KEUSB24
PC Keyboard Encoder
User Manual

Table of Contents

Thank you for purchasing the
HAGSTROM ELECTRONICS, INC.
KEUSB24. 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 KEUSB24.

Introduction to the KEUSB24

Our KEUSB24 Keyboard Encoder is a product designed to interface Keypads, Switches, and/or other contact closures to the computer's USB port. Devices connected to the KEUSB24 I/O header produce keystrokes that appear to the PC as if they were entered from a standard USB keyboard.

The KEUSB24 is fully programmable by the user. This programmability feature allows the configuration of the I/O as well as the selection of the keystrokes that will be sent to the PC. The KEUSB24 stores the user's configuration program in non-volatile memory so that the information is retained on the unit even after power is turned off.

The KEUSB24 I/O

The 2 x 25 pin dual row header provides 24 I/O signals that can be programmed to scan any size matrix up to 12 Columns x 12 Rows. Any of the 24 I/O pins may be designated as either a Column or a Row. The KEUSB24 configures its scanning to the keypad, allowing the direct connection of many "off the shelf" keypads without any modified or complicated cabling.

Power Requirements

The KEUSB24 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 KEUSB24. The KEUSB24.EXE Program is for Windows based systems.

Hardware Requirements

The KEUSB24 is designed to work with standard, commercially available cables for connection to the PC. An A-B Type USB cable is required for this connection.

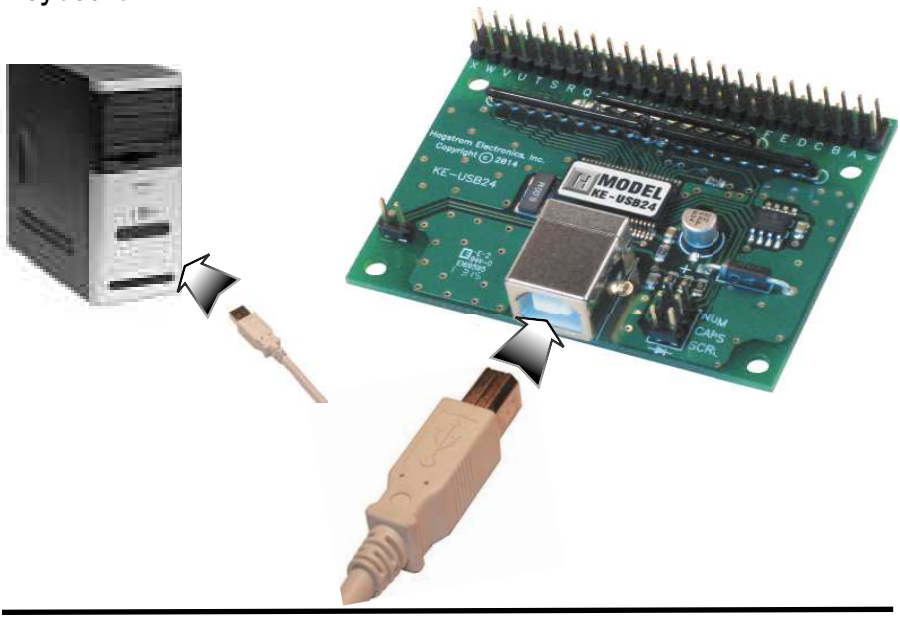
Default Settings

The KEUSB24 is programmed and shipped with a default 4x4 matrix configuration. This default configuration can be changed or modified at any time by the user.

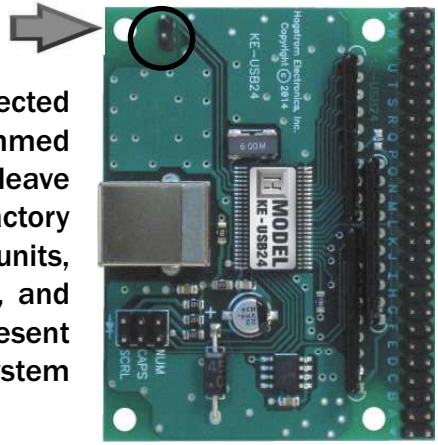
Computer Connection

There is one USB connector located on the KEUSB24. Connection to this port can be made with power on as the KEUSB24 supports "Hot Plug" operation as a USB device.

The KEUSB24 emulates a standard 104 key USB keyboard and may be used in addition to or in place of the system's own keyboard.



