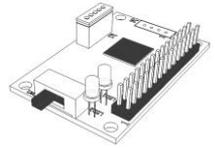




# $\pi$ 3 Matrix Encoder Board Product Manual



- ❑ Model XK-0988-UNM128-R
- ❑ 128 Switch Points
- ❑ Designed, Sold, and Supported in USA
- ❑ From P.I Engineering, *The No Slogan Company*
- ❑ [www.xkeys.com](http://www.xkeys.com)

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The X-keys®  $\pi$ 3 Matrix Encoder Board uses the same electronic design as our X-keys Programmable Keyboards and Foot Pedals. X-keys devices work in cooperation with a standard keyboard. Each of the 128 switch points can be programmed with multiple keystrokes, combinations, mouse functions, game controller (joystick) actions and more. Programming is easily accomplished via our included X-keys MacroWorks 3 software for Windows (XP, Vista, or 7) and programmers can use one of our SDKs for Windows or Linux to read data directly from the X-keys.

## Box Contents

This package contains:

- 1- X-keys  $\pi$ 3 Matrix Encoder Board with USB Cable
- 1- Product Manual (this document)

## Quick Start for Windows

1. Run the MacroWorks 3 (MW3) installation program from the enclosed disc.
2. Plug in the X-keys  $\pi$ 3 Matrix Encoder Board and wait for Windows to recognize it.
3. MW3 will display an icon in your Windows Taskbar. Click on the icon and select the  $\pi$ 3 Matrix Board.
4. Press any switch connected to the  $\pi$ 3 Matrix Board (or double-click on the cell in the image) to begin recording a macro.
5. Type keystrokes or select text, shortcut, or function. Multiple lines of keystrokes, text, shortcuts, and functions may be entered on a single switch.
6. Press the switch again (or click Save) to complete programming.
7. When finished, close the programming window.

To quickly learn how to use MW3 watch the brief tutorials on the disc or on our website. Consult the MW3 help file for complete instructions and tips on programming and using your X-keys.

## Developers

P.I. Engineering offers a free Software Development Kit with code samples in C#, C++ and .NET. Please visit the Developers section on our website: [xkeys.com/PISupport/Developer.php](http://xkeys.com/PISupport/Developer.php).

## Support

Should you encounter difficulty with the installation or programming, please check the troubleshooting guide on our web site ([www.xkeys.com](http://www.xkeys.com)). Alternatively, you may contact our technical support department.

USA: [tech@xkeys.com](mailto:tech@xkeys.com) | Phone: 1-517-655-5523

UK: [support@x-keys-uk.com](mailto:support@x-keys-uk.com) | Tel + 44 (0)1869 338428

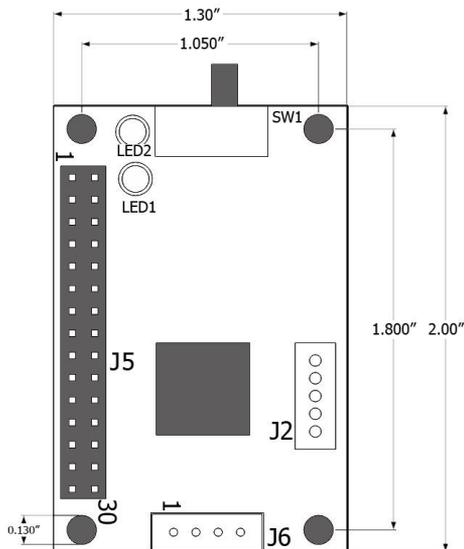
## Compatibility

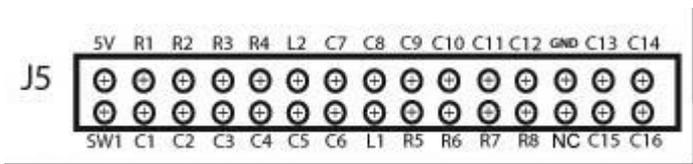
X-keys USB devices require MacroWorks 3 for Windows XP, Vista, or 7. The X-keys  $\pi$ 3 Matrix Board also has a “Hardware Mode Feature” which gives it the ability to mimic a USB keyboard, mouse, or game controller (joystick) on any USB enabled operating system (including Linux). Learn more about Hardware Mode on our web site or contact our Technical Support Department ([tech@xkeys.com](mailto:tech@xkeys.com)).

