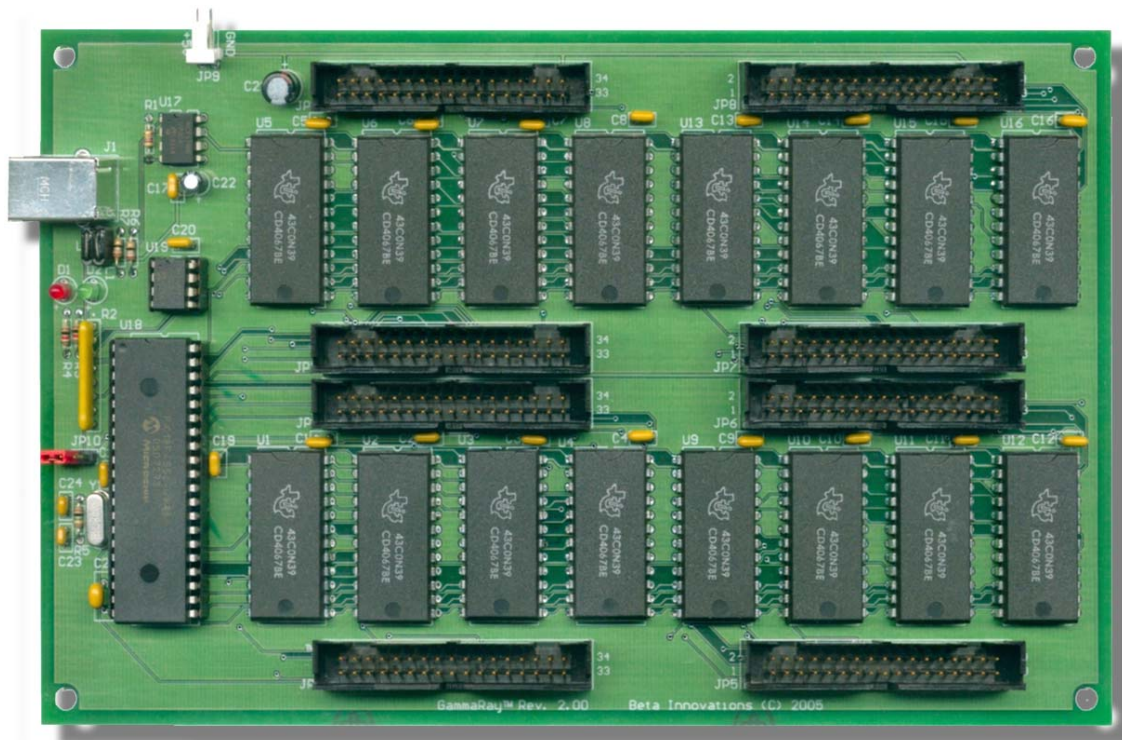


GammaRay-256™ V2 USB Module



Product ID. : 510
Board Rev. : 2.00
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Firmware Rev. : 2.11