Device ID Jumper



Two KEUSB24 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 KEUSB24 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 KEUSB24 I/O Header

The 2 x 25 pin dual row header on the KEUSB24 consists of 24 I/O pins with a Logic Ground at one end. The I/O signals are labeled on the KEUSB24 as “A” through “X”. Each pin on the dual row header is connected in parallel with its adjacent pin. Therefore, each I/O signal is available on two different pins.

Use the supplied KEUSB24.EXE program to configure the I/O pins as either Rows or Columns. Keystrokes are initiated by shorting a Row pin to a Column pin through a contact closure. The pins that are defined as Columns will sink current while scanning the matrix. The Rows are used to read the status of the inputs when a Column is active.

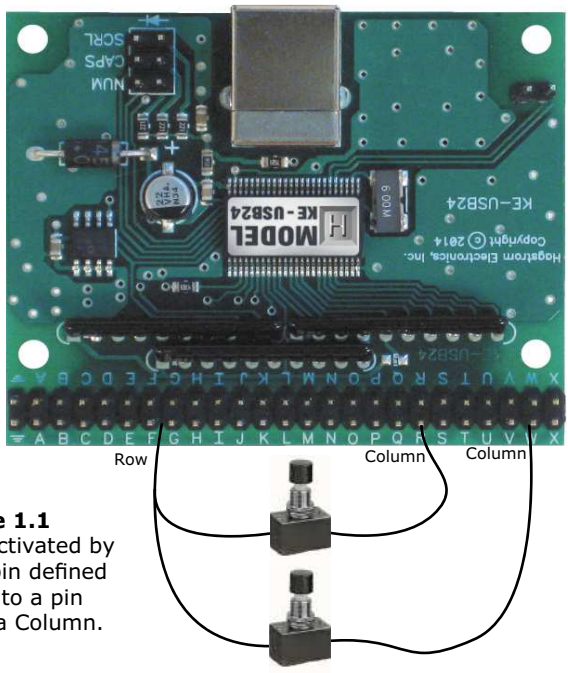
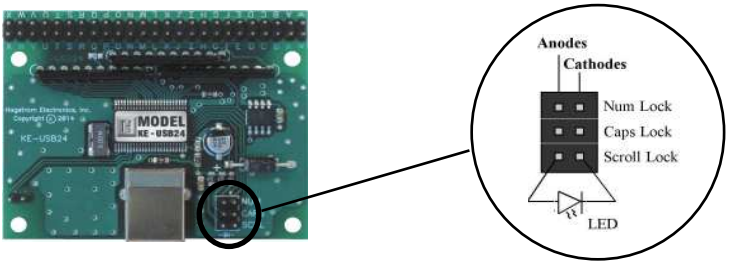


Figure 1.1
Inputs are activated by shorting a pin defined as a Row to a pin defined as a Column.

***Note:** The switch, keypad, or input device that is used must be capable of carrying at least 1mA of current. In addition to switches and keypads, other electronic circuits may also be used to generate keystrokes, provided that they do not exceed the 5 volt logic level range of the KEUSB24 I/O.*

Status LED Connections



The KEUSB24 features a 2 x 3 header for driving the three status LEDs for Num, Caps, and Scroll Lock. Connect LEDs as shown to use this drive capability. No external current limiting resistors are required as they are supplied on the board.

The KEUSB24.EXE Program

The KEUSB24 unit is shipped with a CD ROM containing the KEUSB24.EXE utility program which is used for configuring the unit. Configuration parameters include the defining of the I/O pins as Rows and Columns, the keystrokes generated by the contact closures, as well as other various options.

Getting Started

To begin using the KEUSB24, follow the steps listed below.

