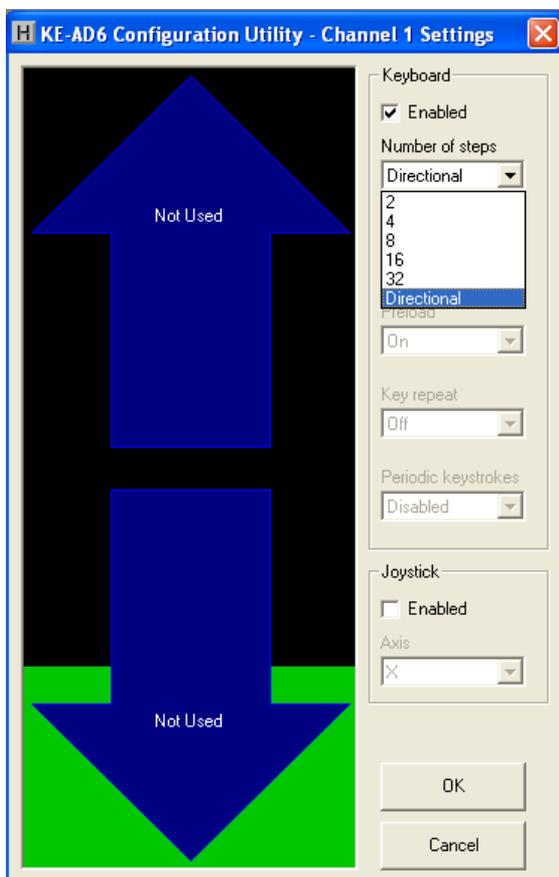
Step Mode

When programmed to send keystrokes, channels can be placed into a step mode where the channel becomes sectioned into a number of equal parts in which each section can be assigned a different keystroke. To place a channel into step mode, first open the settings window for the channel. Make sure that the keyboard enabled checkbox is checked. Change “Number of steps” to 2, 4, 8, 16, or 32, as shown below. The keystrokes these steps produce can be assigned by clicking on a section of the graph and selecting a key representation as described in the “Assigning Keystrokes” section found later in this manual. When a channel has been set to step mode, the programmed keystroke for that position is sent when the potentiometer value crosses into that particular step from either direction.

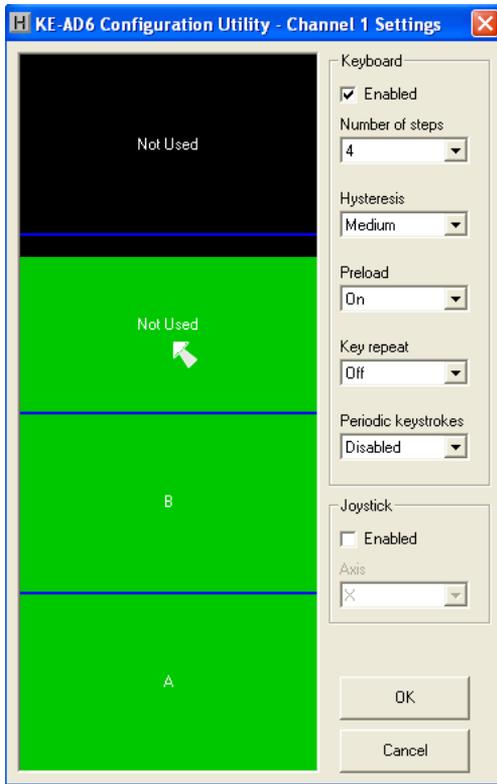


Directional Mode

When sending keystrokes, channels may be placed into a directional mode where the keystrokes are produced when the channel value changes by a defined amount. The amount of potentiometer movement required to generate a keystroke in this mode is determined by the hysteresis setting. To place a channel into directional mode, open the settings window for the channel. Then change “Number of steps” to Directional as shown below. The graph will show two arrows which represent increasing and decreasing values. The keystrokes produced can be assigned by clicking on an arrow and selecting a key representation as described on the following page.



