RG-3W
Operation Manual

Link to Current Manual	Version	Release Date	Description
	1.0	02/01/22	Initial release document
	1.1	02/10/22	Updated graphics and information
	1.2	2/11/22	Added LED status indications.

Table of Contents

Introduction

This manual explains the operation, installation, maintenance, and troubleshooting of the ***ReactionGate***™ RG-3W light system for version 22.01.05. The version number is the year, month, and day of release. No printed manual is provided with the product as this manual is available only online and thus updates are readily accessible.

ReactionGate™ is a training and evaluation tool that enhances rider reaction time, strengthens focus, and helps improve riding skill. Commonly utilized in the " Brake and Escape" or "40 mph Deceleration" evaluation patterns, the ***ReactionGate***™ senses vehicle position, vehicle speed, and provides lighting indicating lanes of traffic to avoid as well as flashing if the vehicle is under speed. Eliminating the need for an additional personnel with flags or other means on the course, the system provides a level of consistency needed for proper scoring/evaluation as well as allowing all instruction personnel to remain safely clear of the moving vehicles.

The system operates on AA batteries which makes it versatile in a variety of configurations and very useful in setting up temporary cone patterns in various locations.

Additional features for the system include a counter which determines the number of times that the *Gate* has been crossed and the ability to change parameters for a variety of vehicle types and lengths. Some applications have included motocross courses with multiple tracks and the ***ReactionGate***™ sends riders on the "high road" or the "low road" completely randomly.

ReactionGate™ is a product of the U.S.A., developed and manufactured by Public Safety Innovation, Inc., Sacramento, CA.

Important Safeguards

- Read and understand all instructions.
- Always turn off all Units when not in use.
- Avoid excessive exposure to moisture, do not submerge.
- Do not expose batteries to excessive heat.
- Inspect the system daily for signs of wear, cracks, damage.
- Remove batteries for system storage longer than 60 days.

Environmental Considerations

All Reaction Gate products are weather resistant and are sealed against light rain and external moisture. Weep holes at the bottom of each unit allow for the escape of trapped water so at no time should the devices be installed upside down.

Internal electronics are sensitive and the units should not be exposed to excessive forces or dropped from a significant distance. There are no user-serviceable parts inside and the housings should never be opened by anyone other than PSI trained technicians.

RF Notification

Contains FCC ID: 2AC72-ESP32WROOM32U 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.	FC CE

WARNING: To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance are not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

System Identification

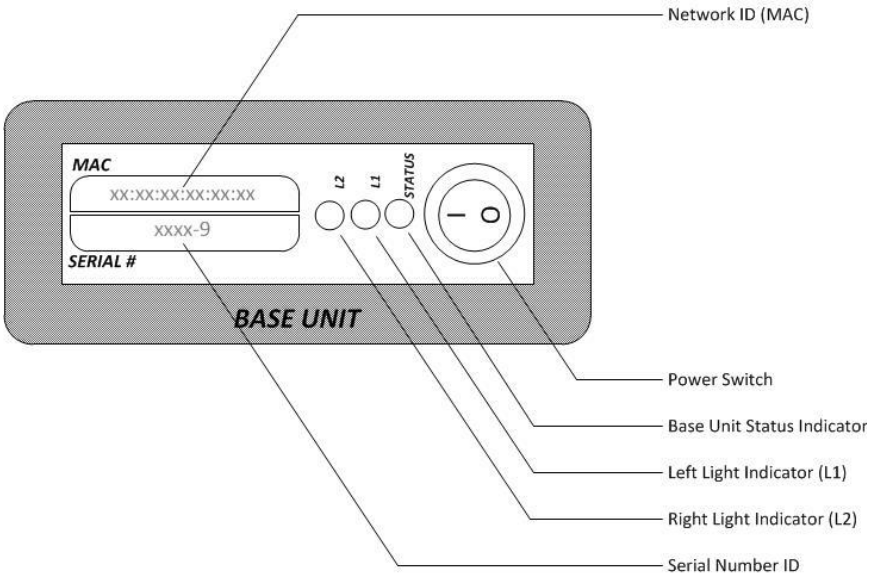


Figure 1: ID Plate Information

Serial Number Identification:

xxxxx-x

When a system is shipped, all units within the system share the first five characters of the serial number (xxxxx). The last digit of the serial number indicates whether a device is a Base Unit, or which particular Light Unit. Since the system is synchronized with an RF channel and a network ID, it is essential that units of the same base serial number operate together.