## Connection

Connection to the computer is accomplished via standard USB plug (included). Connection for switches is a 30 pin header which will accept a double row, .100" (2.5mm) Female Header Receptacle (not included) commonly available from electronics connector suppliers.

Alternatively, up to three switches may be wired directly to the Encoder Board using existing holes (see J6 below).





## Header Wiring

Pin	Label	Use
1	SW1	Parallel switch closure
2	C1	Column 1 of the matrix
3	C2	Column 2 of the matrix
4	C3	Column 3 of the matrix
5	C4	Column 4 of the matrix
6	C5	Column 5 of the matrix
7	C6	Column 6 of the matrix
8	L1	+ Side of LED 1 (green)
9	R5	Row 5 of the matrix
10	R6	Row 6 of the matrix
11	R7	Row 7 of the matrix
12	R8	Row 8 of the matrix
13	NC	No Connection
14	C15	Column 15 of the matrix
15	C16	Column 16 of the matrix
16	5V	+5 Volt source (from USB connection)
17	R1	Row 1 of the matrix
18	R2	Row 2 of the matrix
19	R3	Row 3 of the matrix
20	R4	Row 4 of the matrix
21	L2	+ Side of LED 2 (red)
22	C7	Column 7 of the matrix
23	C8	Column 8 of the matrix
24	C9	Column 9 of the matrix
25	C10	Column 10 of the matrix
26	C11	Column 11 of the matrix
27	C12	Column 12 of the matrix
28	GND	Ground
29	C13	Column 13 of the matrix
30	C14	Column 14 of the matrix

## J2: USB Connection

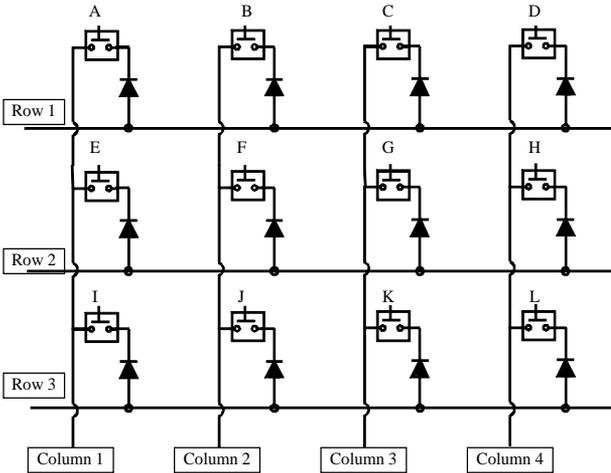
Included for reference. The USB Cable is already connected to J2

### J2 Wiring

Pin	Use
1	VBus
2	USB -1
3	USB +1
4	Ground
5	Shield

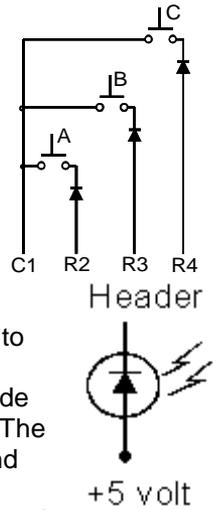
## Connecting the Switches

The 128 switch points in the matrix are connected by wiring one side of eight switches to one of the 16 column pins. The other side of each switch is then wired, through a diode, to one of the 8 rows and the wiring is repeated for each of the 16 columns (see diagram below). Using standard signal diodes (1N4148 or equivalent) will isolate each switch so no phantom keys will appear if more than 3 keys are pressed.