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GammaRay-256 USB Module

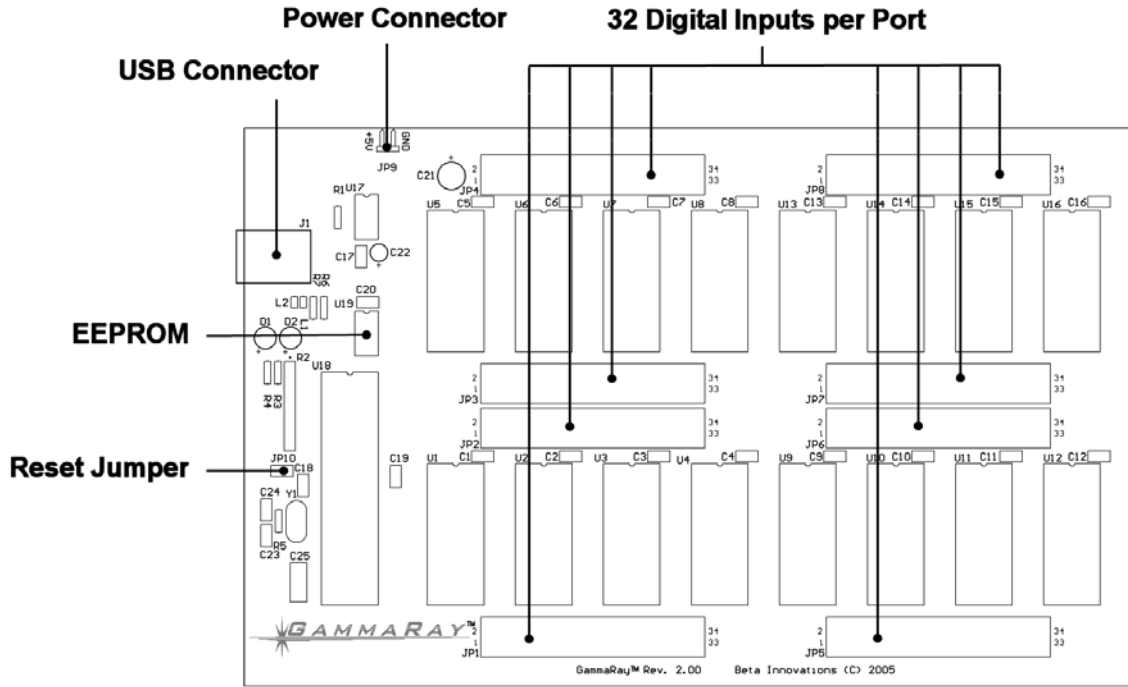


Figure 1 - GammaRay-256

Main Features

- **Easy installation**
The GammaRay™ V2 is a Full Speed USB HID compliant device which employs default drivers supplied by most OS and powered by the USB Bus.
- **Digital Inputs**
Supports 256 inputs with support for common switches: push buttons, toggles, etc. Each port individually configurable for various modes of operation.
- **Rotary Encoder**
Up to 16 rotary encoders supported including Gray Code, Gray Code ½ Pulse & 2-Bit Quadrature.
- **Short Circuit Protection**
Up to 500 mA available on all ports for external circuitry eliminating the need for additional power supplies. Monitoring circuitry prevents component damage.
- **Software Configurable Operation**
Device features can be customized through a simple to use configuration utility.
- **Flash Loader Mode**
Incorporates a Flash Loader for easy firmware updates via USB.
- **Software Development Kit**
Provides easy access to communicate with device through custom applications with skeleton samples in VB6, VC++ and MFC.
- **Keyboard Emulation**
Supports software based keyboard emulation using Keyboard Studio™.

Introduction

The GammaRay™ V2 USB module has been developed for applications requiring hardware input such as switches and digital circuitry. When used with switches, the multiplexed inputs prevent phantom signals or "ghosting" and do not require individual diodes such as scan matrix designs simplifying wiring considerably.

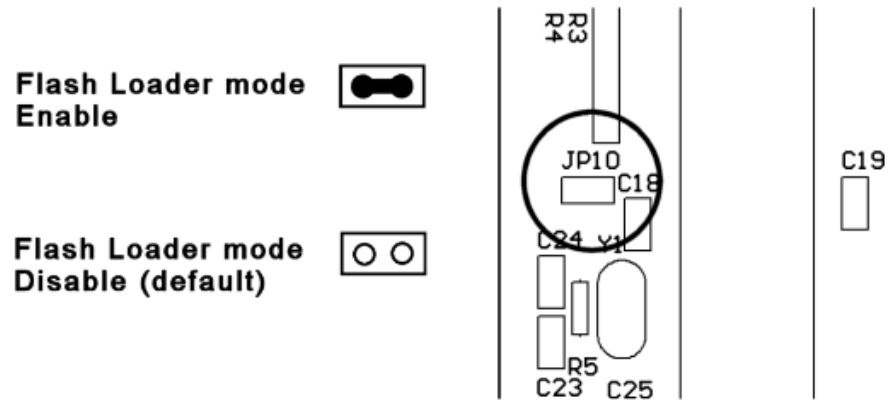
Through a simple to use software configuration utility, device firmware can be easily updated adding new features when they become available. Additionally, various parameters and many aspects of the device can be controlled, adjusted, activated or deactivated to meet individual needs. In each case the GammaRay unit will reconfigure itself in real-time. As such, the configuration settings can be altered at any time during normal operation without the need to disconnect and reconnect the device from the USB bus.

Driver installation is automatic and most OS will install the required drivers without any user intervention. Note: Reset JP10 should be removed prior to plugging the device into a USB port.

