

# GammaRay USB Module



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## Table of Contents

<b>Table of Contents</b> .....	<b>2</b>
<b>GammaRay-64 USB Module</b> .....	<b>3</b>
<b>GammaRay-256 USB Module</b> .....	<b>4</b>
<b>Main Features</b> .....	<b>5</b>
<b>Introduction</b> .....	<b>6</b>
<b>GammaRay-64 Pin-Out</b> .....	<b>7</b>
<b>GammaRay-256 Pin-Out</b> .....	<b>8</b>
<b>Connecting Various Switches</b> .....	<b>10</b>
SPST Toggle Switches (On-Off) .....	10
SPDT Switches (On-On) .....	10
Rocker Switches (On-Off-On).....	10
Push Button Switches.....	11
Knitter Rotary Switches .....	11
Mechanical / Optical Rotary Encoders .....	11
<b>Hardware Specifications</b> .....	<b>12</b>
<b>Mechanical Specifications: GammaRay-64</b> .....	<b>13</b>
<b>Bill Of Materials: GammaRay-64</b> .....	<b>14</b>
<b>Mechanical Specifications: GammaRay-256</b> .....	<b>15</b>
<b>Bill Of Materials: GammaRay-256</b> .....	<b>16</b>

## GammaRay-64 USB Module

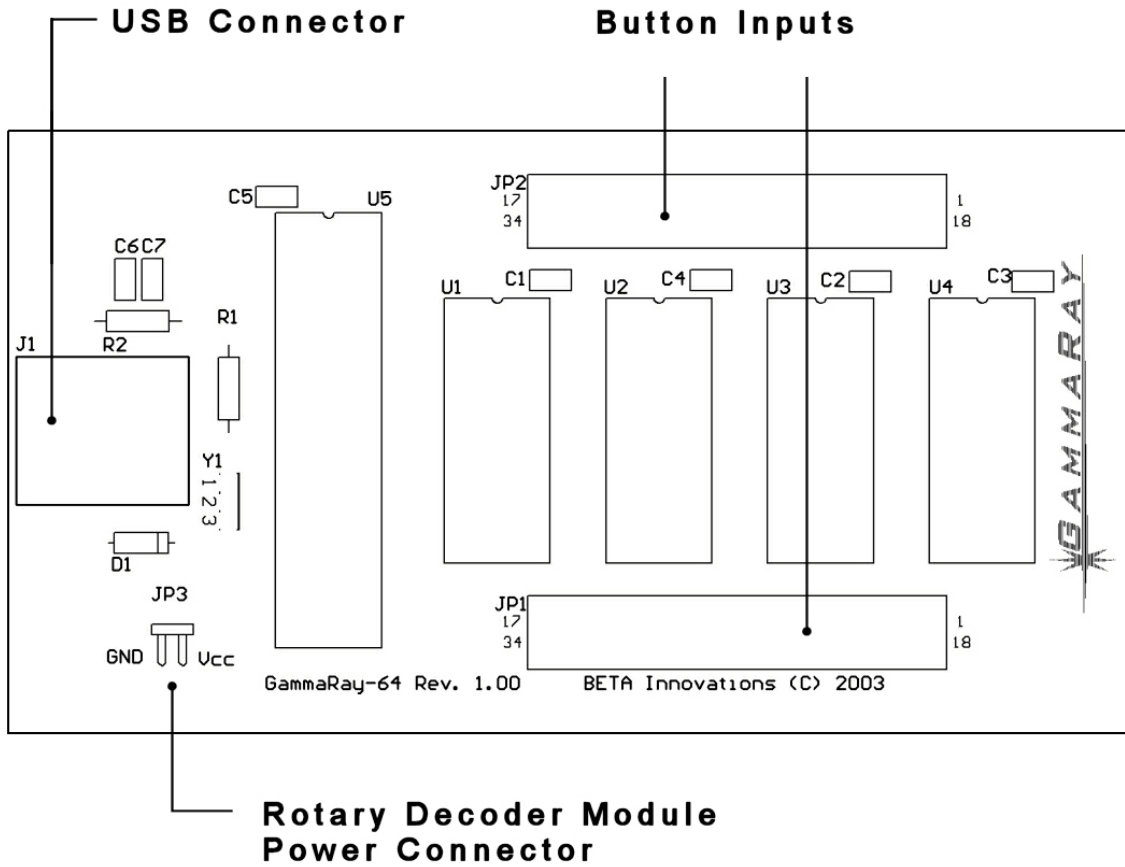


Figure 1 - GammaRay-64

## GammaRay-256 USB Module

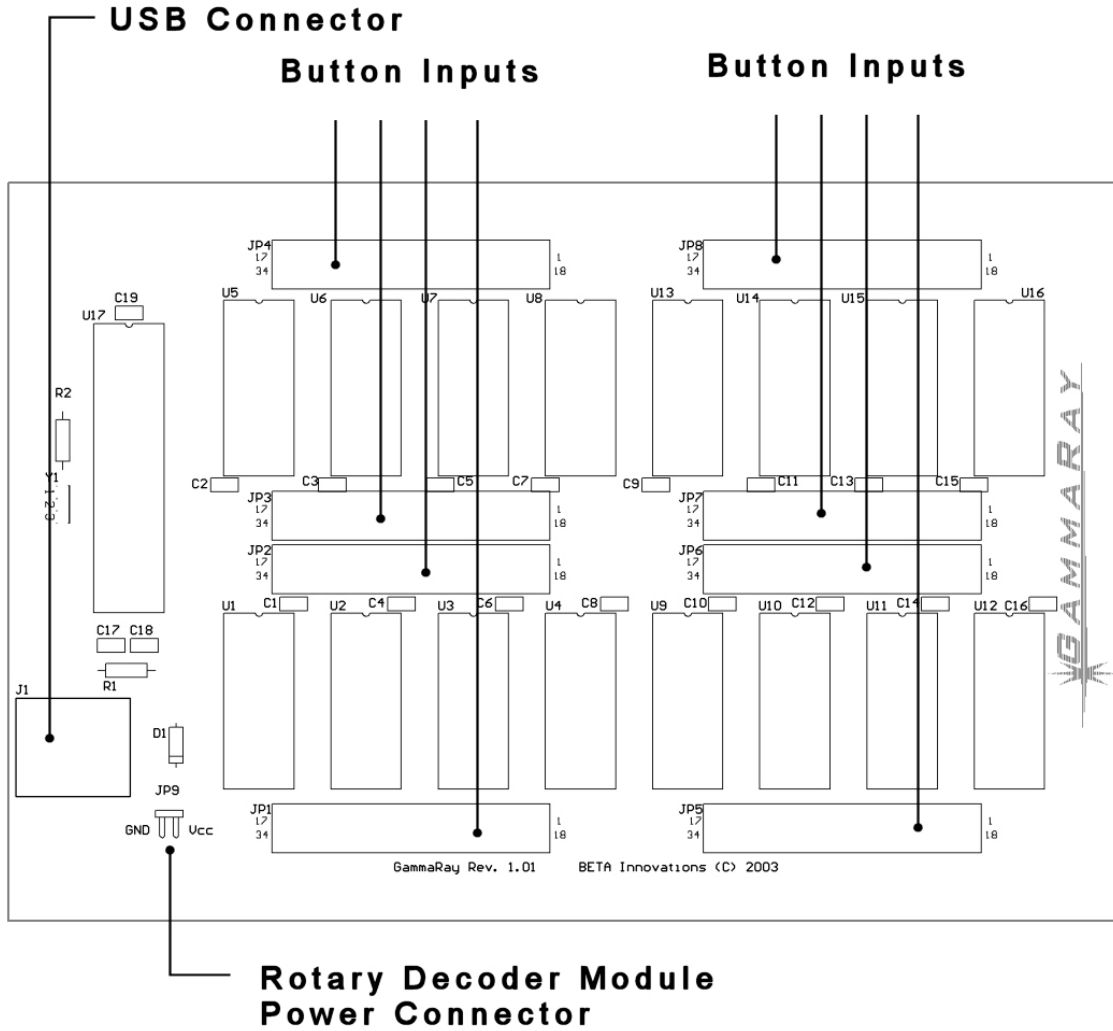


Figure 2 - GammaRay-256

## Main Features

- **Easy installation**

The GammaRay devices are Low Speed USB HID compliant using default USB HID drivers and powered by the USB Bus.

- **Digital Inputs**

GammaRay-64 device support up to 64 individual inputs.  
GammaRay-256 device support up to 256 individual inputs.