## J6 Connection for Three or Less Switches

J6 is available for smaller applications (we use this for our X-keys Foot Pedal). The 4 holes in area J6 are labeled C1 R2 R3 R4 (Column 1, Row 2, Row 3, Row 4) and correspond to the pins with the same designation on the 30-pin header (see diagram on right).



## The LEDs

The two LEDs mounted next to the programming switch indicate the active layer on the Matrix Board. If you choose to make second layer features available to the end user, we recommend making these LEDs visible. Pins 8 and 25 provide a means of connecting indicator LEDs through the header. The other end of the LEDs must be connected to a 5V source and pins 13 and 30 may be used for this purpose. When connecting LEDs to these pins, the LEDs on the Encoder Board should be disconnected.

## SW1

The switch can be used to open the programming interface in our MacroWorks 3 or for other purposes by SDK users.

## π3 Features

Our new π3 firmware offers many new features to the user and developer.

- ❑ Hardware programming in Windows 7
- ❑ Joystick (Game controller) emulation
- ❑ Mouse emulation
- ❑ Reflector feature
- ❑ Combined software, hardware, and reflector messaging
- ❑ Dongle feature

Consult our help files or contact us for more information on these features.

## Compatible Accessories

Please visit the Accessories page on our website for details on the following.

- ❑ X-keys USB Extender – run up to 150 feet via CAT 5 cable
- ❑ Cherry MX Switches – durable mechanical momentary switches
- ❑ Single Key Caps (various colors) – for Cherry MX Switches
- ❑ Low Profile Tact Switches - the switch we use in our Stick
- ❑ Diode pack – for key isolation to prevent ghosting

## Specifications

<b>Unit Specifications</b>	
<b>Connector Type</b>	USB "A" plug
<b>Input Connector</b>	0.1" double row, 30 pin female header receptacle (not included)
<b>Number of Inputs</b>	128 possible matrix points (switches)
<b>Dimensions</b>	2" x 1.3" x 0.58", (50.8mm x 33mm x 15mm)
<b>Weight</b>	2.56 oz. (73 grams)
<b>Cord Length</b>	8' (2.44 m)
<b>Power Consumption</b>	Low power USB device, less than 15 ma @ 5 vdc
<b>Power Source</b>	USB port power, nominal voltage = 5 vdc
<b>Certification</b>	FCC Class B, CE
<b>Software Mode Features</b>	
<b>Operating System</b>	Windows XP, Vista, 7
<b>Included Software</b>	MacroWorks 3 (Windows), ControllerMate (Mac OS X)
<b>Available Software</b>	Windows and Linux SDKs (free download)
<b>Layers</b>	MW3 supports multiple layers including application specific programming.
<b>Hardware Mode Features</b>	
<b>Hardware System</b>	Any architecture supporting USB, including Sun, SGI, and HP workstations
<b>Operating System</b>	Programming requires MacroWorks 3 for Windows XP, Vista or 7. Operates on any OS supporting USB including Unix, Sun and Mac OS-X
<b>Memory Capacity</b>	Each matrix point is allocated 3 characters and a pool of 560 additional keystrokes is available to any switches requiring additional characters
<b>Memory Type</b>	EEPROM, non volatile memory (X-keys retains memory for over 200 years)
<b>Layers</b>	2 layers – user selectable toggle and/or shift function
<i>Specifications subject to change without notice</i>	

## Other Products from P.I. Engineering

Please visit our website for a complete listing of our current products. This is only a partial listing of our innovative computer input devices.

- ❑ X-keys USB 3 or 12 Switch Interface
- ❑ X-keys XK-24 – 24 keys with backlighting
- ❑ X-keys XK-60 – 60 keys with backlighting
- ❑ X-keys XK-80 – 80 keys with backlighting
- ❑ X-keys XKE-128 – 128 keys with backlighting
- ❑ X-keys Foot Pedals – front or rear hinged
- ❑ X-keys Sticks – 4, 8, or 16 keys
- ❑ X-keys XK-12 Joystick – 12 keys and an integrated joystick
- ❑ X-keys XK-12 Jog & Shuttle – 12 keys with Jog & Shuttle
- ❑ X-keys XK-68 Joystick – 68 keys and an integrated joystick
- ❑ X-keys XK-68 Jog & Shuttle – 68 keys with Jog & Shuttle
- ❑ Y-mouse PS/2 to USB Adapter
- ❑ Y-key key – PS/2 Dual Keyboard Adapter
- ❑ Y-mouse – PS/2 Dual Mouse Adapter
- ❑ RailDriver Desktop Train Cab Controller ([raildriver.com](http://raildriver.com))