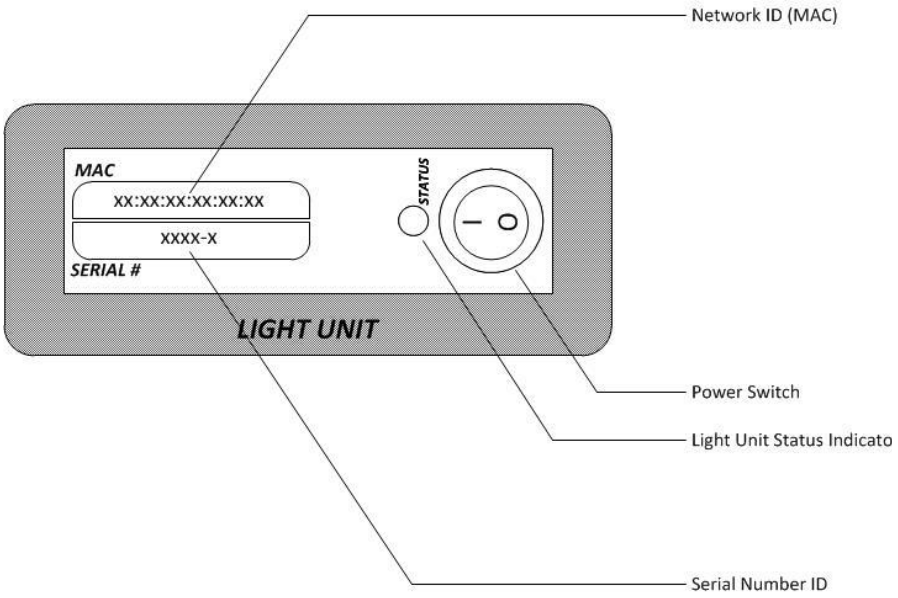


Table 1: Serial Number Identification

xxxxx-0	System (case)
xxxxx-9	Base Unit
xxxxx-1	Light Unit 1
xxxxx-2	Light Unit 2
xxxxx-{3-8}	Light Unit {3-8}

The components of each system are uniquely paired and thus other systems will not interfere with the operation, however components may not be interchanged. No field modifications are possible and any changes or re-configuration requires factory service.

MAC

Each component of the ***ReactionGate***™ has a unique ID that allows for system configuration. This is the MAC (Medium Access Controller) field. When replacing or augmenting an existing system this number is critical for configuration. Additionally, the last four of the MAC identify the WiFi SSID utilized for configuration and operation.

System Setup

Battery Installation

Each Light Unit and the Base Unit has two access doors at the back for replacement of the AA batteries. Install eight new AA batteries (do not mix old and new batteries or various battery types) while paying attention to the polarity indicators.

Always remove batteries from all *Units* when the system is stored for more than 6 months. Leaving batteries installed will result in battery corrosion and damage to the *Units*.

Battery Selection

The ***ReactionGate***™ is designed for operation with Alkaline AA batteries. In each *Light Unit*, and the *Base Unit* are battery compartments that hold 8 AA batteries. While the system will operate with Alkaline, Nickel Cadmium (NiCad), Nickel Metal Hydride (NiMH), or Lithium Ion AA style batteries; performance will vary with the various types of batteries.

If using disposable batteries, a quality alkaline battery (such as the Energizer E91) will provide approximately 15 hours of service. The Lithium battery will provide a longer run time and when used in the *Light Unit*, they will maintain maximum brightness throughout the operational time. This is superior to the alkaline batteries which will gradually dim with use.

Table 2: Battery Types and Run Times

Battery Type	Reuse	Base Unit Approximate Run Time	Light Unit Approximate Run Time	Notes
Lithium	Disposable	15 hours	20 hours	*Preferred Battery*
Alkaline	Disposable	15 hours	20 hours	Lights dim as batteries drain
Budget Alkaline	Disposable	12 hours	15 hours	
NiMH	Rechargeable	7 hours	10 hours	
NiCd	Rechargeable	4 hours	5 hours	Batteries have memory

