



## SimuWHEEL | SimuBOX | PSUSB\_28 - Catalog and Instructions

### Features

Enclosed Housing

5 buttons with two Auxiliary inputs for External buttons or paddle shifters. (optional)

Real Structural 3K Carbon Fiber (or) Black G10 plates. (lc)

Fully engineered 3D printed housing for maximum rigidity to handle the power of Direct Drive style wheel bases.

Coiled (replaceable) CAT6 Cable connection to SimuCUBE sc1 or PSUSB\_28.

Works with most 310mm or larger 70mm (*momo*) or 74mm (*nardi*) PCD wheels.

### Options

PS1000 or PS1000lc paddle shift switches available.

CAT7 Coiled shielded ethernet cable. (PSW\_CAT7)

Custom Housing, Button, and Printed Graphics are available.

Adaptors and spacers for comfort adjustment and other paddle types / brands.



### SimuWHEELGT (PSWGT & PSWGTLc)

This wheel box is designed to be an affordable unit that can be used with many different wheels from sizes ranging from approx 310mm and above. (*graphite PSWGT version shown*)

#### Design and Use:

The SimuWHEELGT was designed for direct connection with the Granite Devices SimuCUBE SC1 direct drive wheel controller, however, we extended the usability of this wheel box to other wheel types through our modular PSUSB\_28 USB interface box. With the PSUSB\_28 you can connect this box plus 3 other SimuBOX units to ANY wheel system that allows for custom or standard steering wheels to be attached.

## Features

### Enclosed Housing

5 buttons with Integrated Paddle Shift units designed with inspiration from an actual 2013 William Formula 1 FW35

Real Structural 3K Carbon Fiber (or) Black G10 plates. (lc)

Fully engineered 3D printed housing for maximum rigidity to handle the power of Direct Drive style wheel bases.

Coiled (replaceable) CAT6 Cable connection to SimuCUBE sc1 or PSUSB\_28.

Mounts ONLY to 70mm PCD hubs.

Works with most 52mm 3-Bolt and 70mm PCD wheels down to 260mm. (choose wheel PCD when ordering)

## Options

Some screw in style 70mm Hubs (e.g. NRG, Accuforce) may require the PSW\_s 8mm Wheel Spacer Plate.

CAT7 Coiled shielded ethernet cable. (PSW\_CAT7)

Custom Housing, Button, and Printed Graphics are available.

Change in Wheel PCD type after ordering must be done through return service due to the difficulty of conversion.



## SimuWHEEL<sup>F1</sup> (PSWF1 & PSWF1lc)

This wheel box is designed to be an affordable small size unit that can be used to create a formula style wheel using some of the smallest diameter wheels (e.g. 260mm) on the market. (graphite PSWF1 version shown)

### Design and Use:

The SimuWHEEL<sup>F1</sup> was designed for direct connection with the Granite Devices SimuCUBE sc1 direct drive wheel controller, however, we extended the usability of this wheel box to other wheel types through our modular PSUSB\_28 USB interface box. With the PSUSB\_28 you can connect this box plus 3 other SimuBOX units to ANY wheel system that allows for custom or standard steering wheels to be attached.

The integrated Paddle Shift units are inspired by the design of the paddles used on the Williams FW35 Formula one car to give both positive actuation and authentic feel to the wheel.

The SimuWHEEL<sup>F1</sup> must be ordered to the specification of the PCD of the wheel to be used with it either 52 or 70mm.

## Features

### Enclosed Housing

7 buttons for the PSB7s and PSB7c while the PSB3e has 3 encoders along with a single common button.

Real Structural 3K Carbon Fiber (or) Black G10 plates. (Ic)

Fully engineered 3D printed housing for maximum rigidity with built in 5mm metal threaded mounting provisions.

## Options

CAT6 ethernet cable.  
(PSW\_CAT6)

CAT7 shielded ethernet cable.  
(PSW\_CAT7)

Custom Housing, Button (7s, 7c) or Encoder Knobs (3e), and Printed Graphics are available.