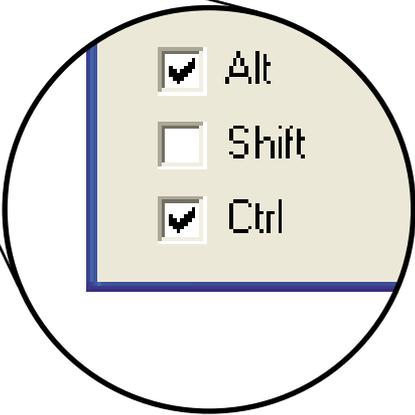
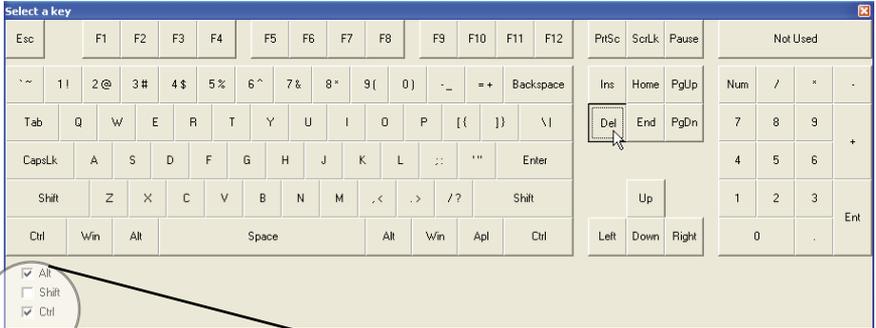
Assigning Keystrokes



Each step of the channel can be assigned a key which will be emulated when the channel value reaches that step. To assign keys, click on the desired step on the graph. A diagram of the keyboard will be displayed, as shown below. Click on the representation of the key to assign it to the selected step.



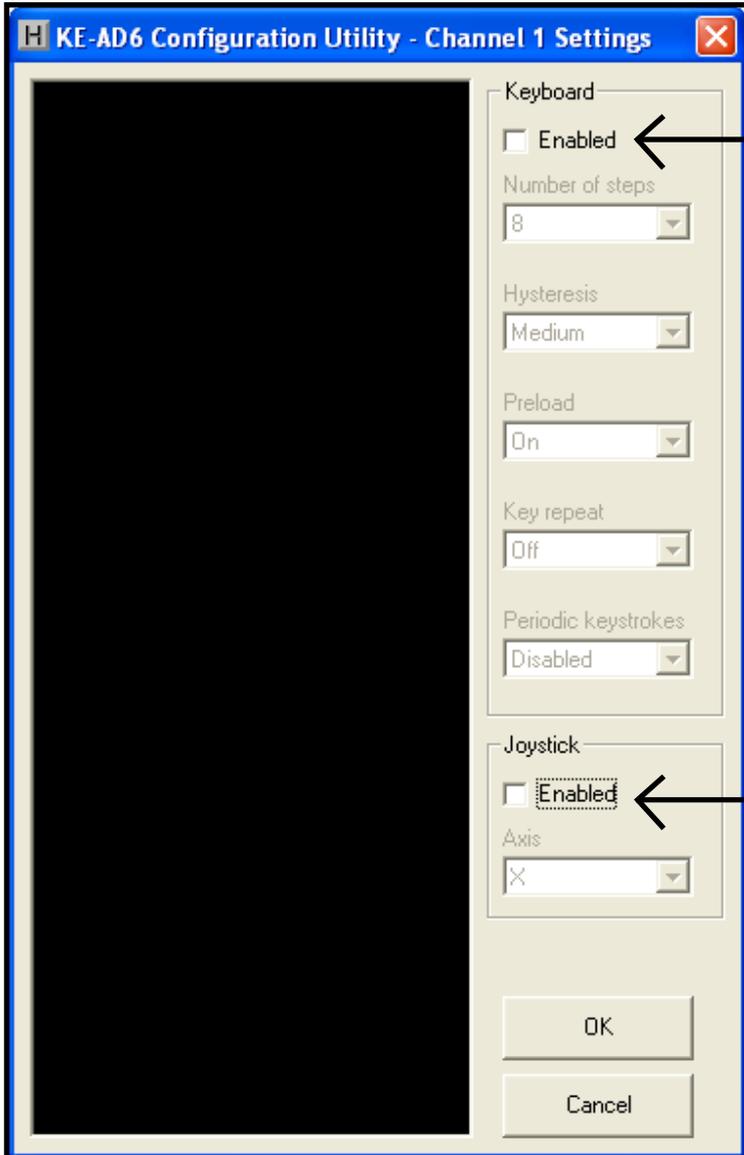
The KEAD6 has the capability to assign Shift, Ctrl, and Alt functions along with a keystroke. For example, one of the responses could be defined as the Ctrl+Alt+Del sequence. The keystrokes emulated by this combination have the same effect as holding the control and alt keys, then pressing the delete key on a PC keyboard. To create this input, check the Ctrl and Alt boxes on the lower left corner of the keyboard diagram, then click the Del button (shown below).