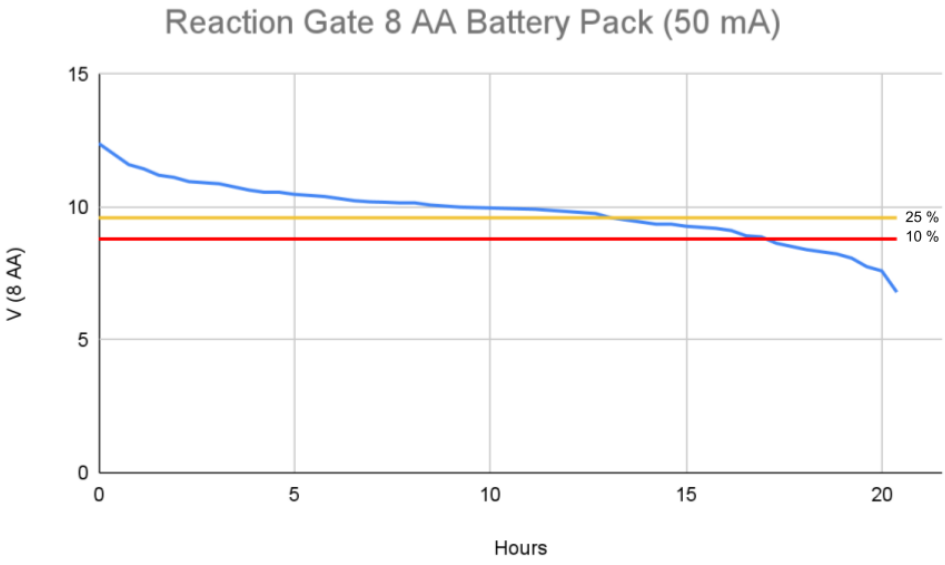
Electrical specifications:

- Base Unit: 130 mA (1.6 W)
- Light Unit: 70 mA (0.8 W) stby, 180 mA (2.2 W) illuminated

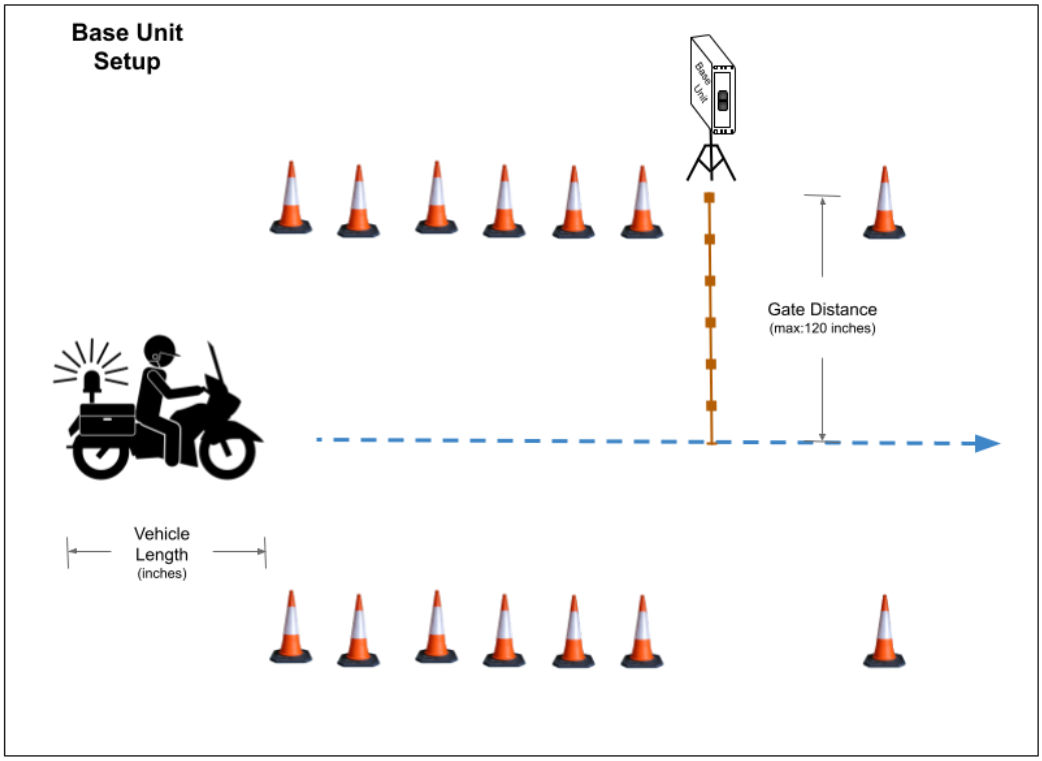
Low Battery Indication

Base Unit: Power LED and application LED illuminate yellow / red.

Light Unit: Power LED and application LED illuminate yellow / red. Also, only the center lights illuminate.



