



LP24

PC Keyboard Encoder User Manual

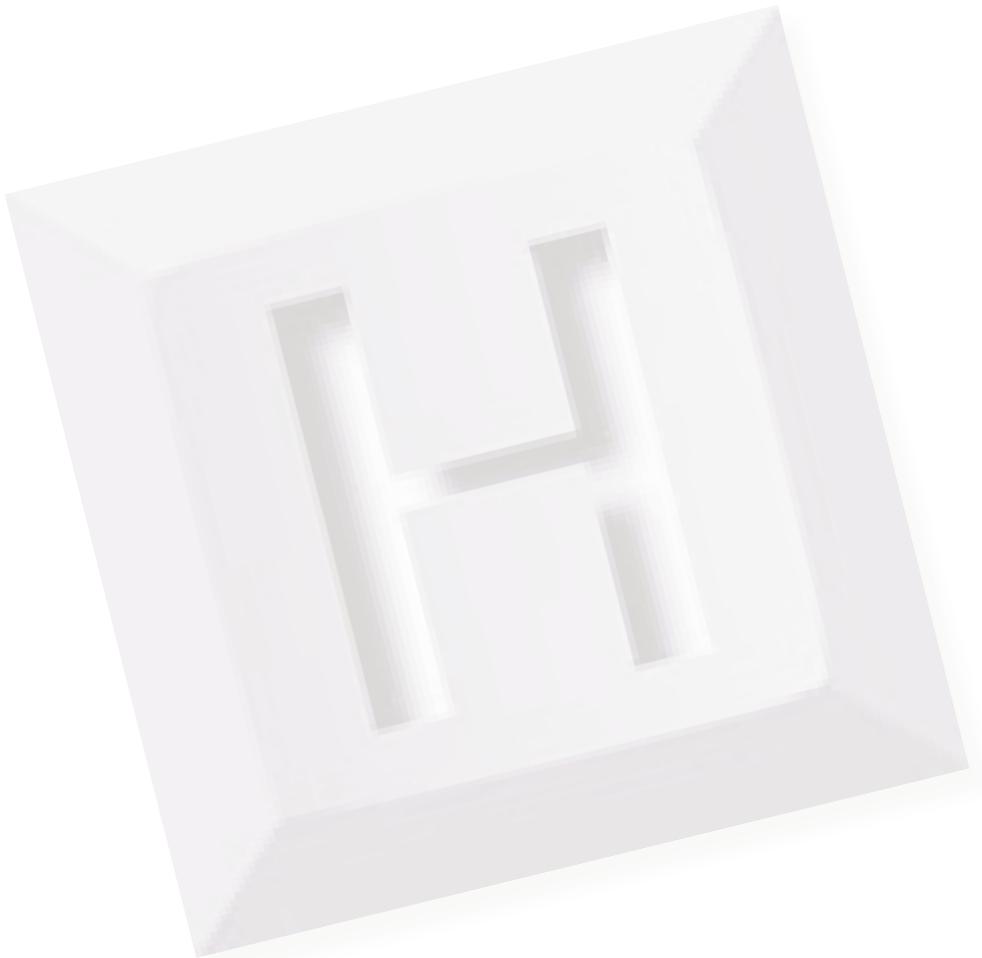


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Thank you for purchasing the
HAGSTROM ELECTRONICS, INC.
LP24. This product is configurable in a variety
of ways to meet your specific requirements.
Please take a few minutes to read this
manual before using your LP24.

Introduction to the LP24

Our LP24 Keyboard Encoder is a product designed to interface Keypads, Switches, and/or other contact closures to the computer's keyboard port. Devices connected to the LP24 I/O header produce keystrokes that appear to the PC as if they were entered from a standard keyboard.

The LP24 is designed to be 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 LP24 stores the user's configuration program in non-volatile memory so that the information is retained even after power is turned off.

The LP24 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 LP24 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 LP24 requires no external power source. It is powered directly from the keyboard port on the PC.