- **Keyboard Emulation**

Keyboard emulation using Keyboard Studio.

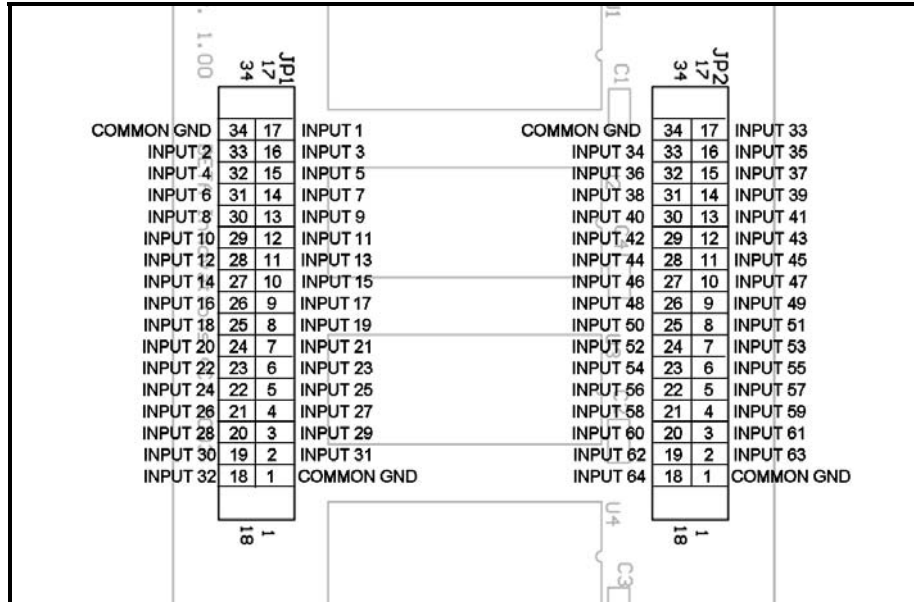
## Introduction

The GammaRay USB module has been developed for applications requiring hardware input such as switches or digital circuitry such as ADCs. When used with switches, the multiplexed inputs prevent phantom signals or "ghosting" and do not require individual diodes such as scan matrix designs.

Being a Low Speed USB HID compliant device, GammaRay utilizes default drivers included with operating systems.