Base Unit Setup



The *Base Unit* must be set up with the *Gate* (beam) pointed across the lane of traffic. A vehicle can be detected up to 10 ft from the *Base Unit* and this parameter is also configurable in ***Setup***. Also shown in the above graphic is the Vehicle Length parameter which is utilized in determination of vehicle speed through the *Gate*.

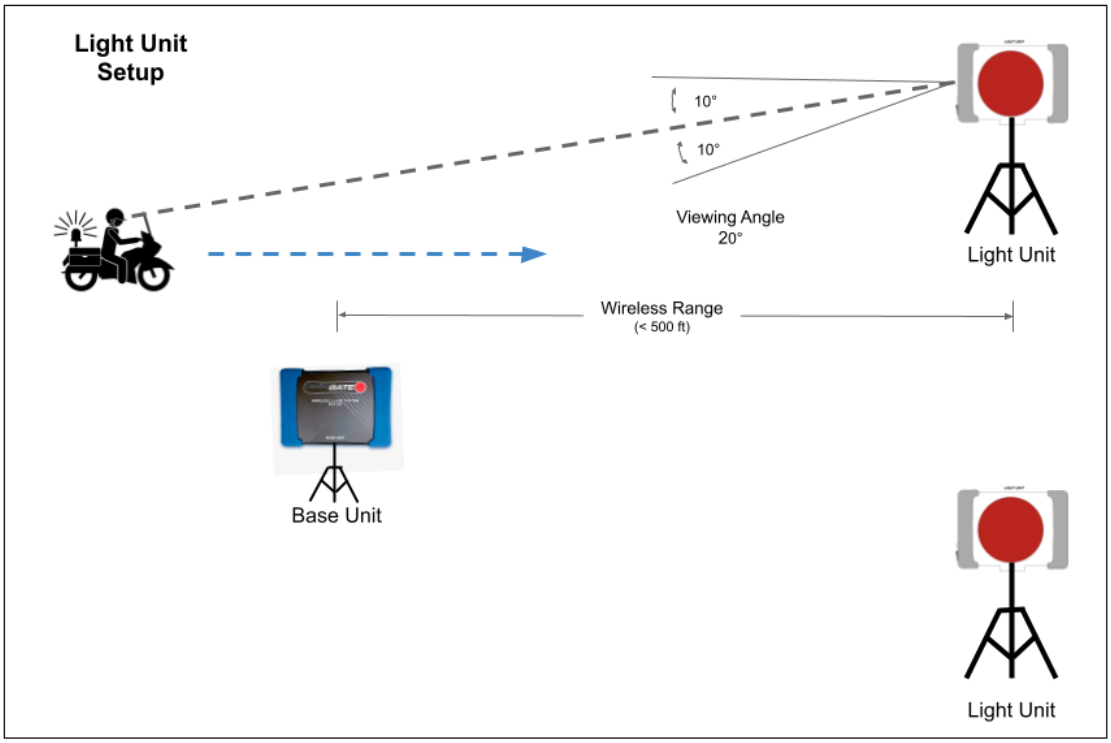
The “Gate” is typically set up to the side of the cone pattern with a clear view of the vehicle entering the pattern. Best practice is to set the Gate Length to the width of the traffic lane to avoid false triggering by personnel or equipment outside the cone pattern. Inside the Case is a tripod that the Base Unit will mount to. Typical height should be 20 inches “ such that the front and rear tire/bumper is detected by the system. The Gate must detect the entire vehicle to accurately determine the fault speed.

Set the Base Unit and turn the Base Unit power on. For safety of the Base, it should be set back from the traffic lane by a safe distance.

As the *Base Unit* powers up, self check will illuminate (L1, L2, Status) LEDs green then red. Battery status is shown in the Status LED for 5 seconds and then system enters Run Mode:

- Status LED - Green if *Gate* is clear, red if *Gate* is obstructed.
- L1/L2 LED - Blinks green 1/sec if communications with the *Light Unit* is good. Blinks red 1/s indicates no communications with that *Light Unit*.
- All LEDs blink simultaneously if communications is good between all devices.