Supported Computers

All PC compatible computers with a PS/2 keyboard port will work with the LP24.

Hardware Requirements

The LP24 is designed to work with standard, commercially available cables for connection to the PC. A male/male PS/2 cable will be required for this connection.

Default Settings

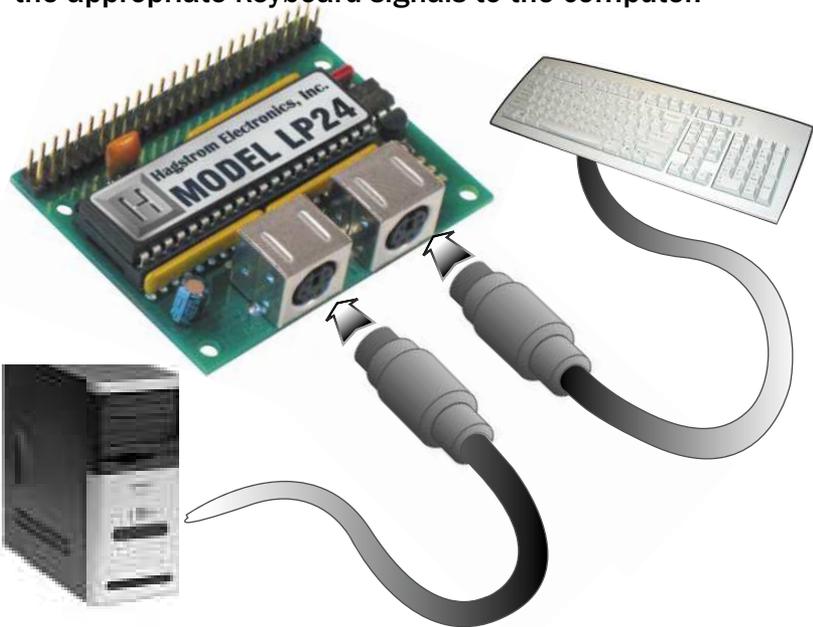
The LP24 is programmed and shipped with a default 4x4 matrix configuration. This default configuration can be changed or modified at any time by the user.

Computer and Keyboard Connections

There are two female PS/2 style keyboard connectors located on the LP24. Connection to these ports should always be done with the PC's power turned off.

The "To PC" port on the LP24 connects to the computer's keyboard input. Insert one end of a standard male/male PS/2 cable into the PC's keyboard input and the other end into the LP24 "To PC" connector.

The "KBD" port on the LP24 connects to an external keyboard. Simply plug the end of a standard PC keyboard into the LP24 "KBD" connector. This keyboard pass through feature allows for the use of an external keyboard with the LP24 unit. It is important to note that an external keyboard is not required for proper operation of the LP24 since the LP24 unit provides all the appropriate keyboard signals to the computer.



***Note:** In the event that the "To PC" and "KBD" connections are reversed when the computer is turned on, an error message may be displayed by the PC. To correct this situation, turn off the computer and connect the connections as described above.

Interfacing to the LP24 I/O Header

The 2 x 25 pin dual row header on the LP24 consists of 24 I/O pins with a Logic Ground at one end. The I/O signals are labeled on the LP24 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 LP24LOAD program to configure the I/O pins as either Rows or Columns. Keystrokes are sent to the PC, via the keyboard port, 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.