1. Attach the KEUSB24 to the computer as described on page 2 under the section "Computer Connections."

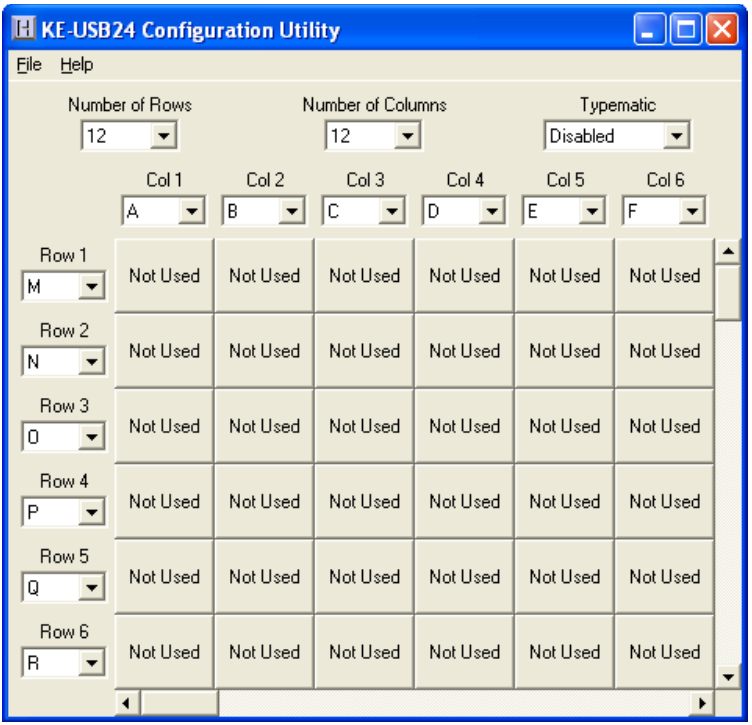
2. Insert the CD and save the content to its own folder on the hard drive. The CD may now be removed and stored in a safe location for future use.

3. Open the folder that was created in step 2 and start the configuration program by selecting the program file KEUSB24.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 back up purposes only.*

The Program Screen

The main program screen displays the configuration settings for the KEUSB24. A list of these settings and a description of how they pertain to the KEUSB24 setup are listed below.



Number of Rows: The number of Rows are selected from the drop down list. This may be any value from 1 to 23.

Number of Columns: The number of Columns are selected from the drop down list. This may be any value from 1 to 23.

***Note:** The number of Rows plus the number of Columns cannot exceed the total number of 24 I/O pins. For example, 5 Rows + 12 Columns = 17 I/O pins.*

Typematic: The typematic option controls the enable or disable of the KEUSB24 repeat function. Typically on a PC keyboard when a key is held down, it will begin to repeat after a short delay. This function can be duplicated by the devices connected to the KEUSB24 I/O header by enabling this option. Enabling this option will affect all keys within the matrix. The rate at which the key will repeat is the same as your PC keyboard settings on the PC. With this option disabled, the keystrokes being generated from the devices attached to the KEUSB24 will produce one keystroke per activation.

***Note:** The Typematic Enable/Disable option only applies to the devices connected to the KEUSB24 I/O header. It will not affect the repeat functions of the PC keyboard.*

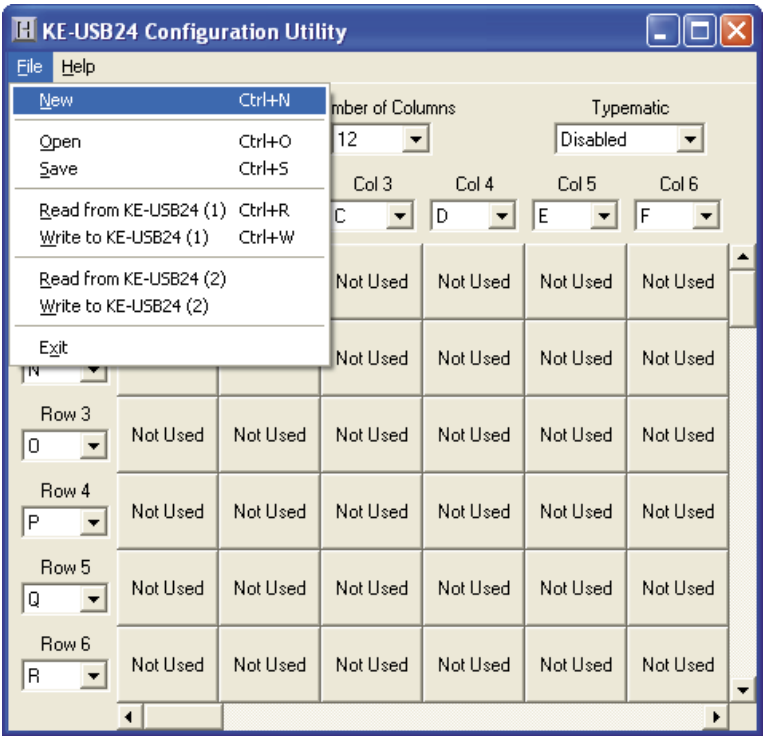
Column Pin Assignments: Column pin assignments are selected from their corresponding drop down list. Each column must have an I/O pin assigned to it. Specify any I/O pin "A" through "X" as a column.

Row Pin Assignments: Row pin assignments are selected from their corresponding drop down list. Each row must have an I/O pin assigned to it. Specify any I/O pin "A" through "X" as a row.