## SimuBOX (PSB7s, PSB7c, PSB3e & Ic variants)

This line of button boxes are designed to be an affordable build as you need system which can offer greater flexibility in both types of controls and placement of those controls on your system. *(graphite PSB units shown)*

### Design and Use:

The SimuBOX units were designed for direct connection with the Granite Devices SimuCUBE SC1 direct drive wheel controller, normally as a secondary control expansion unit to the SimuWHEEL, however, two of these units can be connected directly to the SimuCUBE SC1 if a SimuWHEEL is not used. With the PSUSB\_28 you can connect up to four SimuBOX units, three can be the 3e encoder box, to ANY system that supports USB Game Controller connection.

### Notes:

The SimuBOX units do not come with a connection cable due to differing length requirements needed from user to user. Any standard straight connection RJ45 ethernet cable can be used.

## Features

Enclosed 3D printed housing.

Real Structural 3K Carbon Fiber (or) Black G10 plate. (lc)

Four individual SimuBOX or SimuWHEEL button boxes may be used simultaneously on a single PSUSB\_28. Three of these units may be PSB3e encoder boxes but one must remain standard buttons.

The PSUSB\_28 may be used in conjunction with the SimuCUBE sc1 and additional PSUSB\_28 units for a myriad of control options.

Custom programmed TeensyLC micro processor controller is used to allow for maximum flexibility and optimal encoder usability.

Fully Grounded circuitry through the USB back to the computer.

Integrated Mounting tabs.

USB cord included.

## Options

SimuWHEELgt & lc

SimuBOX7s & lc

SimuBOX7c & lc

SimuBOX3e & lc



## PSUSB\_28

The PSUSB\_28 connection box is a USB connection interface that allows for any of the SimuWHEEL or SimuBOX button boxes to be use with ANY system capable of using a USB game controller interface regardless as to if you have a SimuCUBE Direct Drive control from Granite Devices.

*(graphite PSUSB\_28 version shown)*

### Design and Use:

The PSUSB\_28 was designed to be a primary or supplementary expansion unit for the SimuWHEEL and SimuBOX products. Multiple PSUSB\_28 units can be used at the same time or along with the SimuCUBE sc1 to allow for additional button boxes to be used on your system. On any single PSUSB\_28 unit you may have up to four SimuBOX or SimuWHEEL devices with a MAXIMUM of three PSB3e encoder boxes.





## Instructions...



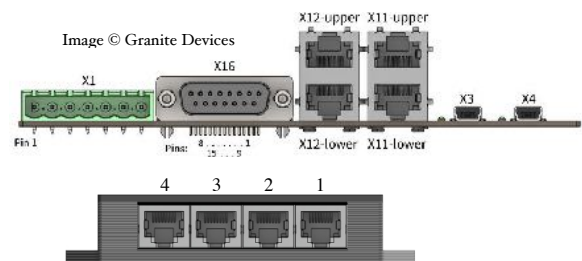
## SimuWHEEL<sup>GT</sup> (PSWGT & PSWGTic)

Connecting the SimuWHEEL to the SimuCUBE sc1:

- Plug the RJ45 connector into RJ45 port X12 upper.

Connecting the SimuWHEEL to the PSUSB\_28:

- Plug the RJ45 connector into RJ45 Port 1



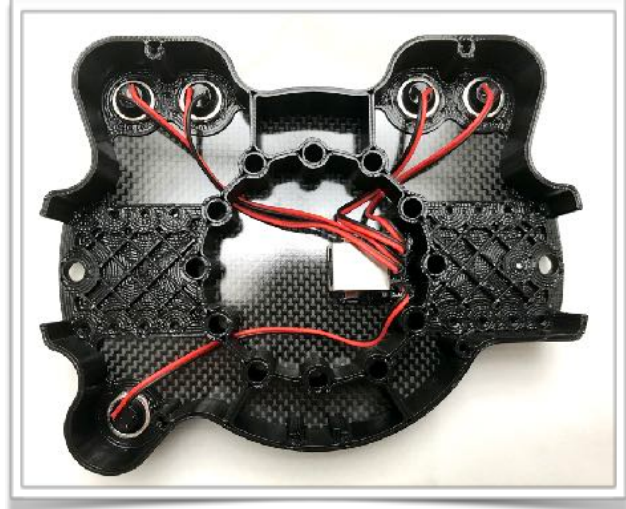
### Notes:

**Software** - The SimuCUBE sc1 Firmware (v 0.11.0 and beyond) allows for the configuration of the X12 Inputs via the "X12 Input Mode Configuration" on the *Hardware Set-up Tab* to allow the use of a "shift" button. When enabled, pressing this button concurrently with another button it allows for a second independent button to be registered (including aux/shifter and buttons/encoders connected to the second X12 port). On the standard SimuWHEEL layout the Yellow button is used for this feature.