Any step in the channel can be modified by one or a combination of Shift, Alt, or Ctrl keys using the method described above. Use the Shift function to generate uppercase characters or shifted characters (!, @, etc.) in the application. Combinations such as Ctrl+Alt+F1 can also be created by checking the appropriate boxes along with the selected key. To remove one of these special functions, uncheck the appropriate box and click on the desired key.

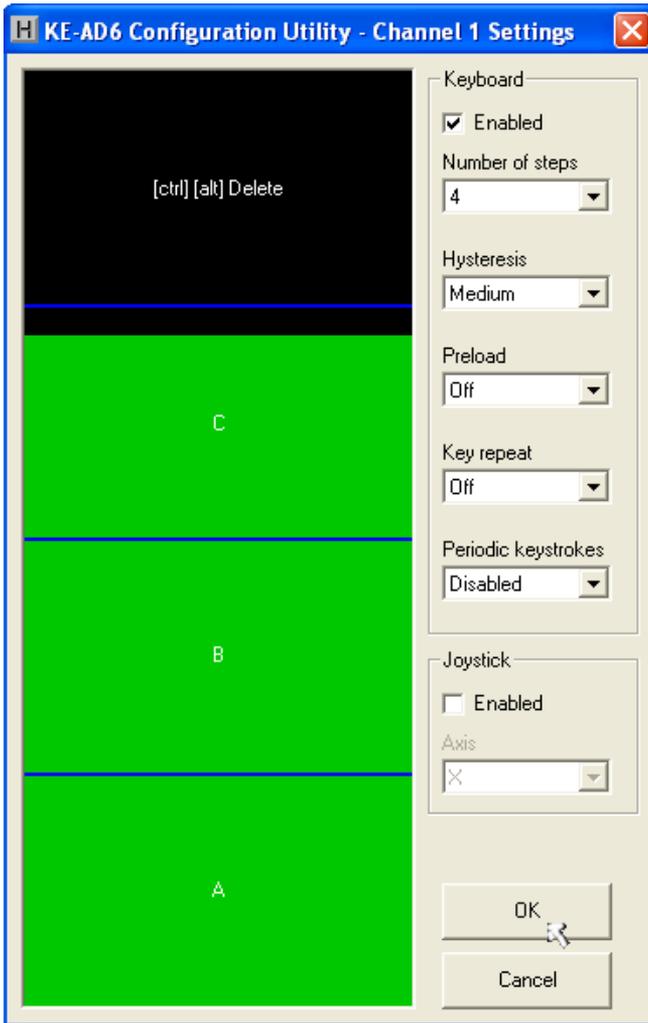
Disabling Channels

Any channels that are not used should be set to be disabled. To disable a channel, first open the settings window for the channel. Then uncheck the Keyboard and Joystick “Enabled” checkboxes (see arrows below). Once the configuration is written to the device, this channel will be disabled.