***Note:** A pin cannot be assigned to both a Column and a Row.*

File Menu Selections

These 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 KEUSB24. A list of these options along with descriptions of how they pertain to the KEUSB24 setup are listed below.



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 KEUSB24 (1): This option will read the current configuration in the KEUSB24 and display it on the screen. Click on "Read from KEUSB24" with the mouse or press Ctrl+R on the keyboard to perform this operation.

Write to KEUSB24 (1): This option will write the current configuration displayed on the screen to the KEUSB24. The KEUSB24 can be programmed and re-programmed as many times as necessary. Click on "Write to KEUSB24" with the mouse or press Ctrl+W on the keyboard to perform this operation. After the KEUSB24 has been loaded with the new configuration, it will scan according to this new setup.

Read from KEUSB24 (2): This option will read the current configuration from a unit configured as Device ID 2.

Write to KEUSB24 (2): This option will write the current configuration from a unit configured as Device ID 2.

Exit: This option exits and closes the KEUSB24.EXE program.

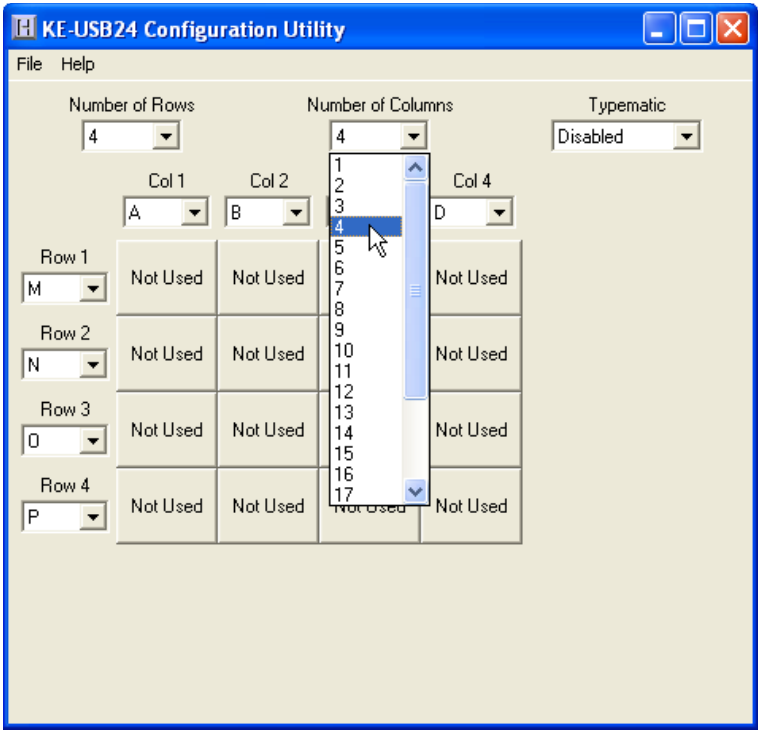
***Note:** Make sure that the KEUSB24 is connected to the PC before performing either the "Read to KEUSB24" or "Write to KEUSB24" operations. If the KEUSB24 is not present, a "The KEUSB24 was not Found" error will be displayed on the computer screen.*

Sample KEUSB24 Configuration

The following exercise demonstrates how to program the KEUSB24 to scan a keypad. The keypad in the example is a 4x4 matrix (16 key) device.

Step 1

Select the Number of Rows on the screen and set it to 4. Select the Number of Columns, and set that value to 4 as well. The screen should appear as shown below.



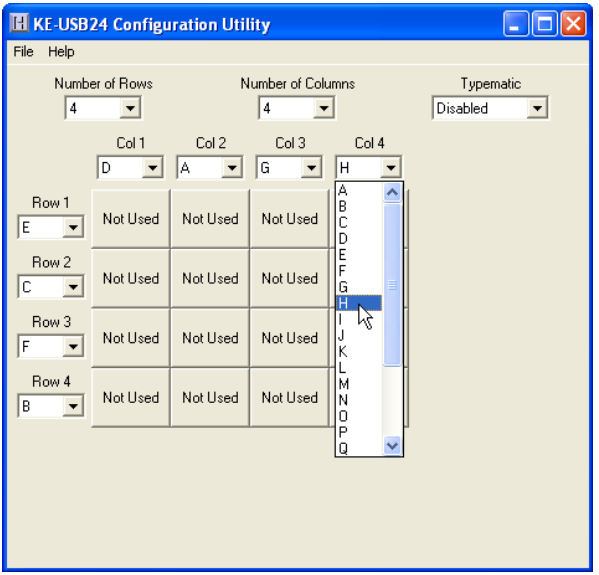
Step 2

Now that the size of the matrix to be scanned has been selected, the pins of the KEUSB24 I/O header to be used as rows and columns must be selected. The keypad example has 8 interface pins. The easiest way to plug the keypad in is to attach it 1:1 to the I/O header. For this example, the header pins "A" through "H" are used as the connection point.