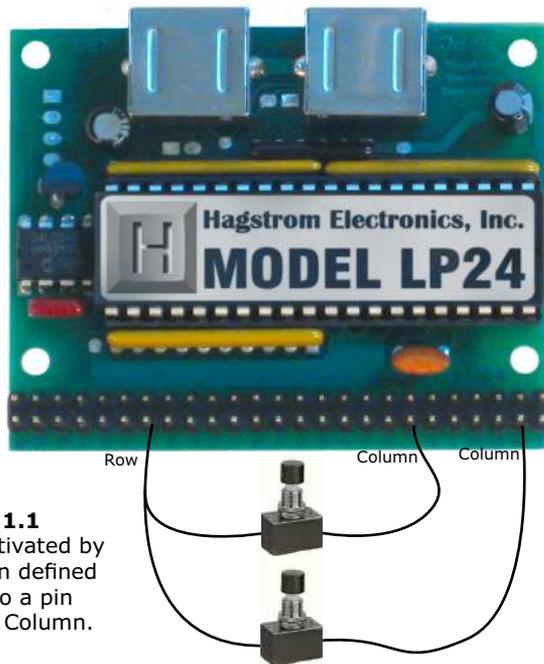


Figure 1.1
Inputs are activated by shorting a pin defined as a Row to a pin defined as a Column.

***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 LP24 I/O.

The LP24LOAD Program

The LP24 unit is shipped with a disk containing the LP24LOAD program which is used for configuring the unit. Configuration parameters include the defining of the I/O pins as Rows and Columns, which keystrokes are generated by the contact closures, as well as other various options.

Getting Started

To begin using the LP24, follow the steps listed below.

- 1.** With the PC's power turned off, attach the LP24 to the computer as described on page 2 under the section titled "Computer and Keyboard Connections."
- 2.** Power up the PC.
- 3.** Insert the disk and save the content to its own folder on the hard drive. The disk may now be removed and stored in a safe location for future use.
- 4.** Open the folder that was created in step 3 and start the configuration program by selecting the LP24LOAD.EXE file. This will display the program screen.

***Note:** *It is recommended that the program be copied to and run from its own folder on the PC's hard drive. The disk itself should be reserved for back up purposes.*

The Program Screen

The main program screen displays the configuration settings for the LP24. A list of these settings and a description of how they pertain to the LP24 setup are listed below.

The screenshot shows the 'LP24 Configuration Utility' window. It features a menu bar with 'File' and 'Help'. The main area contains several configuration options:

- Number of Rows:** A dropdown menu set to '12'.
- Number of Columns:** A dropdown menu set to '12'.
- Typematic:** A dropdown menu set to 'Disabled'.
- Column Headers:** Six dropdown menus labeled 'Col 1' through 'Col 6', with values 'A', 'B', 'C', 'D', 'E', and 'F' respectively.
- Row Headers:** Six dropdown menus labeled 'Row 1' through 'Row 6', with values 'M', 'N', 'O', 'P', 'Q', and 'R' respectively.
- Grid:** A 6x6 grid of cells. Each cell contains the text 'Not Used'.

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 LP24 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 LP24 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 LP24 will not be repeated.

***Note:** *The Typematic Enable/Disable option only applies to the devices connected to the LP24 I/O header. It will not affect the repeat functions of the PC keyboard.*

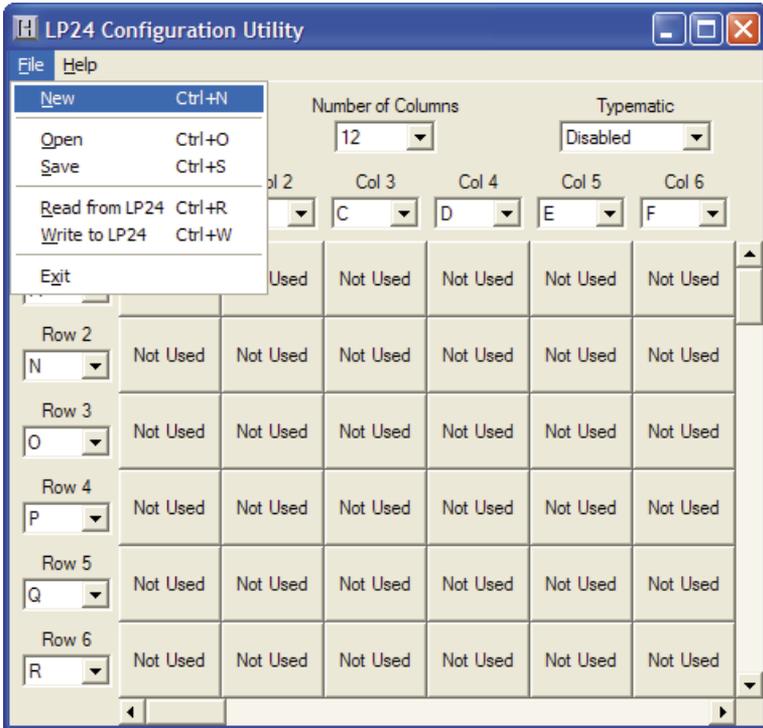
Column Pin Assignments: Column pin assignments are selected from their corresponding drop down list. Each column must have an I/O pin assigned to it. Specify any I/O pin “A” through “X” as a column.