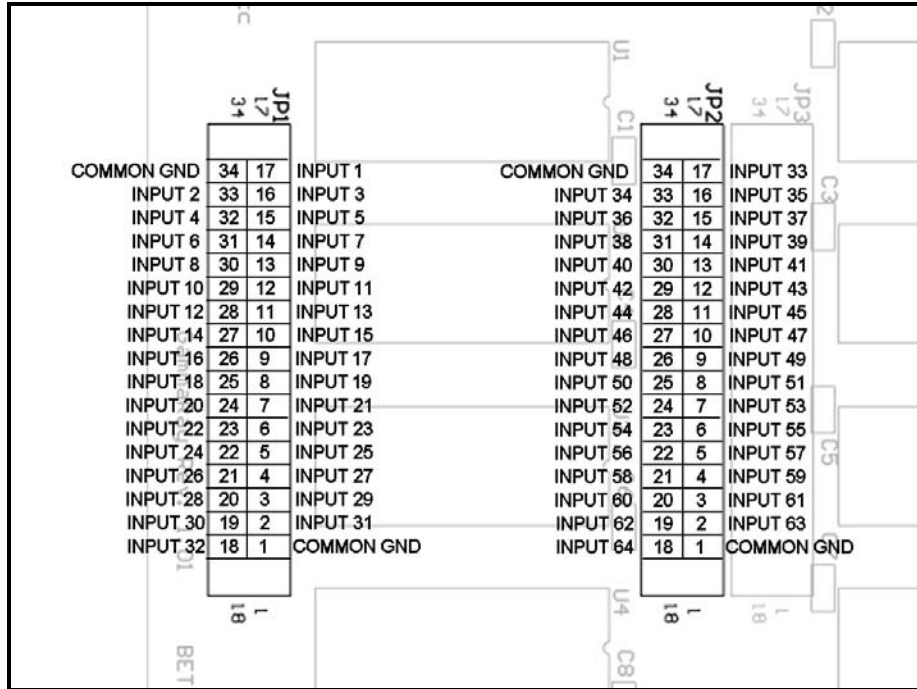
## GammaRay-64 Pin-Out

JP1 – JP2 Pin-Out

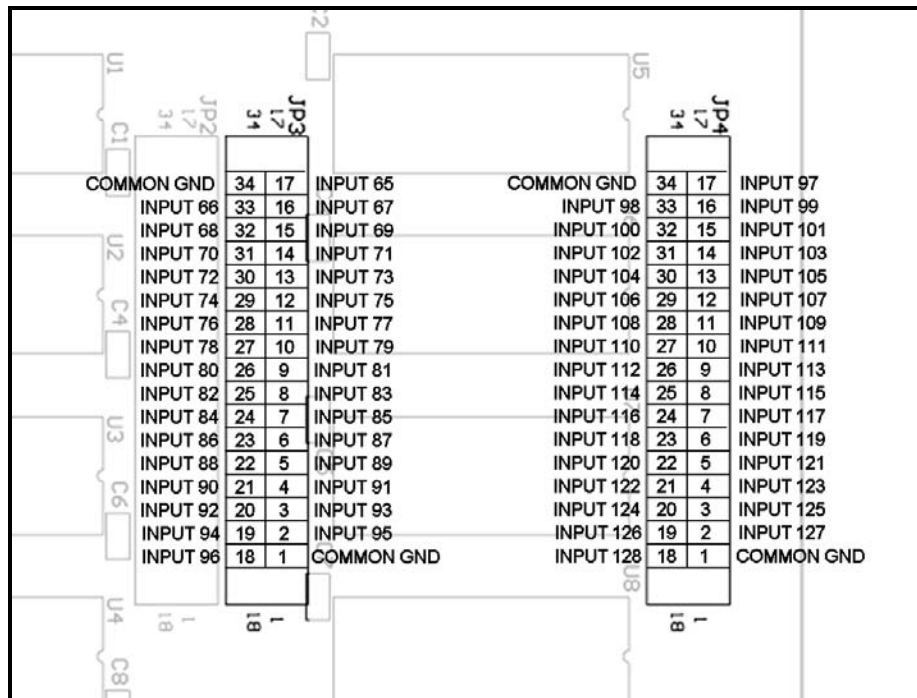


## GammaRay-256 Pin-Out

JP1 – JP2 Pin-Out

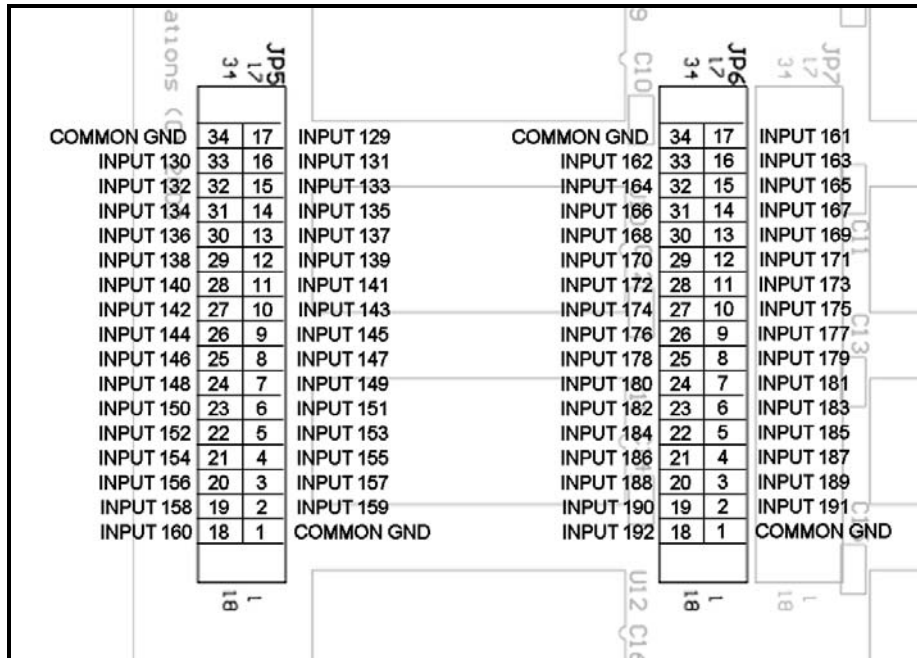


JP3 – JP4 Pin-Out

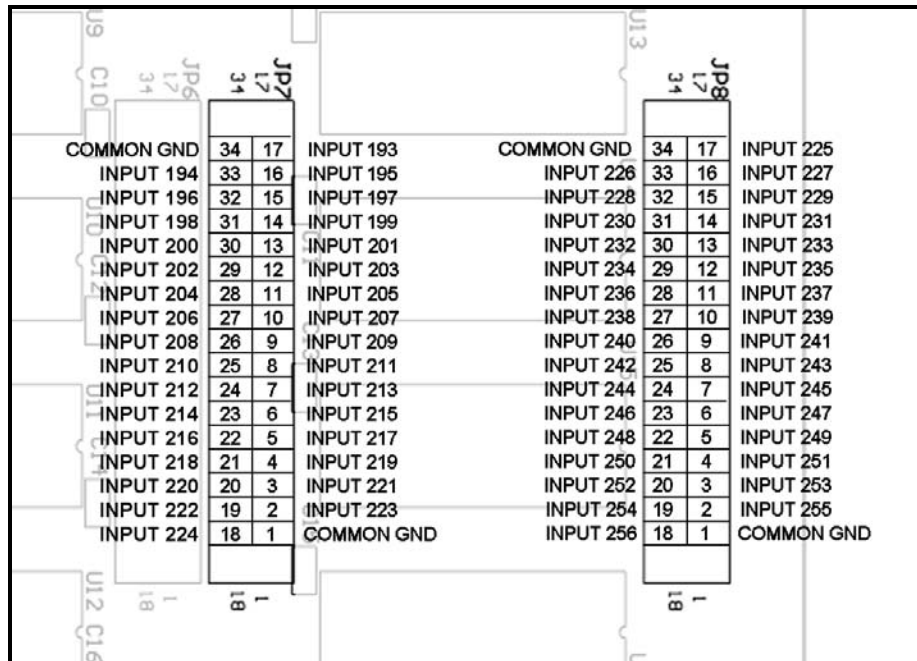




JP5 – JP6 Pin-Out



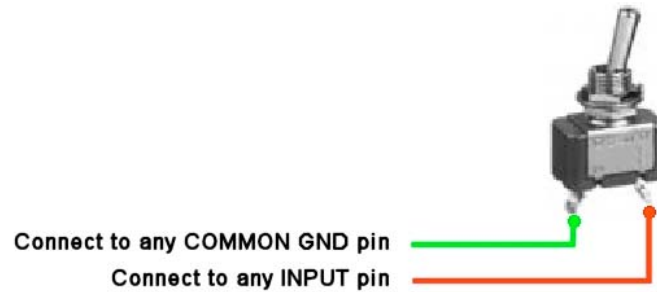
JP7 – JP8 Pin-Out