***Note:** *Any 8 of the KEUSB24 pins could have been used for this example.*

Since the Columns and Rows for the example keypad are intermixed, the pin definitions for the Rows and Columns must be assigned. Highlight the Column pin designations, and assign them as follows:

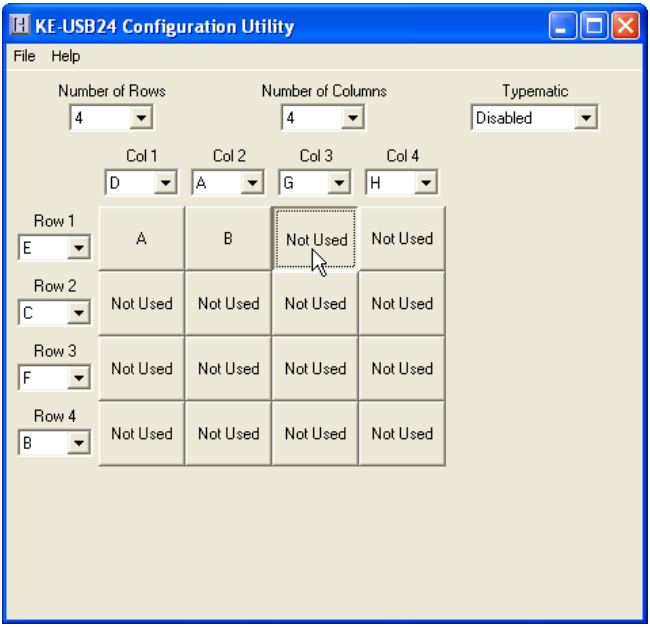
Col 1 = Pin D, Col 2 = Pin A, Col 3 = Pin G, Col 4 = Pin H



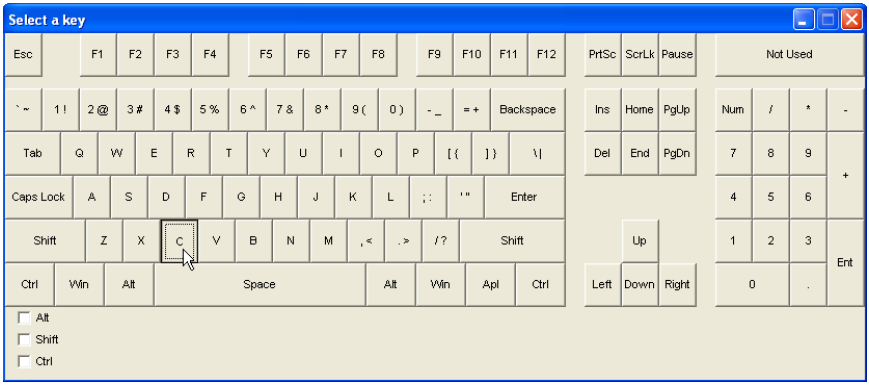
Select the Row Pin definitions next, and change them to:

Row 1 = Pin E, Row 2 = Pin C, Row 3 = Pin F, Row 4 = Pin B

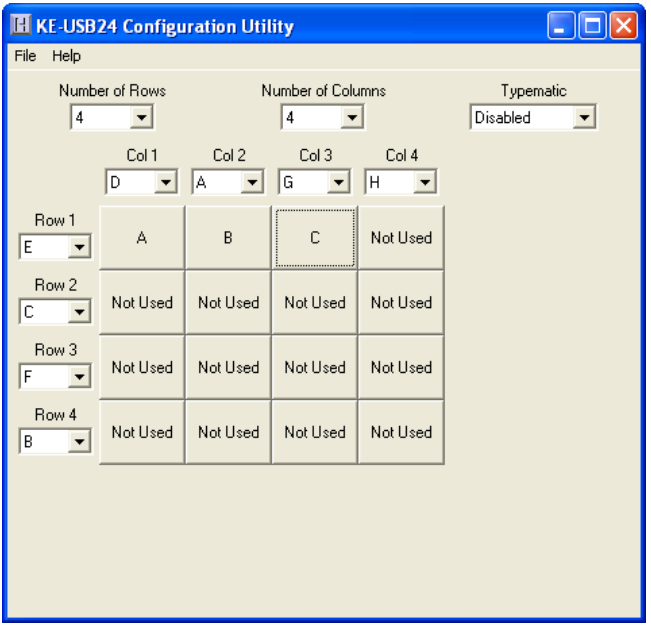
Step 3



With the size of the matrix now defined, and the I/O pins selected, assign the keys to be emulated to each position in the matrix. To assign keys, click on the desired matrix position. A diagram of the keyboard will be displayed, as shown below. Click on the representation of the key to assign it to the matrix position.