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 hand 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 LP24. A list of these options along with descriptions of how they pertain to the LP24 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 LP24: This option will read the current configuration in the LP24 and display it on the screen. Click on “Read from LP24” with the mouse or press Ctrl+R on the keyboard to perform this operation.

Write to LP24: This option will write the current configuration displayed on the screen to the LP24. The LP24 can be programmed and re-programmed as many times as necessary. Click on “Write to LP24” with the mouse or press Ctrl+W on the keyboard to perform this operation. After the LP24 has been loaded with the new configuration, it will scan according to this new setup.

Exit: This option exits and closes the LP24LOAD program.

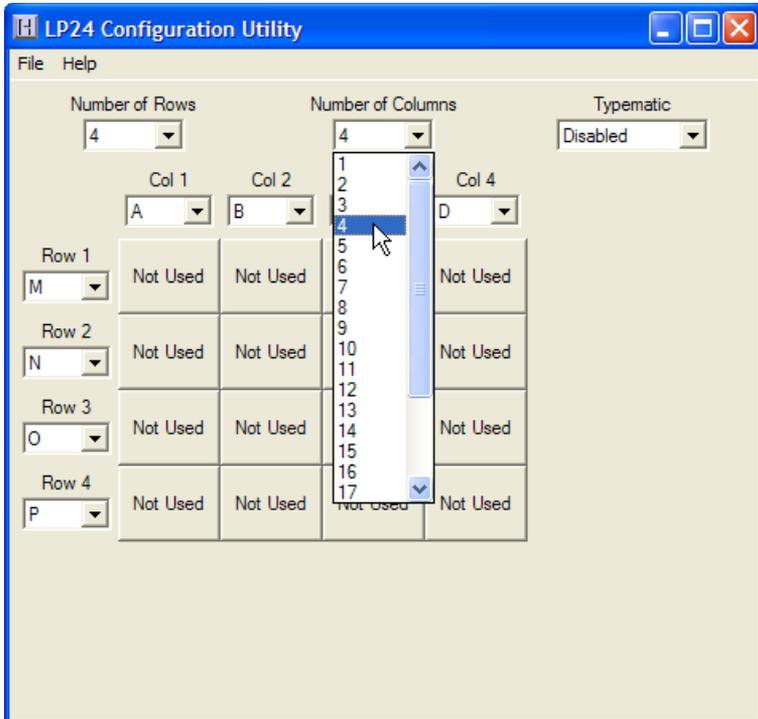
***Note:** *Make sure that the LP24 is connected to the PC before performing either the “Read to LP24” or “Write to LP24” operations. If the LP24 is not present, a “The LP24 was not Found” error will be displayed on the computer screen.*

Sample LP24 Configuration

The following exercise demonstrates how to program the LP24 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.