Accepting Changes

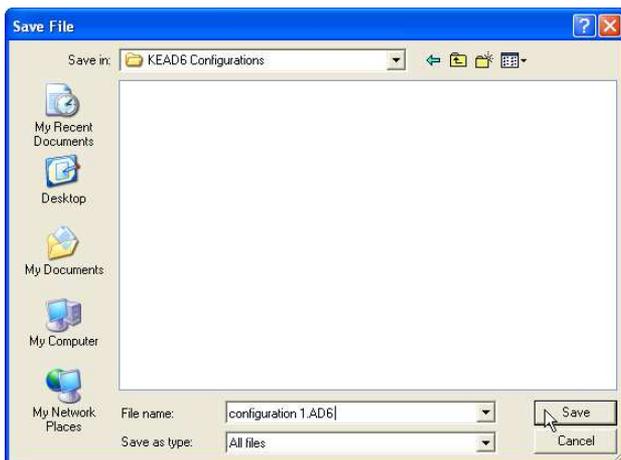
To accept the changes made to a channel setup, click the OK button as shown below. To discard any changes made to the channel settings, click the Cancel button.



***Note:** No changes will take place on the KEAD6 itself until the configuration has been written to the device. Refer to the following page for details on how to write to the KEAD6.

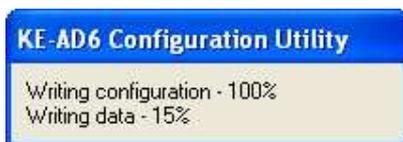
Saving to Disk

Once the desired configuration is created, it should be saved to disk. To do this click on “Save” under the File menu and specify a file name under which to save the configuration.



Saving a Configuration to the KEAD6

To load the KEAD6 with the completed configuration, click on “Write to KEAD6” under the File menu. Be sure that the KEAD6 is connected to the PC. Once the KEAD6 is loaded and the KEAD6.EXE program is closed, the KEAD6 will begin running the new setup.



KEAD6 Operating Tips

Please check the following items before calling us.

- When connecting the KEAD6 to a PC, use a standard USB A-B type Cable.

- The KEAD6.EXE program must be closed before the KEAD6 will produce any keystrokes or joystick movement. The KEAD6.EXE program temporarily disables the KEAD6 responses in order to prevent potential conflicts when changing configurations.
- The maximum recommended cable length from the computer to the KEAD6 is 10 feet. This distance is also the maximum length that should be used on connections from any potentiometer to the KEAD6 input channels.
- If using a Device ID jumper, only make changes to it when the power to the unit is off as the jumper state is sampled at power on or reset only.
- Before using the KEAD6.EXE program, visit Microsoft “Windows Update” and get the latest updates for the operating system. This step is important for making sure the PC has the latest USB port updates.

***Note:** For any questions that are not answered in this manual, please send us an email or call customer service. We have customer service available from 8:00 am to 5:00 pm (EST) Monday through Friday.

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

Toll Free **888-690-9080**, or **(540) 465-4677**

Error Messages

“The KEAD6 was not found”

This error occurs if the computer cannot communicate with the KEAD6 when trying to save to the KEAD6 or read from the KEAD6. Check the cable connections to make sure none of them are loose or unplugged.

“Error while reading from the KEAD6”

“Error while writing to the KEAD6”

This indicates that, while the computer can communicate with the KEAD6, it was not able to read or write the configuration. Communication may be interrupted if a user presses a key on the keyboard or if another program takes the focus away from the KEAD6 application. If this error message is displayed, load the configuration again.



“Invalid configuration”

“Invalid configuration file”

When loading an already existing configuration from a file or uploading a configuration from the KEAD6, the program will give this error message if the file is corrupted or if it is the wrong file type.

“Error opening the file”