**Mounting a Steering Wheel** - Use M5 Flathead screws (*not provided*) in a length that will allow them to pass through the Box to your mounting hub, 45mm would be minimum length for screw in hub, 55-60mm pass through. Allow enough length to allow for proper attachment of any nuts or other hardware needed to secure the wheel properly. Some flat or small diameter wheels have grips on the spokes that may interfere with the SimuWHEEL being mounted flat to the wheel. In this case spacers for clearance between the wheel and the SimuWHEEL box would be needed.

# SimuWHEEL<sup>GT</sup>

## Auxiliary Buttons and Paddle Shift Unit Installation and Adjustment



### Included with the PSWGT are the following items:

- 2x Paddle switch mounting plates in the material of the SimuWHEEL box purchased.
- 2x 2-pin Header Plug for electrical connection to the remaining switch inputs.
- 1 Piece 1/8" heat shrink tube for wire protection.
- 8x T-8 self tapping TORX screws.

#### Items you will need to do any work:

- Slim shaft T-8 screw driver. (or in a pinch a 2mm hex key)
- Soldering Iron. (for attaching Header plugs to your paddles or auxiliary buttons)
- Heat Source for shrinking the shrink tube. (heat gun or in a pinch a flame)

#### Notes:

**Ordered Units** - If you ordered your SimuWHEEL with PS1000 paddle shift units these will be wired and installed before delivery. You will not need to do any wiring and the auxiliary button inputs are used. You will still need to open the PSWGT in order to adjust the paddle switch width or if ever needed replace the connection cord.

### Wiring your Paddle Shift units or Auxiliary buttons:

You can wire up any momentary release button you wish to the PSWGT. Paddle shift units generally use a momentary switch as their main electrical function. To wire a button for use on the PSWGT do the following.

- 1) Strip about 2.5mm of insulation off of the ends of each wire to the switch and tin with your soldering iron.
- 2) Cut the provided heat shrink tubing in half and feed one piece over the two wires for the momentary switch.
- 3) Tin the two contacts on the 2-Pin header plug and then solder one wire from the switch to one terminal of the header plug. Make sure you provide enough heat to the joint so that a good electrical connection is made.
- 4) Once the joints have cooled slip the heat shrink tube over the two wire joints on the plug and use a heat source to string the tubing. (if using flame be careful not to burn the tubing, wire, or plug)

# SimuWHEEL<sup>GT</sup>

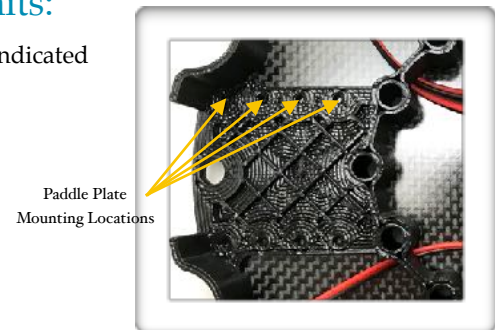
## Auxiliary Buttons and Paddle Shift Unit Installation and Adjustment continued...

### Opening up your PSWGT:

In order to add auxiliary buttons, install paddles, replace the communication cord, or adjust the width of your existing paddle shift units you will need to open your PSWGT. To do so place the box flat on a soft surface (a folded towel works well for this) and remove the (4) T-8 TORX screws that hold the back plate to the box. Remove the back plate taking care to not to lose the strain relief for the communication cable.