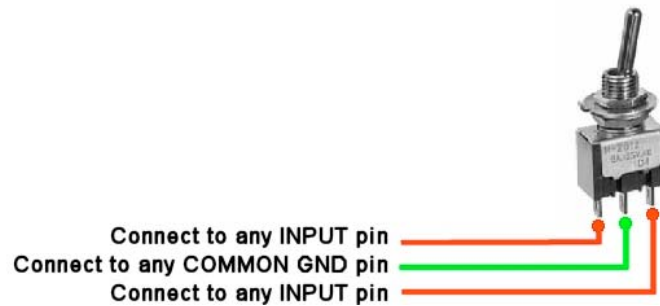
## Connecting Various Switches

The Plasma module does not use a scan matrix type of input layout. As such diodes are not required since it does not suffer from phantom signals when activating several switch inputs at the same time.

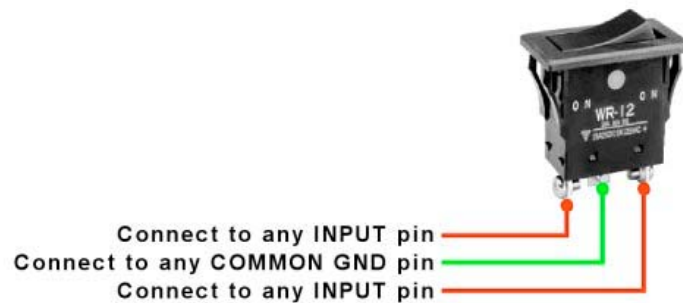
### SPST Toggle Switches (On-Off)