Flash Loader Mode : JP10

The GammaRay™ V2 USB module consists of 2 devices in 1. In *Flash Loader* mode, the module enumerates as a self-programming device used solely for updating the core firmware via USB. In *Standard Device* mode the unit operates as a standard HID device.

RESET Jumper JP10



RESET jumper JP10 can be used to restart the device in *Flash Loader* mode. It should remain open (disable) for normal device operation. The device can be set in *Flash Loader* mode when needed in order to update the core GammaRay firmware. The jumper must be removed after successful firmware update prior to rebooting the device. See the Device Manager utility user manual for details on firmware update procedures.

GammaRay-256 Pin-Out

Digital Mode Pin-Out

JP1 – JP2 Pin-Out

COMMON GND	1	2	INPUT 1	COMMON GND	1	2	INPUT 33
INPUT 2	3	4	INPUT 3	INPUT 34	3	4	INPUT 35
INPUT 4	5	6	INPUT 5	INPUT 36	5	6	INPUT 37
INPUT 6	7	8	INPUT 7	INPUT 38	7	8	INPUT 39
INPUT 8	9	10	INPUT 9	INPUT 40	9	10	INPUT 41
INPUT 10	11	12	INPUT 11	INPUT 42	11	12	INPUT 43
INPUT 12	13	14	INPUT 13	INPUT 44	13	14	INPUT 45
INPUT 14	15	16	INPUT 15	INPUT 46	15	16	INPUT 47
INPUT 16	17	18	INPUT 17	INPUT 48	17	18	INPUT 49
INPUT 18	19	20	INPUT 19	INPUT 50	19	20	INPUT 51
INPUT 20	21	22	INPUT 21	INPUT 52	21	22	INPUT 53
INPUT 22	23	24	INPUT 23	INPUT 54	23	24	INPUT 55
INPUT 24	25	26	INPUT 25	INPUT 56	25	26	INPUT 57
INPUT 26	27	28	INPUT 27	INPUT 58	27	28	INPUT 59
INPUT 28	29	30	INPUT 29	INPUT 60	29	30	INPUT 61
INPUT 30	31	32	INPUT 31	INPUT 62	31	32	INPUT 63
INPUT 32	33	34	VCC	INPUT 64	33	34	VCC

JP3 – JP4 Pin-Out

COMMON GND	1	2	INPUT 65	COMMON GND	1	2	INPUT 97
INPUT 66	3	4	INPUT 67	INPUT 98	3	4	INPUT 99
INPUT 68	5	6	INPUT 69	INPUT 100	5	6	INPUT 101
INPUT 70	7	8	INPUT 71	INPUT 102	7	8	INPUT 103
INPUT 72	9	10	INPUT 73	INPUT 104	9	10	INPUT 105
INPUT 74	11	12	INPUT 75	INPUT 106	11	12	INPUT 107
INPUT 76	13	14	INPUT 77	INPUT 108	13	14	INPUT 109
INPUT 78	15	16	INPUT 79	INPUT 110	15	16	INPUT 111
INPUT 80	17	18	INPUT 81	INPUT 112	17	18	INPUT 113
INPUT 82	19	20	INPUT 83	INPUT 114	19	20	INPUT 115
INPUT 84	21	22	INPUT 85	INPUT 116	21	22	INPUT 117
INPUT 86	23	24	INPUT 87	INPUT 118	23	24	INPUT 119
INPUT 88	25	26	INPUT 89	INPUT 120	25	26	INPUT 121
INPUT 90	27	28	INPUT 91	INPUT 122	27	28	INPUT 123
INPUT 92	29	30	INPUT 93	INPUT 124	29	30	INPUT 125
INPUT 94	31	32	INPUT 95	INPUT 126	31	32	INPUT 127
INPUT 96	33	34	VCC	INPUT 128	33	34	VCC