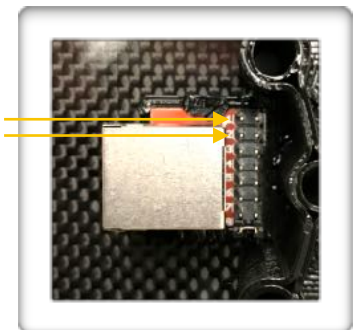
### Installing and Adjusting Width of Paddle Shift Units:

Attach the provided paddle mounting plates to the PS1000 Shift Switches as indicated by the PS1000 instructions. If you are using another brand of shift units that have a 10mm mounting you will need the PS1004\_a Adaptor Plate Kit or another method of adapting the mounting to the provided plates. Once the paddles are mounted on the plates, install them into the SimuWHEEL using the (8) T-8 self tapping TORX screws at the width increment where you wish to have the paddles mounted. There are 3 options for placement, each option is 10mm apart changing the paddle width by 20mm. If you need to move the paddles further away from the steering wheel you can install the PS1004 Paddle Spacer Kit, this kit is installed between the mounting plate and the PS1000 Paddle Switch. Please see PS1000 instructions for further information.



### Plugging in the Paddle Shift units or Auxiliary Buttons:

Once your SimuWHEEL is open, route the wires for the paddle switches or your auxiliary buttons into the center of the SimuWHEEL. Behind the RJ45 Socket is the button interface bus. The two ports that are used for the paddle switch or auxiliary buttons are Port 1 and Port 2. In order to access the ports you may have to move wires, if you happen to unplug one of the other buttons be sure to re-attach the button before closing the PSWGT up. (*early SimuWHEELgt's use port 1 and 6*)



### Replacing Communication Cable:

- 1) Open your SimuWHEEL.
- 2) Disconnect the cable from the RJ45 Socket. To ease disconnection use a paperclip or hex key to press the disconnect clip on the RJ45 plug from underneath which will allow it to be removed easily.
- 3) Plug in the replacement Ethernet cable and route the same as the original reinstalling the strain relief and back plate.

#### Notes:

**Screws** - Be sure to not over tighten the T-8 TORX screws, snug torque only. The screws are being installed into plastic and though they can take some torque it is possible to strip the plastic, Doing so would require the replacement of the inner structure to fix.

# SimuWHEEL<sub>F1</sub>

## Connection and included Parts...

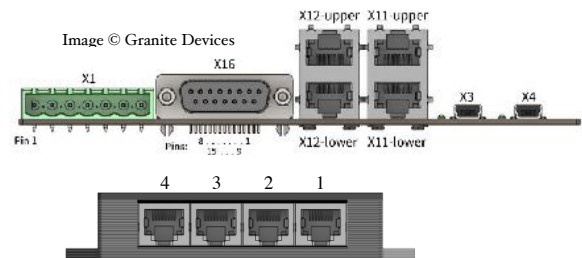


Connecting the SimuWHEEL to the SimuCUBE sc1:

- Plug the RJ45 connector into RJ45 port X12 upper.

Connecting the SimuWHEEL to the PSUSB\_28:

- Plug the RJ45 connector into RJ45 Port 1



### Notes:

**Software** - The SimuCUBE sc1 Firmware (v 0.11.0 and beyond) allows for the configuration of the X12 Inputs via the "X12 Input Mode Configuration" on the *Hardware Set-up Tab* to allow the use of a "shift" button. When enabled, pressing this button concurrently with another button it allows for a second independent button to be registered (including aux/shifter and buttons/encoders connected to the second X12 port). On the standard SimuWHEEL layout the Yellow button is used for this feature.

**SimuWHEEL<sub>F1</sub> configurations** - When ordered you should choose a configuration for the the F1 box to match the PCD mounting style of the steering wheel you are going to use with it. This would either be a 70mm 6 bolt PCD or a 52mm 3 bolt Formula PCD. The conversion process between 52mm PCD and 70mm PCD wheel configurations is difficult and will be performed by us via a free labor return service if needed. The SimuWHEEL<sub>F1</sub> wheel box is NOT designed to be mounted to a 52mm PCD wheel hub. **Please contact us if there are any issues.**