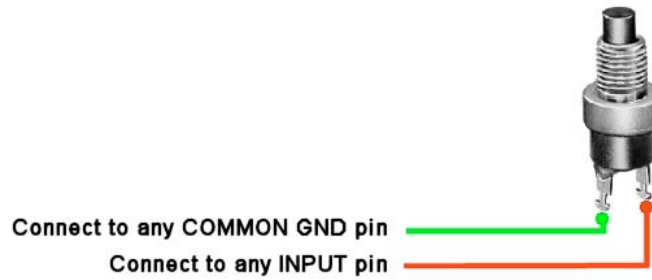
### SPDT Switches (On-On)



### Rocker Switches (On-Off-On)

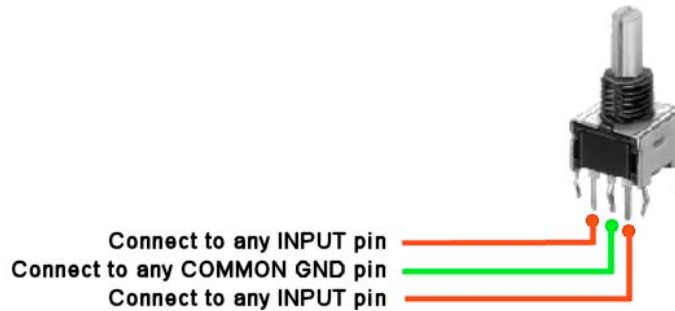


## Push Button Switches



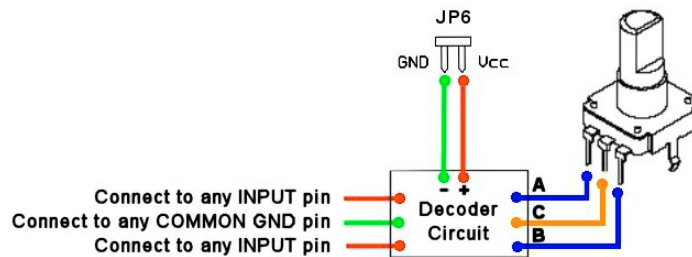
## Knitter Rotary Switches

These are special rotary type switches that do not require a decoder circuit in order to be used with the Plasma button inputs. Typical rotary encoders require a decoder circuit in order to convert the output signals into a form usable by this USB module.



## Mechanical / Optical Rotary Encoders

These types of rotary encoders require a decoder circuit in order to convert the output signals into a form usable by this USB module. Rotary output signals can be 2-bit gray code or 2-bit quadrature code.



## Hardware Specifications

The GammaRay-64 firmware runs at 10 ms iteration rate whereas the GammaRay-256 firmware runs at 40 ms iteration rate. As such, any custom interface software should poll this device at least every 10 ms to prevent missing any input. All inputs are active low, which means you must ground an input in order to register a high “on” signal at the output.

Windows will detect and load the appropriate HID driver for your the device and does not require that a custom device driver be installed.

Maximum power consumption is 750mW (150mA) and is USB bus powered. You do not need to use an external power supply for this device, even when connecting (and powering) several rotary decoder modules to the onboard power pins specifically added for this purpose.