JP5 – JP6 Pin-Out

	1	2							
COMMON GND	1	2	INPUT 129	COMMON GND	1	2	INPUT 161		
INPUT 130	3	4	INPUT 131	INPUT 162	3	4	INPUT 163		
INPUT 132	5	6	INPUT 133	INPUT 164	5	6	INPUT 165		
INPUT 134	7	8	INPUT 135	INPUT 166	7	8	INPUT 167		
INPUT 136	9	10	INPUT 137	INPUT 168	9	10	INPUT 169		
INPUT 138	11	12	INPUT 139	INPUT 170	11	12	INPUT 171		
INPUT 140	13	14	INPUT 141	INPUT 172	13	14	INPUT 173		
INPUT 142	15	16	INPUT 143	INPUT 174	15	16	INPUT 175		
INPUT 144	17	18	INPUT 145	INPUT 176	17	18	INPUT 177		
INPUT 146	19	20	INPUT 147	INPUT 178	19	20	INPUT 179		
INPUT 148	21	22	INPUT 149	INPUT 180	21	22	INPUT 181		
INPUT 150	23	24	INPUT 151	INPUT 182	23	24	INPUT 183		
INPUT 152	25	26	INPUT 153	INPUT 184	25	26	INPUT 185		
INPUT 154	27	28	INPUT 155	INPUT 186	27	28	INPUT 187		
INPUT 156	29	30	INPUT 157	INPUT 188	29	30	INPUT 189		
INPUT 158	31	32	INPUT 159	INPUT 190	31	32	INPUT 191		
INPUT 160	33	34	VCC	INPUT 192	33	34	VCC		

JP7 – JP8 Pin-Out

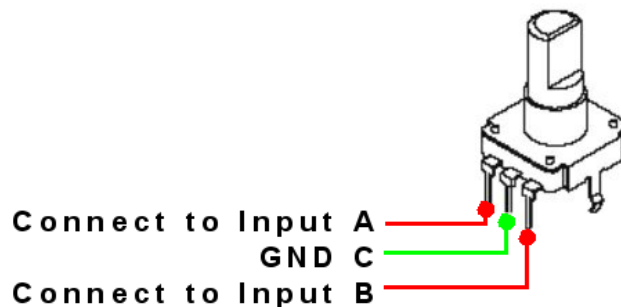
	1	2							
COMMON GND	1	2	INPUT 193	COMMON GND	1	2	INPUT 225		
INPUT 194	3	4	INPUT 195	INPUT 226	3	4	INPUT 227		
INPUT 196	5	6	INPUT 197	INPUT 228	5	6	INPUT 229		
INPUT 198	7	8	INPUT 199	INPUT 230	7	8	INPUT 231		
INPUT 200	9	10	INPUT 201	INPUT 232	9	10	INPUT 233		
INPUT 202	11	12	INPUT 203	INPUT 234	11	12	INPUT 235		
INPUT 204	13	14	INPUT 205	INPUT 236	13	14	INPUT 237		
INPUT 206	15	16	INPUT 207	INPUT 238	15	16	INPUT 239		
INPUT 208	17	18	INPUT 209	INPUT 240	17	18	INPUT 241		
INPUT 210	19	20	INPUT 211	INPUT 242	19	20	INPUT 243		
INPUT 212	21	22	INPUT 213	INPUT 244	21	22	INPUT 245		
INPUT 214	23	24	INPUT 215	INPUT 246	23	24	INPUT 247		
INPUT 216	25	26	INPUT 217	INPUT 248	25	26	INPUT 249		
INPUT 218	27	28	INPUT 219	INPUT 250	27	28	INPUT 251		
INPUT 220	29	30	INPUT 221	INPUT 252	29	30	INPUT 253		
INPUT 222	31	32	INPUT 223	INPUT 254	31	32	INPUT 255		
INPUT 224	33	34	VCC	INPUT 256	33	34	VCC		

Rotary Mode Pin-Out

	1	2	
COMMON GND	1	2	Rotary 1 Input A
Rotary 1 Input B	3	4	Rotary 2 Input A
Rotary 2 Input B	5	6	Rotary 3 Input A
Rotary 3 Input B	7	8	Rotary 4 Input A
Rotary 4 Input B	9	10	Rotary 5 Input A
Rotary 5 Input B	11	12	Rotary 6 Input A
Rotary 6 Input B	13	14	Rotary 7 Input A
Rotary 7 Input B	15	16	Rotary 8 Input A
Rotary 8 Input B	17	18	Rotary 9 Input A
Rotary 9 Input B	19	20	Rotary 10 Input A
Rotary 10 Input B	21	22	Rotary 11 Input A
Rotary 11 Input B	23	24	Rotary 12 Input A
Rotary 12 Input B	25	26	Rotary 13 Input A
Rotary 13 Input B	27	28	Rotary 14 Input A
Rotary 14 Input B	29	30	Rotary 15 Input A
Rotary 15 Input B	31	32	Rotary 16 Input A
Rotary 16 Input B	33	34	VCC