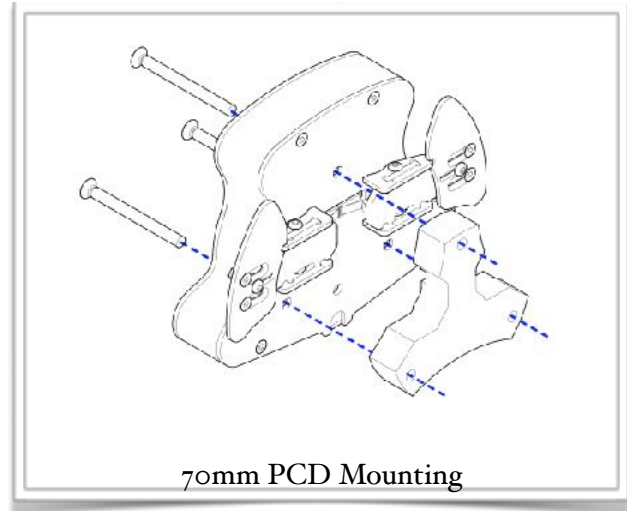
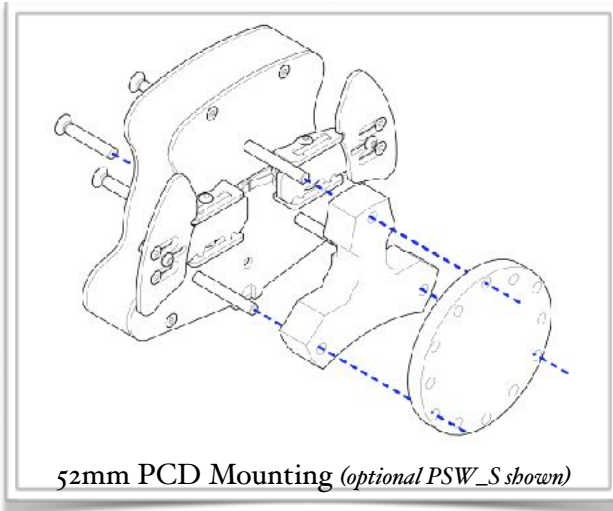
### Replacing Communication Cable:

If you need to replace the communication cable to the SimuWHEEL<sub>F1</sub> you can do so by removing the the (4) T-8 TORX screws that hold the back plate to the box, Disconnect the cable from the RJ45 Socket, Plug in the replacement Ethernet cable and route it in the same manner as the original reinstalling the strain relief and back plate.



# SimuWHEEL<sub>F1</sub>

## Mounting and Paddle Plate Adjustment



### Installation:

**52mm PCD Wheels** (see 52mm PCD Mounting image) - Mount the SimuWHEELF1 to your 70mm hub using the captured M5 bolts. These bolts use a 4mm hex key through the holes in the front of the plate. Tighten the bolts to your in a manner which provides even torquing. If you have a hub such as an Accuforce QR or NRG you may need the optional PSW\_S (8mm wheel spacer - shown) for the wheel box to fit securely. Once the box is secure use the 3 included M5x30 to attach your 52mm PCD Wheel to the box. DO NOT use longer bolts than the ones provided or interference with the paddles may occur.

**70mm PCD Wheels** (see 70mm PCD Mounting image) - Mount your wheel and the box with the paddle spacer as shown using three M5 flat head bolts that are long enough to securely mount the entire assembly to your hub. Mounting bolts for 70mm PCD wheels are not included due to the wide range hub and wheel depths used. Flat head 5mm bolts approx 60 - 65mm in length will more than likely be needed.

*\*Conversion between the 52 PCD and 70 PCD options is Difficult but not impossible - Please contact us for options if needed...*

### Adjusting the paddles:

The included paddles are mounted with a fully adjustable triangulated mounting system. You can mount the paddles to the front or the back of the paddle shift levers depending on the distance needed for the paddles. We recommend mounting to the back of the lever so that the edge of the lever does not come in contact with your fingers during actuation. To mount the paddles place all three screws into the paddle with the two countersunk screws in the countersunk slot and the Button head screw in the center location. Loosely tighten the paddle to the lever with the included nuts, the paddle should slide with a little friction. Once you find the position you feel is optimal for the paddle tighten the center button head screw to lock in the location, then tighten each of the flat head screws to further secure the paddle in place. Once secure the paddle should not move or rotate on the mounting. It is recommended to tighten the center button head screw first as tightening the flat head screws prior to the button head can cause tracking which will alter the positioning of the paddle.

### Notes:

**Paddle Spacing** - It is possible to space the paddle further away from the lever if wanted by using longer screws and spacers between the paddle and lever.