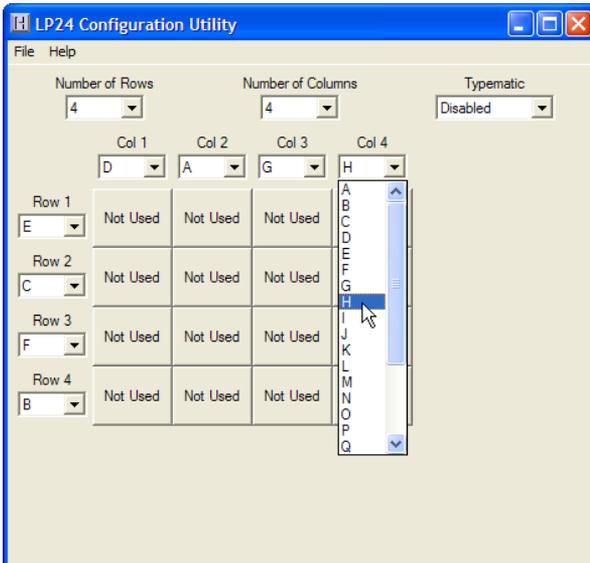
Step 2

Now that the size of the matrix to be scanned has been selected, the pins of the LP24 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 LP24 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:

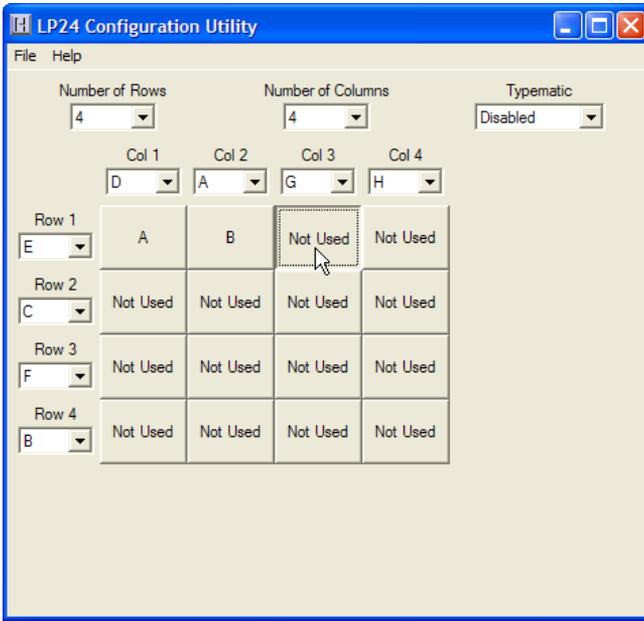
Col 1 = Pin D, Col 2 = Pin A, Col 3 = Pin G, Col 4 = Pin H



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

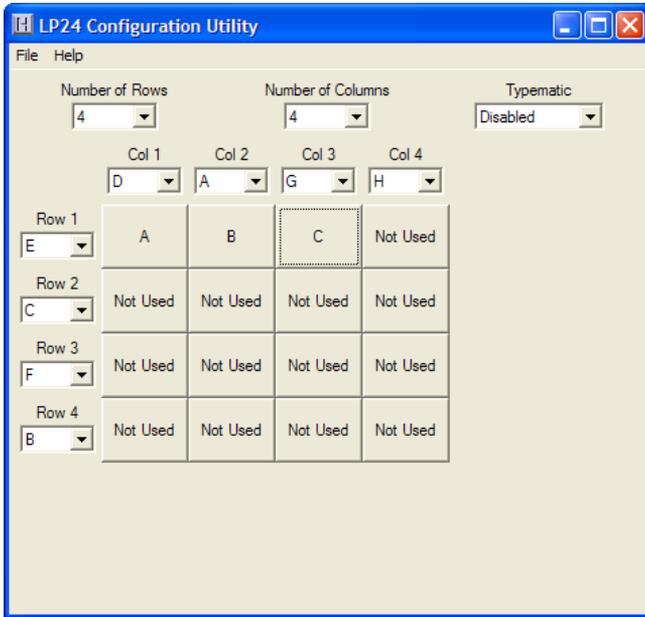
Step 3



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.