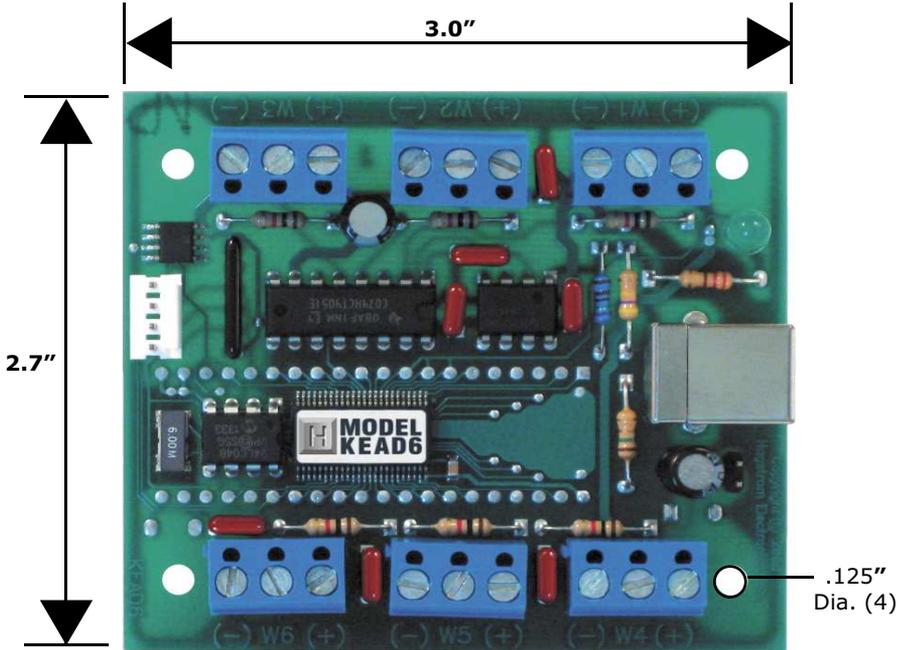
This error message is shown if the KEAD6.EXE program attempts to open a file that is already open in another application. If this happens, close the other application and open the file again.

“Error saving file”

This error message is shown if the KEAD6.EXE program attempts to save a file that is already open in another application, or if there is not enough disk space. If this happens, close the other application and try saving the file again.



Appendix A: KEAD6 Specifications

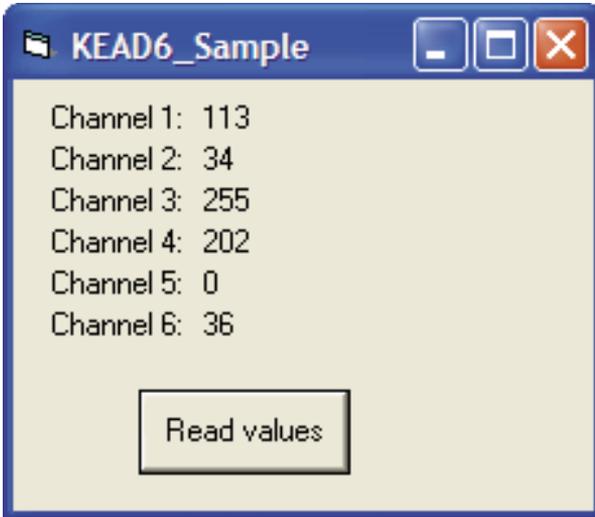


Operating Voltage	5 Volts DC +/- 5%
Operating Current	15 ma Typical + potentiometers
Operating Temp.	0 to 70 Degrees C
PC Interface	USB
Potentiometer Range	500Ω to 1MΩ

Appendix B: Using the KEAD6 with Custom Software

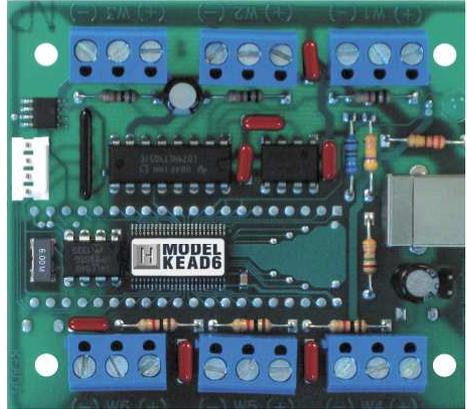
In addition to converting potentiometer movement to keystrokes or joystick action, the KEAD6 input channels can also be used as an analog to digital converter. The current voltage level of each channel can be read as an 8 bit value by the user's custom software utilizing the KEAD6.dll which is located on the included CD-ROM.

A Visual Basic sample program demonstrating how to read the digital values from the KEAD6 inputs is included on the CD-ROM under the KEAD6_Sample folder. The source code for this sample is also located under this folder.



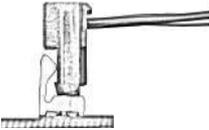
***Note:** We recommend disabling all scanned channels on the KEAD6 when used strictly as an analog to digital converter. To disable the channels, use the KEAD6 configuration utility.