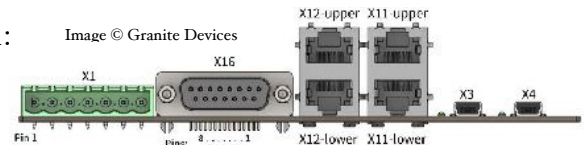
# SimuBOX 7s & 7c (PSW7s, PSW7c, PSW7slc, PSW7clc)

## Connection and Installation...



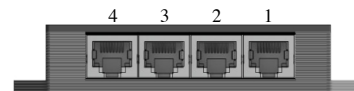
Connecting the SimuBOX 7s or 7c to the SimuCUBE sc1:

- Plug the RJ45 connector into RJ45 port X12 upper or X12 lower.



Connecting the SimuBOX 7s or 7c to the PSUSB\_28:

- Plug the RJ45 connector into any RJ45 port.



## Mounting your SimuBOX 7s or 7c:

The SimuBOX 7s and 7c can be mounted in many different ways from using double sided tape or by hard mounting the boxes using the provided metal threaded 5mm mounting provisions integrated into the rear of each box. The dimensions for these mounts are provided on the Mounting Schematics Page.

### Notes:

**Connection** - The SimuBOX 7s & 7c do not come with the ethernet connecting cable as every user has their own requirements for cable length to be able to mount the box where they choose in their set-up. Any straight connection RJ45 ethernet cable can be used for this purpose. It is best to choose a cable that is as close to the length needed for your mounting SimuBOX mounting location. We offer 3 meter CAT6 (PSW\_CAT6) and Shielded CAT7 (PSW\_CAT7) cables as options for these boxes.

**Software** - The SimuCUBE sc1 Firmware (v 0.11.0 and beyond) allows for the configuration of the X12 Inputs via the "X12 Input Mode Configuration" on the *Hardware Set-up Tab* to allow the use of a "shift" button. When enabled, pressing this button concurrently with another button it allows for a second independent button to be registered (including aux/shifter and buttons/encoders connected to the second X12 port). On the SimuBOX7s layout the Yellow button is used for this feature, on the SimuBOX7c the upper left white button is used for the "Shift" feature.

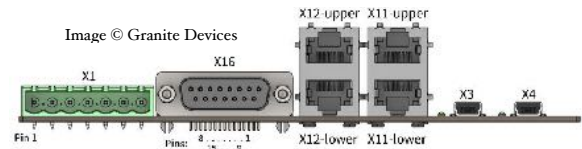
## SimuBOX 3e (PSW3e, PSW3elc)

### Connection and Installation...



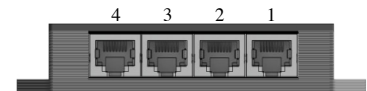
Connecting the SimuBOX 3e to the SimuCUBE sc1:

- Plug the RJ45 connector into RJ45 port X12 upper or X12 lower.



Connecting the SimuBOX 3e to the PSUSB\_28:

- Plug the RJ45 connector into RJ45 port 4, 3, or 2 respectively depending on how many PSB3e encoder boxes are being used.



### Mounting your SimuBOX 3e:

The SimuBOX 3e can be mounted in many different ways from using double sided tape or by hard mounting the boxes using the provided metal threaded 5mm mounting provisions integrated into the rear of each box. The dimensions for these mounts are provided on the Mounting Schematics Page.

#### Notes:

**Connection** - The SimuBOX 3e does not come with the ethernet connecting cable as every user has their own requirements for cable length to be able to mount the box where they choose in their set-up. Any straight connection RJ45 ethernet cable can be used for this purpose. It is best to choose a cable that is as close to the length needed for your mounting SimuBOX mounting location. We offer 3 meter CAT6 (PSW\_CAT6) and Shielded CAT7 (PSW\_CAT7) cables as options for these boxes.

**Software** - The SimuCUBE sc1 Firmware (v 0.11.1 and beyond) allows for the configuration of the X12 Inputs via the "X12 Input Mode Configuration" on the *Hardware Set-up Tab* to allow the use of encoders. When using the PSB3e Encoder box you will want to select the " (1/1 pulse) per detent" selection. If using the "shift" function on the other X12 input encoder and button inputs will be able to be doubled. You cannot enable the "shift" function using the single button the PSB3e do to the wiring required.

## PSUSB\_28 & PSUSB\_28lc *USB Interface Box*

### *Connection and Setup...*



To connect the PSUSB\_28 use the provided cord to connect to any available USB port on your computer. This controller requires no additional software or drivers as it is a standard Windows HID device. The PSUSB\_28 initializes upon being powered up so any setup changes will not take effect until the device is power cycled either by unplugging it or by turning off your computer.