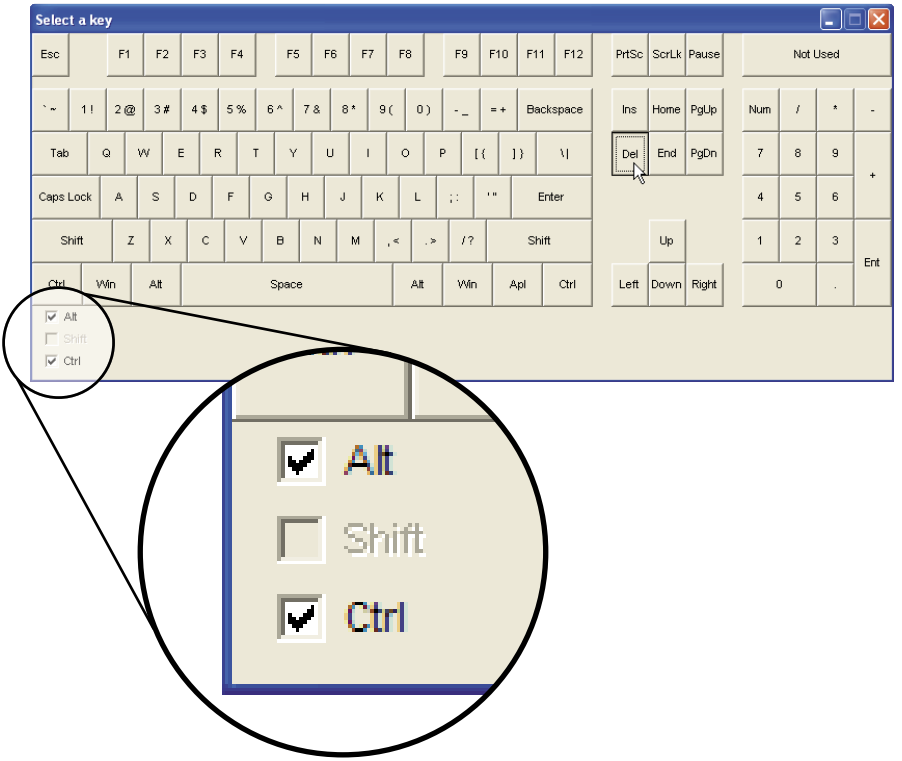
In the example illustrations, the user clicked matrix position Row 1, Col 3 and assigned the key “C” to it.



Continue selecting each position in the matrix and assign the desired keys from the keyboard diagram until the matrix is finished.