Accessories



KE-USBMM6

6 foot USB Type A to Type B connecting cable between KEAD6 and PC.



MTA100-4-12

Cable set for use with KEAD6 Joystick Button inputs, 4 wires, each 12 inches long. Terminated with a 4 position connector on one end with loose wires at the other end.

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.

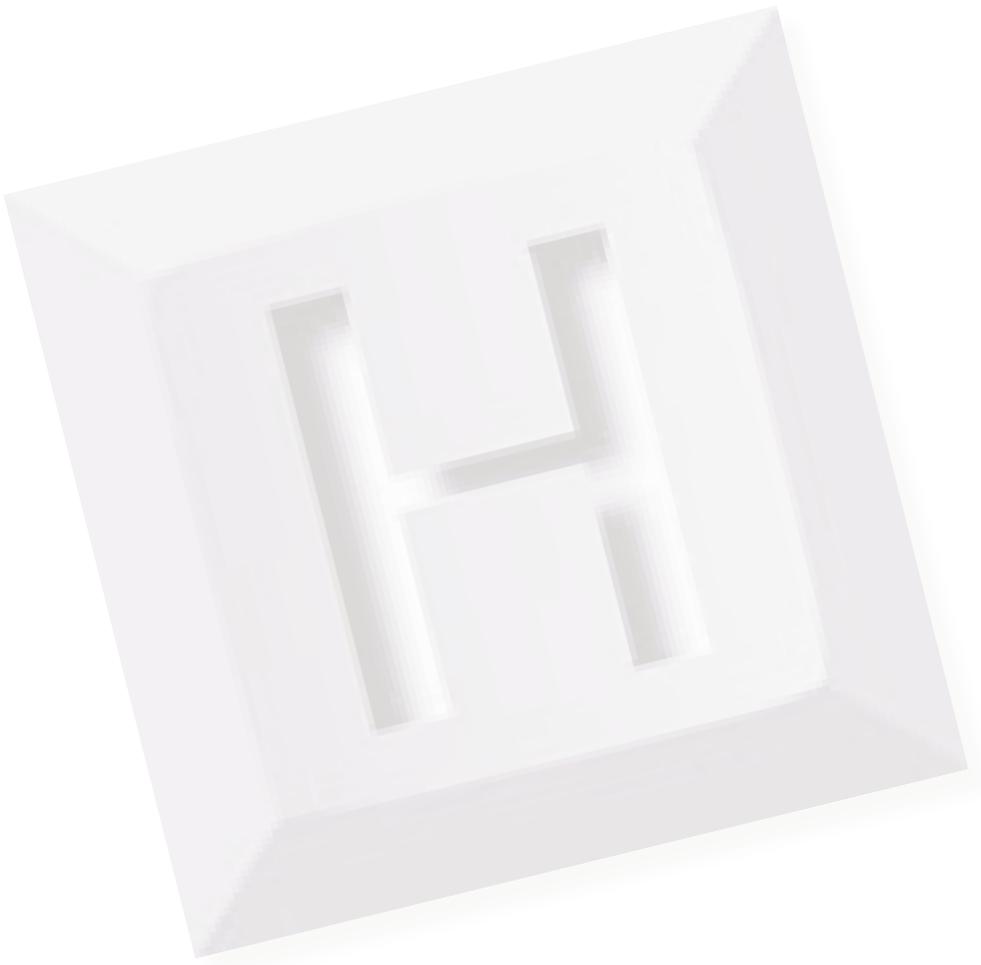
Great care has been taken during the assembly, testing, and burn-in of your KEAD6 to ensure its performance. If you have any questions, please send us an email or give us a call. Support is available Monday through Friday, 8:00 am to 5:00 pm (EST).

customer service email: *sales@hagstromelectronics.com*

Call Toll Free **888-690-9080**, or **(540) 465-4677**

NOTICE The KEAD6 product is designed to be used by technically oriented computer users. When the KEAD6 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.

Your keyboard encoder is designed for OEM use, and is not FCC part 15 approved. Because the packaging and use of the product will directly affect the characteristics of the unit, it is the responsibility of the purchaser to obtain final approval of their application, if required.



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