#### Notes:

**First Connection** - On the first connection the PSUSB\_28 will be set-up for all ports to be used with button boxes. Port 1 of the PSUSB\_28 cannot be altered from the initial button configuration. The Device will show up as Penguin r/c PSUSB\_28 in the Windows devices and peripherals.

### Opening your PSUSB\_28:

In order to change device set-up for use with the PSB3e or PSB3elc encoder boxes you will need to open the PSUSB\_28 to change the programming and ports used for encoders.

- 1) First make sure the PSUSB\_28 is disconnected from your computer.
- 2) Open the PSUSB\_28 by removing the (3) T-8 TORX screws that hold the top plate to the box using either a T-8 driver or if in a pinch a 2mm Hex Key can work.
- 3) When finished setting up the PSUSB\_28 replace the top plate to protect the electronics.

### Setting up your PSUSB\_28 for encoder use:

In order to use the PSB3e Encoder box correctly with the PSUSB\_28 you will need to set the programming for encoders use. In the process you will also set down many and which Ports are converted for encoder use. It is NOT recommended to use the encoder programming with button boxes as some paired inputs could be ignored causing missed button presses.



# PSUSB\_28 & PSUSB\_28lc USB Interface Box

## Connection and Setup continued...

### Setting Encoder Programming and Ports:

Inside the PSUSB28 there is a Red DIP switch which controls what programming is set to which ports. By selecting different combinations on the switches you can control how many of the ports provide decoding for the encoder input from the PSB3e. Below is the table showing which ports are converted with each setting.



**Port 1, 2, 3, and 4**  
Standard Button Inputs  
(default configuration)



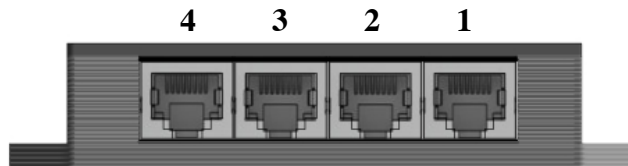
**Port 1, 2, and 3**  
Standard Button Inputs  
**Port 4**  
Encoder Programming



**Port 1 and 2**  
Standard Button Inputs  
**Port 3 and 4**  
Encoder Programming



**Port 1**  
Standard Button Inputs  
**Port 2, 3, and 4**  
Encoder Programming



PSUSB\_28 Interface

### Mounting your PSUSB\_28:

The PSUSB\_28 can be mounted in many different ways from using double sided tape or by hard mounting using the integrated 5mm mounting tabs. The dimensions for these mounts are provided on the Mounting Schematics Page.

#### Notes:

**Connection Length** - The PSUSB\_28 control box inputs are completely diode isolated with pull-up resistance to provide error free button actuation over longer connection lengths. The unit has been fully tested with ethernet cables up to 3 meters and semi-tested with ethernet cables of 10 meters without issue. Environmental conditions could cause shorter or longer wire lengths to be used effectively.

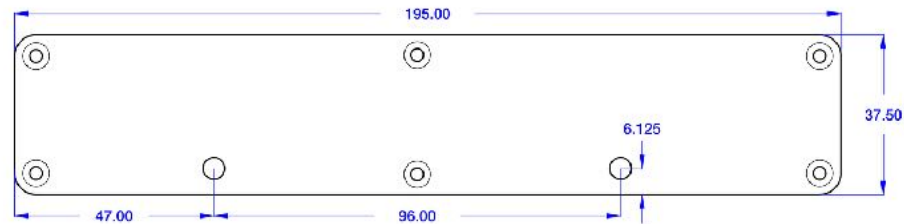
**DIY Supported Capability** - The PSUSB\_28 control box inputs allow for DIY connections through the RJ45 plugs if you are inclined to do so. Pins 1-7 on each RJ45 port correspond to an independent button which can be triggered with any momentary release button you choose. Pin 8 is a common ground.

As mentioned in the Connection Length notes above all inputs are diode separated and have installed pull up resistors so they are capable of being used without any additional hardware needed.