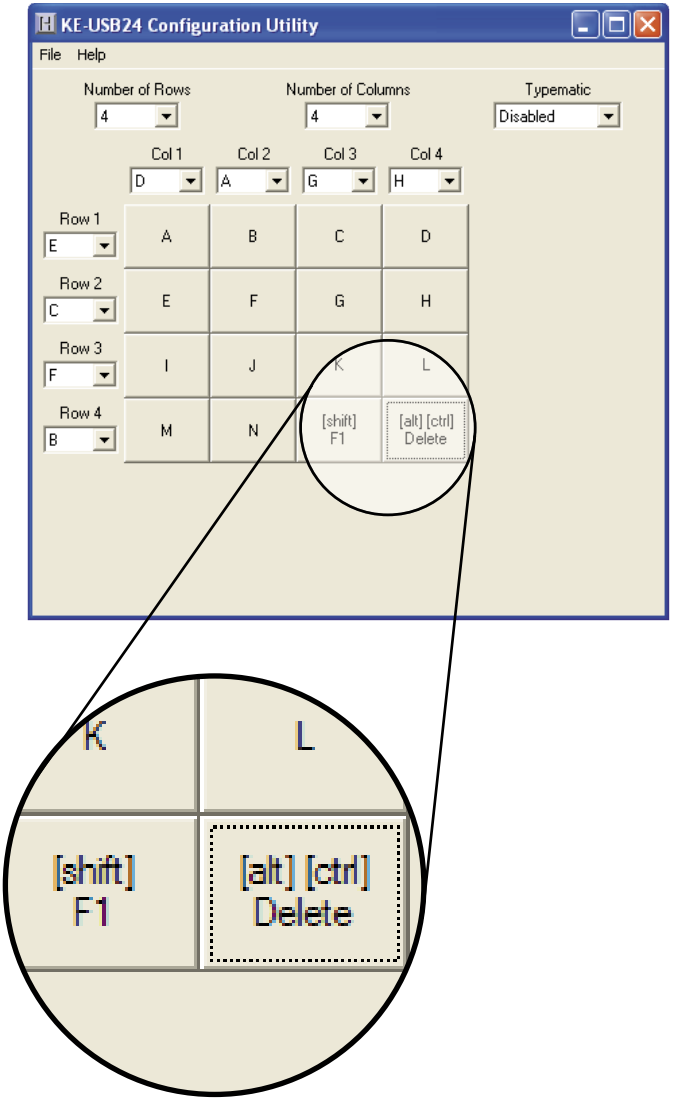
Step 4

The KEUSB24 has the capability to assign Shift, Ctrl, and Alt functions along with a keystroke. For this sample setup, one of the keys is 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 on the Del button (shown below).



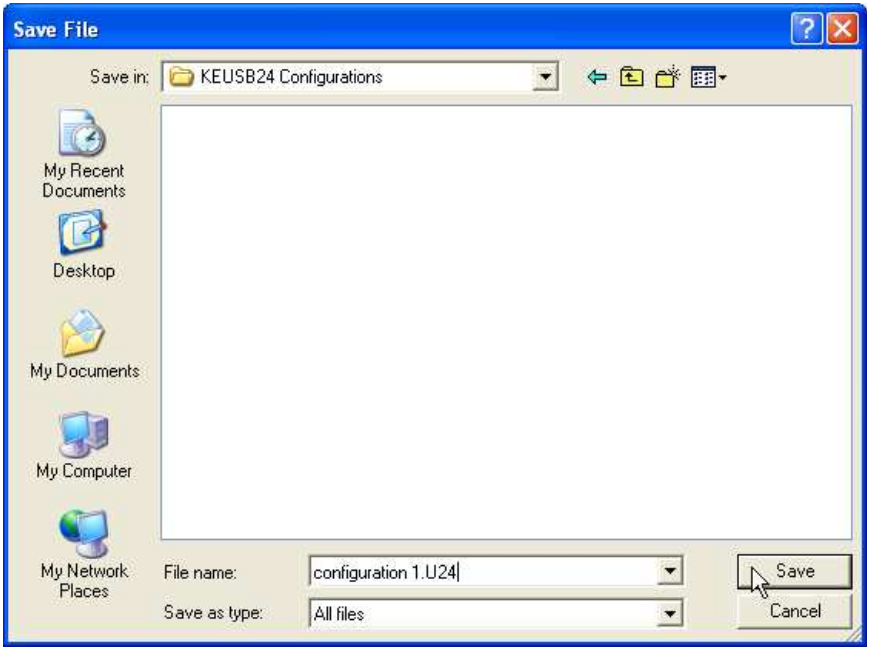
Any position in the KEUSB24 matrix can be modified by one or a combination of two of the Shift, Alt, or Ctrl keys using the method described above. Use the Shift function to generate upper case characters, or shifted characters (!, @, etc.) in the application. To remove one of these special functions, uncheck the appropriate box and click on the desired key.

The following diagram shows the completed setup created in this example. Note the presence of modifier keys in Row 4, Col 3 and Row 4, Col 4.



Step 5

Now that the setup is complete, it can be saved to disk. Specify a file name under which to save the configuration.



Step 6

Load the KEUSB24 with the configuration. Be sure that the KEUSB24 is connected to the PC. Once the KEUSB24 is loaded, it will begin running the new setup.

Error Messages

"The KEUSB24 was not found"

This error occurs if the computer cannot communicate with the KEUSB24 when trying to save to the KEUSB24 or read from the KEUSB24. Check the cable connections to make sure none of them are loose or unplugged. Check the Device ID jumper.

"Error while reading from the KEUSB24"
"Error while writing to the KEUSB24"

This indicates that, while the computer can communicate with the KEUSB24, 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 KEUSB24 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 KEUSB24, 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 KEUSB24.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 KEUSB24.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.