### Mechanical Specifications: GammaRay-64

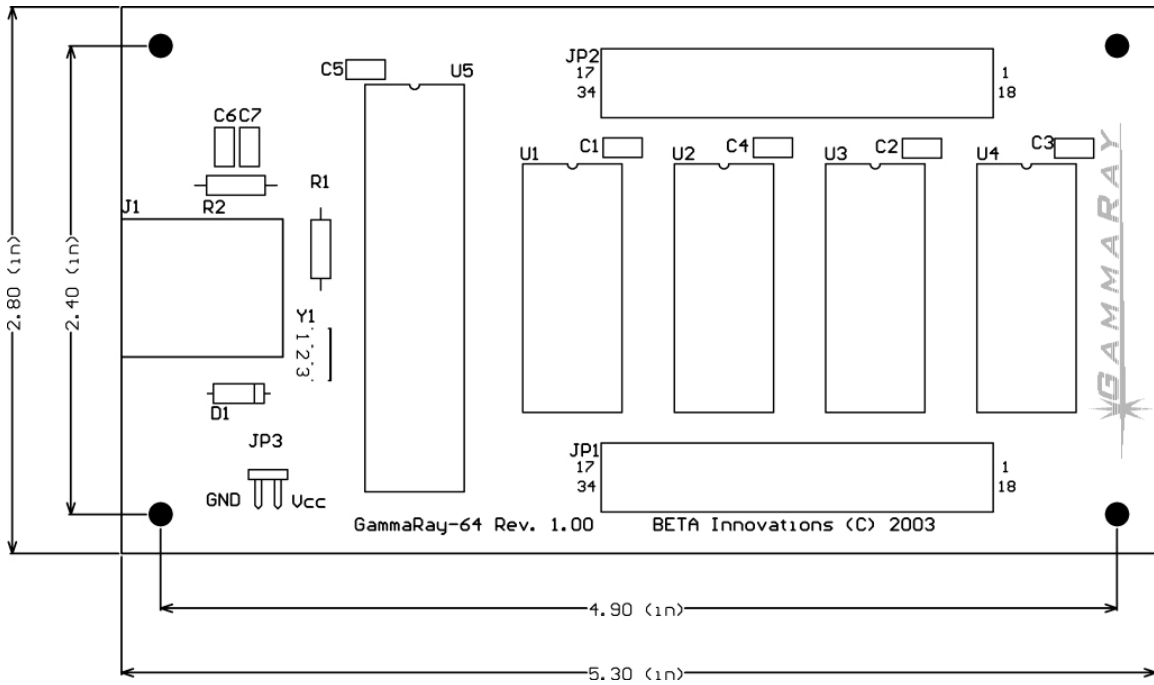


Figure 3 - GammaRay-64

## Bill Of Materials: GammaRay-64

C1	0.1 $\mu$ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C2	0.1 $\mu$ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C3	0.1 $\mu$ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C4	0.1 $\mu$ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C5	0.1 $\mu$ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C6	0.1 $\mu$ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C7	0.1 $\mu$ F, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
D1	1N914 Diode
J1	USB Type 'B' Connector (Digi-Key Part No. 787780-1-ND)
JP1	Header, 17-Pin, Dual row
JP2	Header, 17-Pin, Dual row
JP3	Header, 2-Pin, Right Angle
R1	10K, 10%, 1/4W
R2	1.5K, 1%, 1/4W
U1	HCF4067BEY Analog Multiplexer/Demultiplexer
U2	HCF4067BEY Analog Multiplexer/Demultiplexer
U3	HCF4067BEY Analog Multiplexer/Demultiplexer
U4	HCF4067BEY Analog Multiplexer/Demultiplexer
U5	PIC16C765-I/P EPROM-Based 8-Bit CMOS Microcontroller with A/D Converter 40 pin DIP socket for the PIC Micro
Y1	6MHz Ceramic Resonator (Digi-Key Part no. X904-ND)