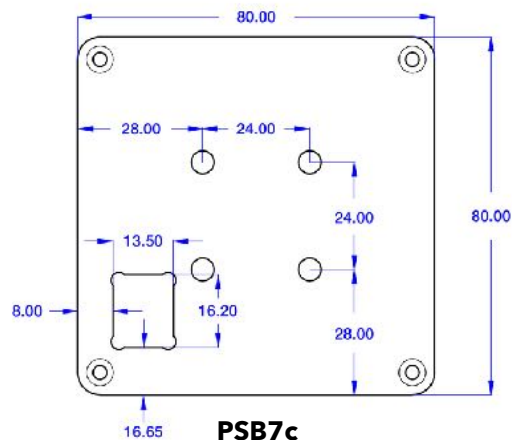
Encoder programming for 1:1 (full greyscale cycle, 4 pulse per detent) encoders is enabled through the dip switch. When the encoder programming is enabled Pin 1 is a standard button input while Pins 2+3, 4+5, and 6+7 are linked for encoder decoding. Pin 8 remains a common ground when encoder programming is enabled.

# Mounting Schematics

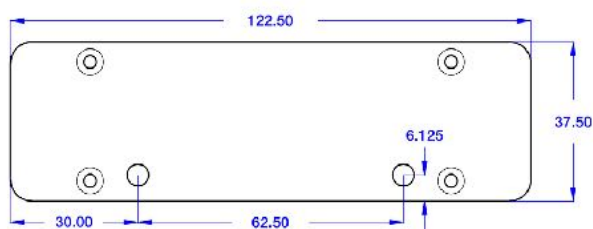
*Dimension and Shape...*



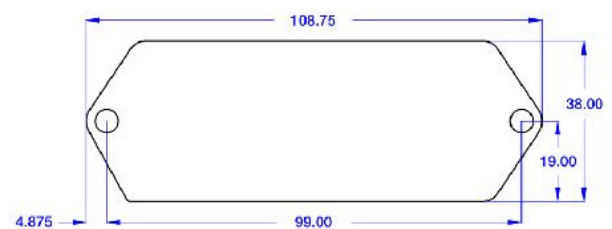
**PSB7s**



**PSB7c**



**PSB3e**



**PSUSB\_28**

## Notes:

**Measurements** - All measurements are provided in millimeters

**Scale** - the drawings provided on this page are not actual size but are to scale of the actual parts..



## About, Contact, and Customs Information...

### Contact Information

*Address:*

Penguin r/c  
1230-P North Jefferson Street  
Anaheim CA 92807

*Website:*

Main - [www.penguinrc.com](http://www.penguinrc.com)  
Simulation Site - [click here...](#)

*email:*

[simulation@penguinrc.com](mailto:simulation@penguinrc.com)

*Phone:*

714.630.9015

*Fax:*

714.630.6250

### Catalog Notes

**Pricing** - There are no prices in this catalog. Current pricing can be found on our website along with further information.

**Ordering** - Throughout this catalog there are "Visit our website..." links that will open up the ordering page for the items in this catalog.

**Questions** - Feel free to email us at any time.

### About us...

Penguin r/c was opened in April of 1997 with the intent of creating the best products that could be made for reasonable prices. Originally we started business focusing on aftermarket parts and chassis upgrades for high performance remote control vehicles, pinpointing the areas where existing cars could be made to perform beyond their original design. Penguin r/c made a name for itself by achieving this goal through products where the additional performance gained far outweighed the cost of the parts. Having racked up a couple of championships and a good name in the market place we slowly transitioned into becoming a more involved OEM supplier for other manufactures in the r/c industry and other industries. We still sell and support our r/c products to this day and will continue to do so with every product we produce. In 2010 we started manufacturing parts for a high-end simulation company and found a renewed love for racing in the form of iRacing and Simulation equipment. In 2018 we decided that we could bring our expertise in manufacturing and design to the Simulation products market and started researching and designing what you see today. We hope to bring the same values and customer support to the simulation marketplace as we have for years as an OEM manufacturer and part supplier to the r/c industry.

### Custom Designs...

Penguin r/c is capable of Custom Manufacturing and Design of prototype and production parts for individuals and companies. Most of our manufacturing is done in-house which allows us significant control over the quality and assembly of parts we manufacture and allows us to make prototypes that have the quality and durability of production pieces. If you have anything that you would like to produce please feel free to contact us about the possible product.