"Error: Pin * is used for multiple scan lines"

If a header pin is used to designate more than one row or column or is used for both a row and a column, this error will be displayed when saving the configuration to a file or to the KEUSB24. Check the matrix configuration and eliminate redudant pin letters. The error message will give the letter of the problematic pin (Example: "Error: Pin D is used for multiple scan lines").

KEUSB24 Operating Tips

Please check the following items before contacting us.

- When connecting the KEUSB24 to a PC use a standard USB A-B type Cable.

- Check the KEUSB24 configuration. Check the I/O configuration for the number of Columns, Rows, etc. Review the matrix table for the desired responses.

- The maximum recommended cable length from the computer to the KEUSB24 is 10 feet. This distance is also the maximum length that should be used on connections from the switches or keypads to the KEUSB24 I/O header.

- If using a Device ID jumper, only make changes to it when the power to the unit is off as it is sampled at power on or reset.

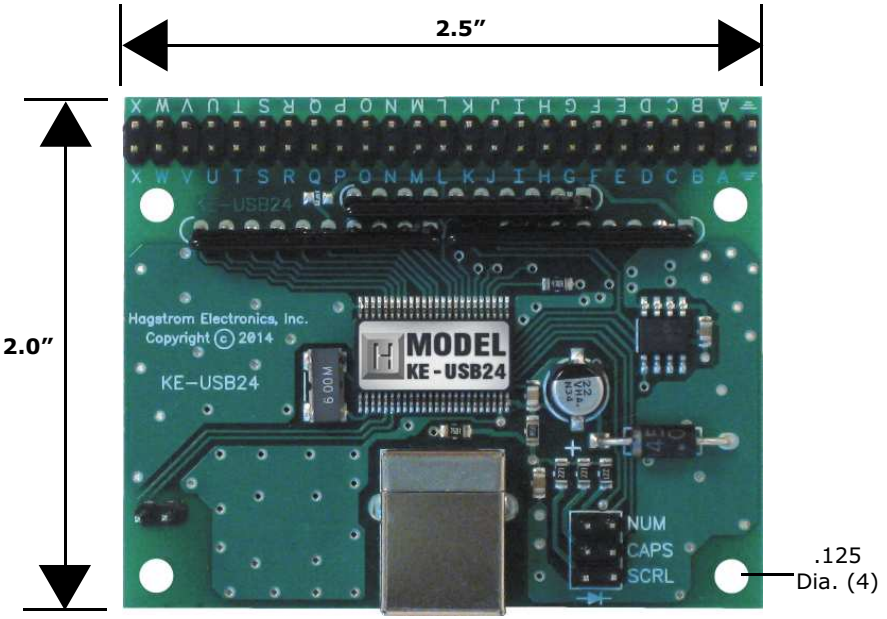
- While the KEUSB24 only scans a matrix, running a 1 x 23 matrix essentially provides 23 individual inputs without the inherent matrix issues.

***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***

Appendix A:
KEUSB24 Specifications

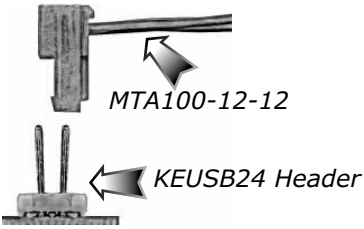


Operating Voltage	5 Volts DC +/- 5%
Operating Current	12 ma Typical
Operating Temp.	0 to 70 Degrees C
PC Interface	USB
Input Debounce Time	15 - 20 Msec Typical
I/O Header	24 I/O, up to 12x12 Matrix (programmable)

Appendix B:
Command Line Loader

The KEUSB24 can also be loaded through the command line by using the supplied KEUSB24LOAD.EXE program. Refer to readme.txt located under the Command Line Loader folder on the supplied CD ROM for further details.

Accessories



MTA100-12-12

MTA Harness to connect to the KEUSB24 header. Features a right angle connector that plugs directly to the I/O header, and provides 12 inches of discrete wire for each header pin.

KE-USBMM6

6 foot USB Type A to Type B connecting cable between KEUSB24 and PC.

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 KEUSB24 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 KEUSB24 product is designed to be used by technically oriented computer users. When the KEUSB24 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.

HAGSTROM
ELECTRONICS, INC.

Toll Free 888-690-9080
Phone: **(540) 465-4677** Fax: **(540) 465-4678**
Monday through Friday, 8:00 am to 5:00 pm (EST)

sales@hagstromelectronics.com
www.hagstromelectronics.com
1986 Junction Road, Strasburg, VA 22657

V. 07.16