Mechanical / Optical Rotary Encoders

Typically these type of rotary encoders require a decoder circuit in order to convert the output signals into a usable form by software applications. Any one port on the GammaRay can be configured for rotary encoder support whereby all decoding is done in firmware eliminating the need for external decoding circuitry. Supported rotary encoder output signals can be Gray code, Gray code ½ Pulse or 2-bit Quadrature code.



Typical rotaries consist of 3 pins. Pin "A" & "B" are the encoded outputs and one common middle pin "C".

Connecting Various Switches

The GammaRay 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. This in turn simplifies wiring considerably as illustrated in figure 2.

Simplified Wiring

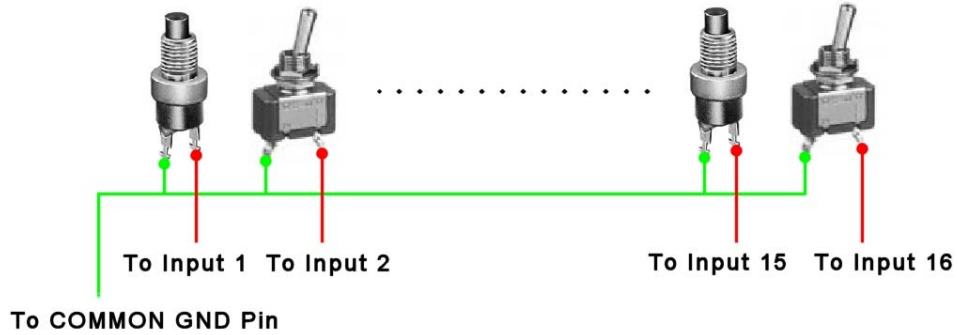
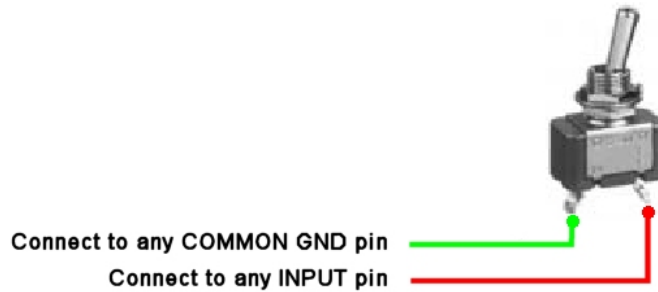
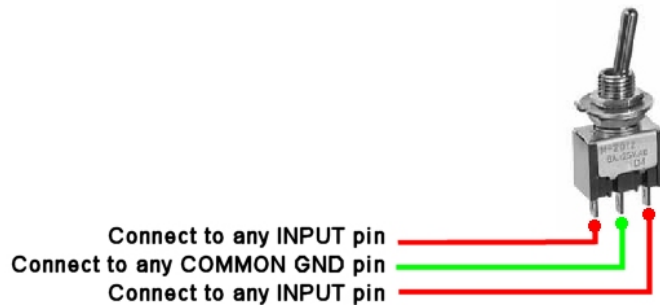


Figure 2 – Simplified Wiring

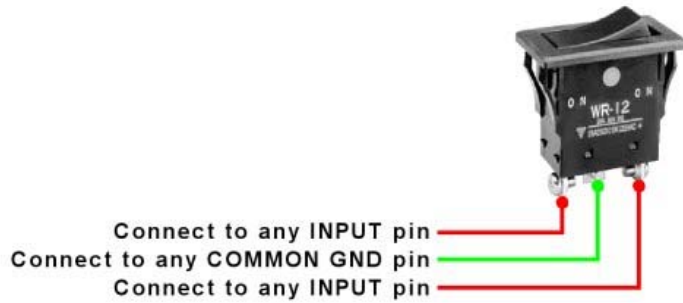
SPST Toggle Switches (On-Off)