## Mechanical Specifications: GammaRay-256

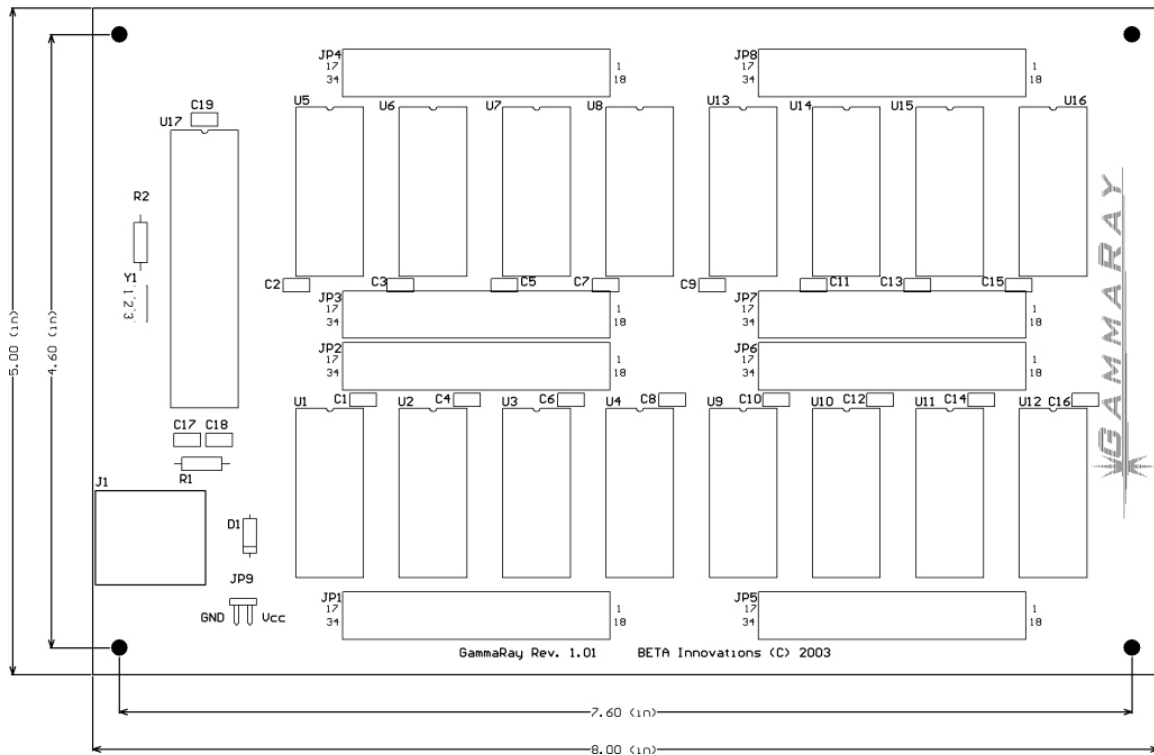


Figure 4 - GammaRay-256

**Bill Of Materials: GammaRay-256**

C1	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C2	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C3	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C4	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C5	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C6	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C7	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C8	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C9	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C10	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C11	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C12	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C13	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C14	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C15	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C16	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C17	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C18	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
C19	0.1µF, 20%, 50VDC Ceramic (Digi-Key Part no. BC1127CT-ND)
D1	1N914 Diode
J1	USB Type 'B' Connector (Digi-Key Part No. 787780-1-ND)
JP1	Header, 17-Pin, Dual row
JP2	Header, 17-Pin, Dual row
JP3	Header, 17-Pin, Dual row
JP4	Header, 17-Pin, Dual row
JP5	Header, 17-Pin, Dual row
JP6	Header, 17-Pin, Dual row
JP7	Header, 17-Pin, Dual row
JP8	Header, 17-Pin, Dual row
JP9	Header, 2-Pin, Right Angle
R1	1.5K, 1%, 1/4W
R2	10K, 10%, 1/4W
U1	HCF4067BEY Analog Multiplexer/Demultiplexer
U2	HCF4067BEY Analog Multiplexer/Demultiplexer
U3	HCF4067BEY Analog Multiplexer/Demultiplexer
U4	HCF4067BEY Analog Multiplexer/Demultiplexer
U5	HCF4067BEY Analog Multiplexer/Demultiplexer
U6	HCF4067BEY Analog Multiplexer/Demultiplexer
U7	HCF4067BEY Analog Multiplexer/Demultiplexer
U8	HCF4067BEY Analog Multiplexer/Demultiplexer
U9	HCF4067BEY Analog Multiplexer/Demultiplexer
U10	HCF4067BEY Analog Multiplexer/Demultiplexer
U11	HCF4067BEY Analog Multiplexer/Demultiplexer
U12	HCF4067BEY Analog Multiplexer/Demultiplexer
U13	HCF4067BEY Analog Multiplexer/Demultiplexer
U14	HCF4067BEY Analog Multiplexer/Demultiplexer
U15	HCF4067BEY Analog Multiplexer/Demultiplexer
U16	HCF4067BEY Analog Multiplexer/Demultiplexer
U17	PIC16C765-I/P EPROM-Based 8-Bit CMOS Microcontroller with A/D Converter 40 pin DIP socket for the PIC Micro
Y1	6MHz Ceramic Resonator (Digi-Key Part no. X904-ND)



IMPORTANT: You can substitute the analog multiplexer IC's (HCF4067BEY) with practically any other kind without any degradation in performance. Feel free to buy the least expensive types available from your local supplier of electronic components.

Please verify the specs of the ceramic resonator before substituting with any other kind. If you have a hard time finding these ceramic resonators, you can order them from Digi-Key.

Installing the headers and the USB 'B' connector is up to you. You can connect all the buttons and USB wires directly to the PCB board but I do not recommend doing this.

Visit [www.betainnovations.com](http://www.betainnovations.com) for the availability of preprogrammed Microchip micros.