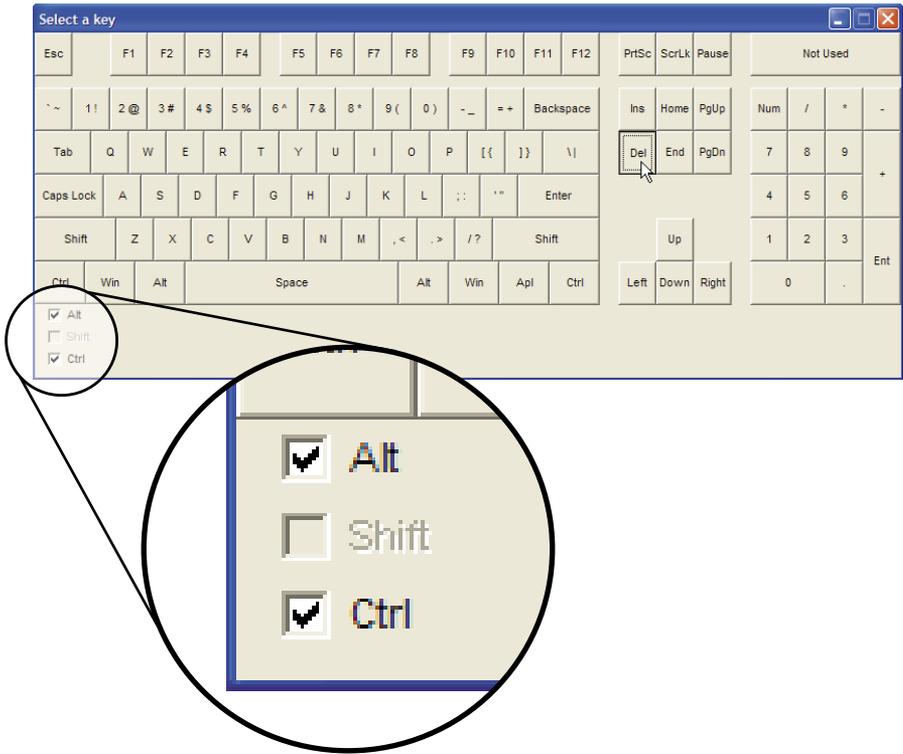
In the example illustrations, the user clicked matrix position Row 1, Col 3 and assigned the key “C” to it.



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

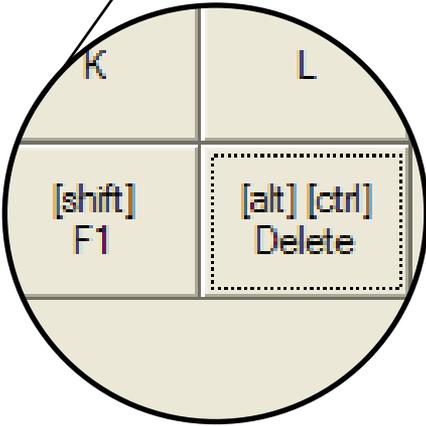
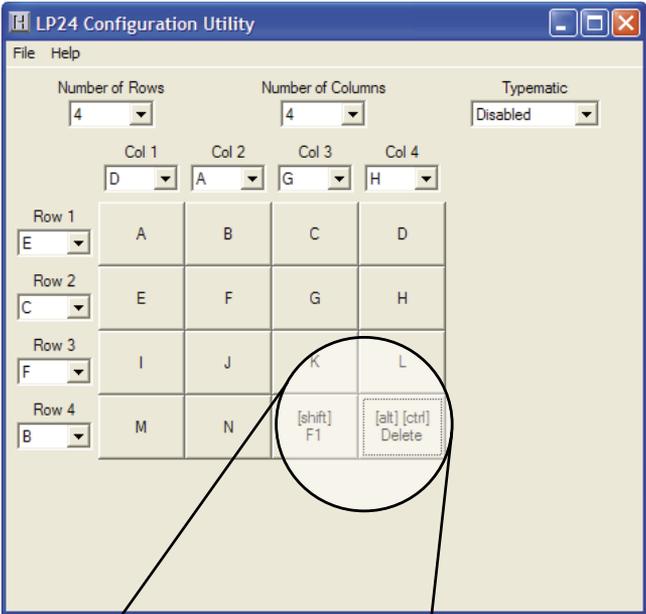
Step 4

The LP24 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 press the Del button (shown below).