## FCC Declaration of Conformity

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:**

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

**Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.**



## Contact Us

<p><b>USA Sales</b>  sales@piengineering.com  Phone: 1-517-655-5523  www.xkeys.com</p>	<p><b>USA Technical Support</b>  tech@piengineering.com  Phone: 1- 517-655-5523  www.xkeys.com/support.php</p>	<p><b>USA Shipping Address</b>  P.I. Engineering  101 Innovation Parkway  Williamston, MI 48895-1663</p>
<p><b>UK Sales</b>  sales@x-keys-uk.com  Tel + 44 (0)1869 338428  www-x-keys-uk.com</p>	<p><b>UK Technical Support</b>  www.x-keys-uk.com  support@x-keys-uk.com  Tel + 44 (0)1869 338428</p>	<p><b>UK Shipping Address</b>  Contact Sales  Manor Farmhouse Clifton  Banbury OX15 0PA</p>

## Limited Warranty

For all X-keys products purchased and installed in the United States and Canada, P.I. Engineering warrants that the X-keys product will be free from defects in materials and workmanship under normal use and service, and will meet the specifications presented by P.I. Engineering at the time of original purchase, for one year as evidenced by a copy of the purchase receipt. Under this warranty, P.I. Engineering will, at its sole option, repair or replace any X-keys product which is defective, provided that you are responsible for (i) the cost of transportation of the product to P.I. Engineering or its designated service facility, and (ii) any loss or damage to the product resulting from such transportation.

Upon discovery of a defect in the product within the Warranty Period, you should notify P.I. Engineering Technical Support via telephone to obtain an RMA (return authorization number) and instructions for shipping the product to a service location designated by P.I. Engineering. You should send the product, shipping charges prepaid, to the designated location, accompanied by the return authorization number, your name, address, and telephone number, proof of purchase, and a description of the defect. P.I. Engineering will pay for return of product(s) to the customer.

P.I. Engineering shall have no responsibility to repair or replace the X-keys product if the failure has resulted from accident, abuse, mutilation, misuse, or repair/modification performed by any entity other than P.I. Engineering.

THIS WARRANTY IS EXCLUSIVE OF ALL OTHER WARRANTIES, WHETHER EXPRESSED, IMPLIED, OR STATUTORY. P.I. ENGINEERING DOES NOT WARRANT THIS **X-keys** PRODUCT FOR FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY. P.I. ENGINEERING AND ITS EMPLOYEES SHALL NOT BE HELD LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, OR INCIDENTAL DAMAGES, EVEN IF ADVISED OF THEIR POSSIBILITY, ARISING OUT OF THE USE OR INABILITY TO USE THIS PRODUCT. SOME STATES DO NOT ALLOW FOR THE EXCLUSION OR LIMITATION OF CERTAIN LIABILITIES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER LEGAL RIGHTS WHICH VARY FROM STATE TO STATE.

In the event that the above limitations are held unenforceable, P.I. Engineering's liability for any damages to you or to any party shall not exceed the purchase price you paid, regardless of the form of any claim.

This limited warranty is valid for and only applies to products purchased and used inside the United States (and its territories) and Canada.

This limited warranty is governed by the laws of the United States of America and the state of Michigan.

X-keys Electronic design: P.I. Engineering, Inc., Williamston, Michigan  
Patent # 4964075

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**www.pieengineering.com** ■ **www.xkeys.com**  
**www.ymouse.com** ■ **www.raildriver.com**



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