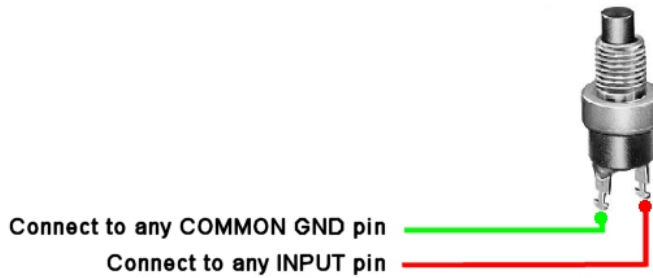
SPDT Switches (On-On)



Rocker Switches (On-Off-On)

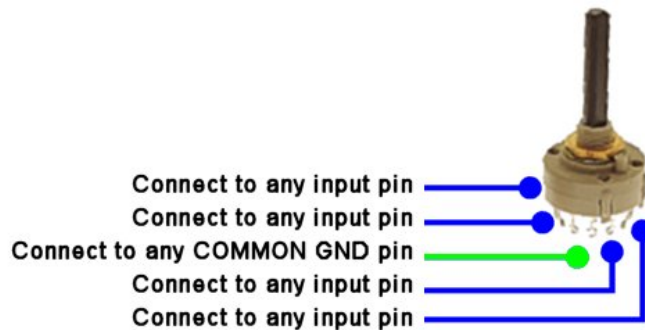


Push Button Switches



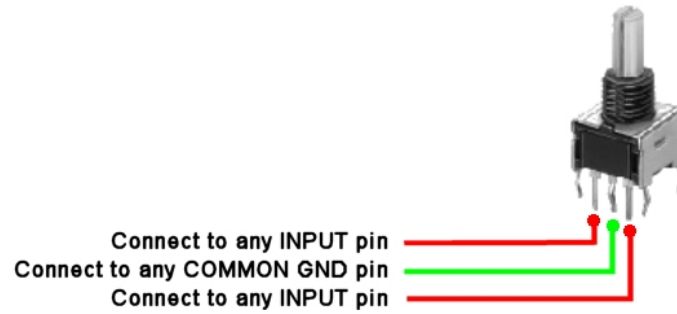
Multi-Position Rotary Switches

Multi-Position Rotary Switches come in many configurations, but the most important thing to note is that they all share one or several common pins. These common pins must be connected to any one of the common GND pins found on the GammaRay unit. All other pins can be connected to any one of the inputs as required.



Knitter Rotary Switches

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



Hardware Specifications

All inputs on the GammaRay are active low, which means you must ground an input in order to register a high “ON” signal at the output.

Most operating systems will detect and load the appropriate HID driver for your device and do not require that a custom device driver be installed.

Maximum power consumption is 2.5W (500 mA) and is powered by the USB bus. You do not need to use an external power supply for this device when connecting several optical encoders or circuitry to the onboard power pins (+5 Vcc) specifically added for this purpose. It is imperative that these devices not consume more than 500 mA. Doing so will trip the short circuit protection which will shut down all power to external devices and circuitry.

DO NOT EXCEED 100 mA when connecting the GammaRay to a bus-powered USB HUB. The USB HUB will not be able to provide sufficient current. This will lead to one of several outcomes depending on the design:

- GammaRay will fail to enumerate and will not function.
- The HUB will shut down until current drain falls below 100 mA.
- The HUB will continue to operate but devices connected to this HUB may display erratic behavior or fail entirely.