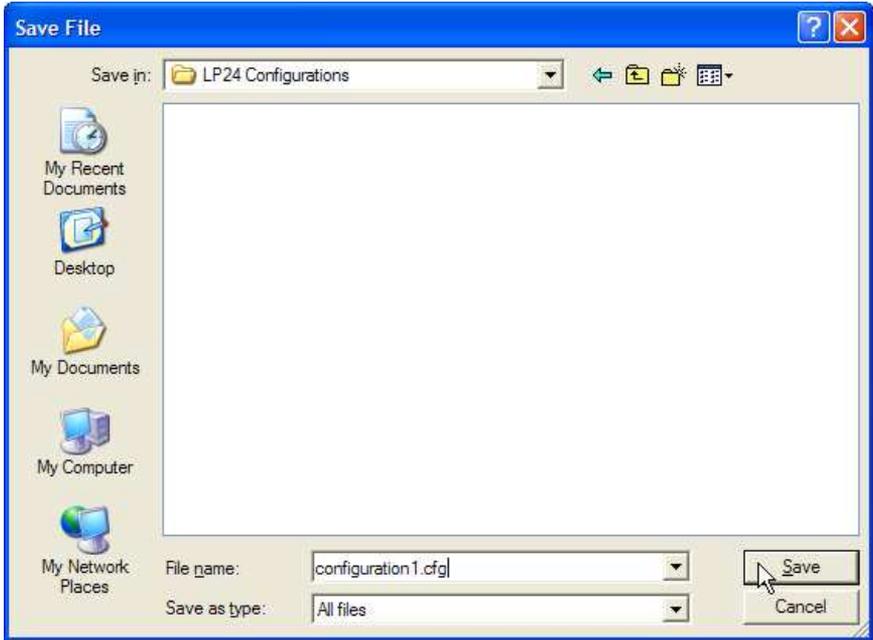
Any position in the LP24 matrix can be modified by one or a combination of two of the Shift, Alt, or Ctrl keys using the method described above. Use the Shift function to generate upper case characters, or shifted characters (!, @, etc.) in the application. To remove one of these special functions, uncheck 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 LP24 with the configuration. Be sure that the LP24 is connected to the PC. Once the LP24 is loaded, it will begin running the new setup.



Error Messages

“The LP24 was not found”

This error occurs if the computer cannot communicate with the LP24 when trying to save to the LP24 or read from the LP24. Check the cable connections to make sure none of them are loose or unplugged.

“Error while reading to the LP24”

“Error while writing to the LP24”

This indicates that, while the computer can communicate with the LP24, 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 LP24 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 LP24, 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 LP24LOAD 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 LP24LOAD 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 LP24. Check the matrix configuration and eliminate redundant pin letters. The error message will give the letter of the problematic pin (Example: “Error: Pin D is used for multiple scan lines”).



LP24 Operating Tips

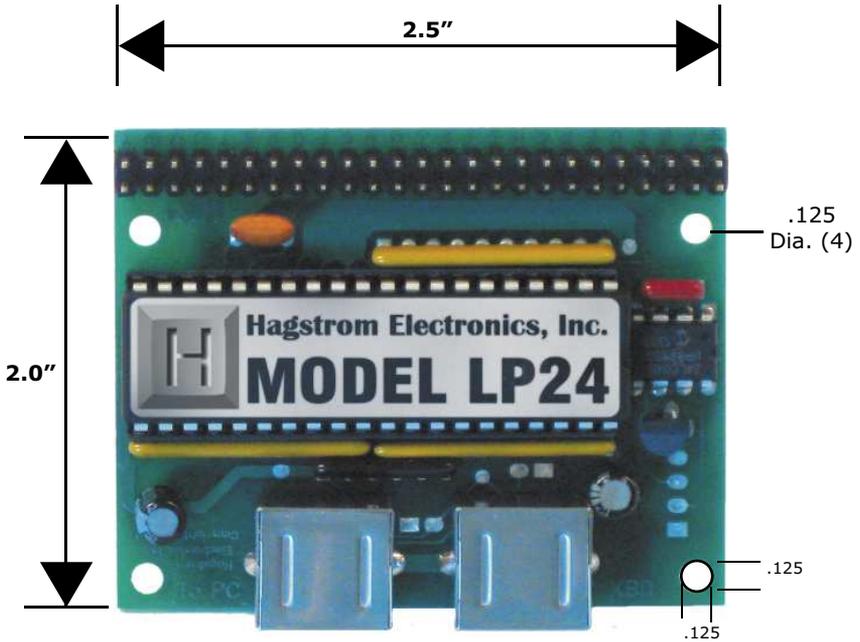
Please check the following items before contacting us.