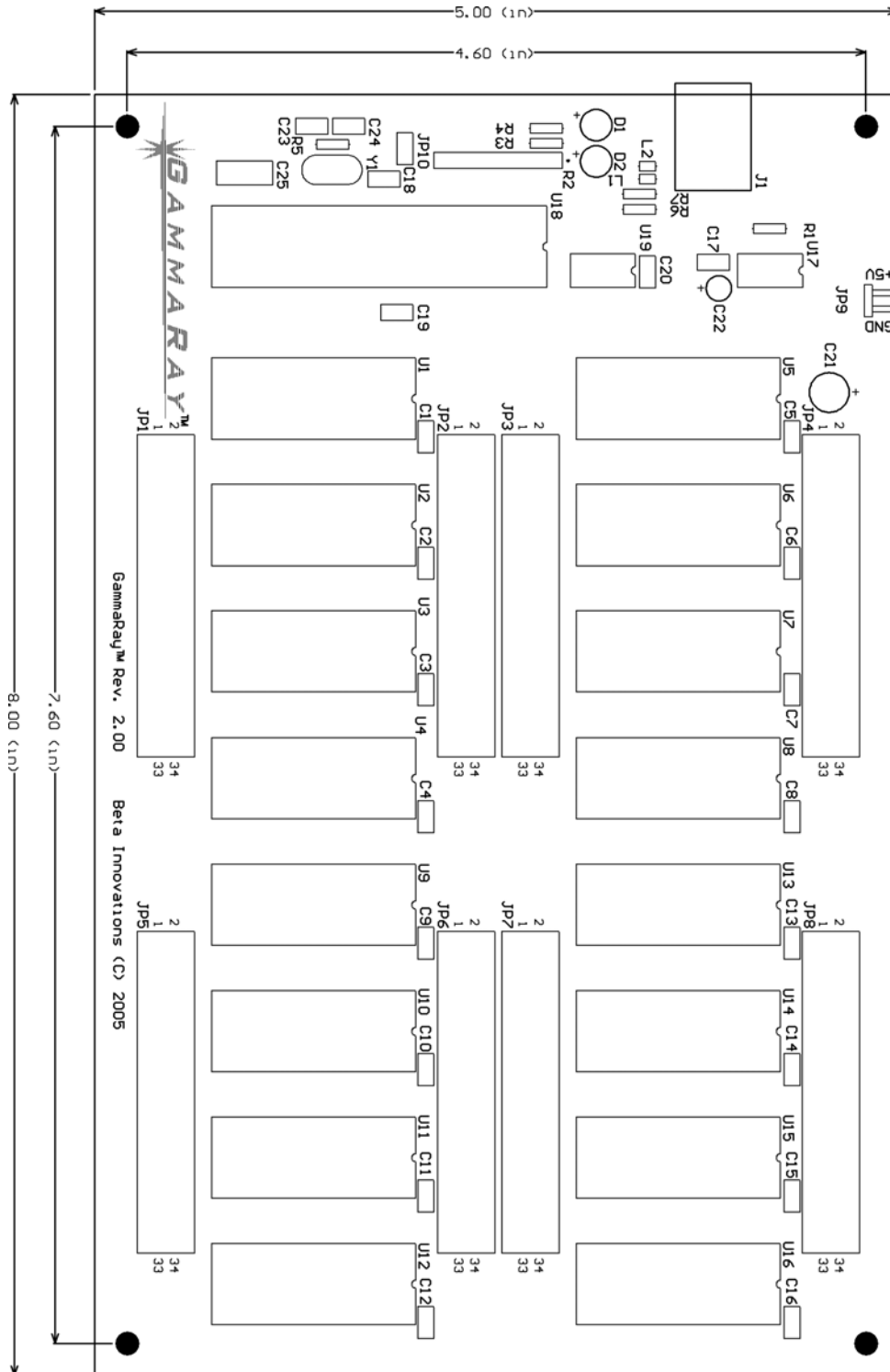
Use **self-powered** HUBs that have their own power source (wall adapter) or connect the GammaRay directly into the USB ports of your PC. As per USB specifications, PC host USB ports must be able to supply up to 500 mA per port.

NOTE: DO NOT CONNECT any of the GammaRay Vcc pins to external power supplies or voltage sources. Although common grounds can be safely connected to external grounds, it is not recommended and should be avoided whenever possible. Doing so may adversely affect performance, possibly causing strange or erratic behavior under certain conditions.

Device Status LEDs

D1	D2	Description
● Off	● Off	Device not powered, not enumerated or short circuit protection has shut down the device.
● On	● On	Device configured in Flash Loader mode.
● On	● Off	Device configured in standard device mode.
●● Blinking	●● Blinking	Device in Suspend state.
● On	●● Blinking	Transmitting data to USB host (Flash Loader Mode).
●● Blinking	● On	Receiving data from USB host (Flash Loader Mode).
● On	●● Blinking	Transmitting data to USB host (Standard Mode).
●● Blinking	● Off	Receiving data from USB host (Standard Mode).

Mechanical Specifications



Visit www.betainnovations.com for the availability of expansion modules and accessories.