- When connecting the LP24 to a PC and keyboard, make sure that they are attached to the proper ports. The connector marked “To PC” on the LP24 must be connected to the PS/2 keyboard input on the PC. Attach the computer keyboard to the LP24 connector marked “KBD.” The LP24 will not function properly if these connections are reversed.
- Check the LP24 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 LP24 is 10 feet. This distance is also the maximum length that should be used on connections from the switches or keypads to the LP24 I/O header.

***Note:** For any questions that are not answered in this manual, please send us an email.

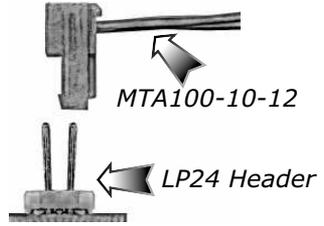
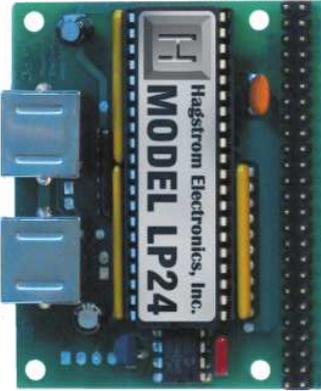
customer service email: sales@hagstromelectronics.com

Appendix A: LP24 Specifications



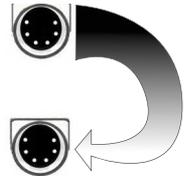
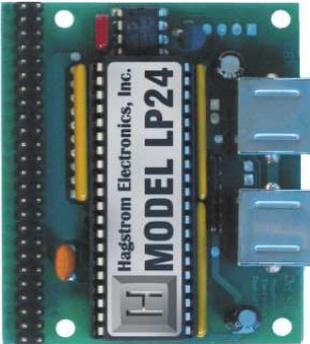
Operating Voltage	5 Volts DC +/- 5%
Operating Current	12 ma Typical
Operating Temp.	0 to 70 Degrees C
PC Interface	AT/PS/2 Compatible (6 pin miniDIN or 5 pin DIN)
Keyboard Interface	AT/PS/2 Keyboard (6 pin miniDIN or 5 pin DIN)
I/O Header	24 I/O, up to 12x12 Matrix (programmable)

Accessories



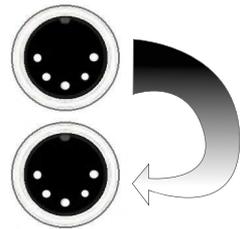
MTA100-12-12

MTA Harness to connect to the LP24 header. Features a right angle connector that plugs directly to the LP24 header, and provides 12 inches of discrete wire for each header pin.



KE-MM6-mini

6 foot 6 pin miniDIN male/male connecting cable between encoder and PC keyboard input. (For 6 pin miniDIN versions.)



KE-MM6

6 foot 5 pin DIN male/male connecting cable between encoder and PC keyboard input. (For 5 pin DIN versions.)

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 LP24 to ensure its performance. If you have any questions, please send us an email.

customer service email: [*sales@hagstromelectronics.com*](mailto:sales@hagstromelectronics.com)

NOTICE The LP24 product is designed to be used by technically oriented computer users. When the LP24 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.



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