Light Unit Setup



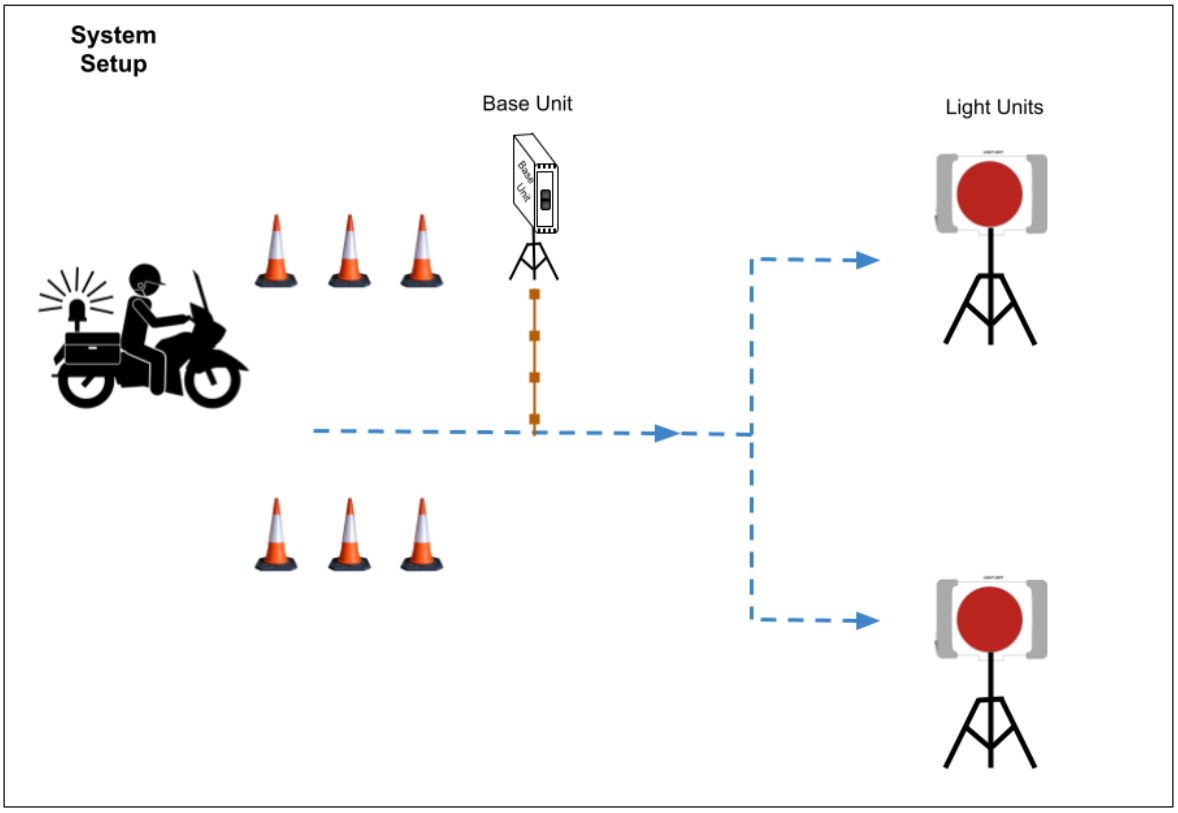
Light Units are placed on the course, typically as an indication of an object to avoid. The lights utilized in the system are brake lights and thus have a viewing angle of +/- 10°. While the *Light Units* are typically set up closer to the *Base Unit*, the wireless range between the *Base Unit* and *Light Units* must not exceed 500'. At this distance the *Light Units* may become difficult to see as well.

Light Units are equipped with mounting hardware that allows for attachment to a 1 ¼" or 1 ½" mast. This mast is standard in the Tripod Kit (TRI-2). Locate the tripods and Light Units down the course in the manner that suits the test.

As the *Light Unit* powers up, self check will illuminate the Status LED green then red. Battery status is shown in the Status LED for 5 seconds and then system enters Run Mode:

- L1/L2 LED - Blinks green 1/sec if communications with the *Light Unit* is good. Blinks red 1/s indicates no communications with that *Light Unit*.
- All LEDs blink simultaneously if communications is good between all devices.

System Setup



While there can be a variety of applications, the most standard configuration of the ***ReactionGate***™ is illustrated above with the *Base Unit* as the trigger for randomly illuminating one of the *Light Units*.

Application

Settings and Configuration

Configuration settings and system status are accessible from any Smart device that can access the WiFi signal of the ***ReactionGate***™ Base Unit.

WiFi ssid: RG_xxxx
Password: reaction

where xxxx = <last four characters of MAC ID> (ex: RG_2D64)

Each Base Unit has a unique ID that allows for independent access. The last four characters of the MAC ID will be the last four of the WiFi ssid. The factory password remains the same for all devices.

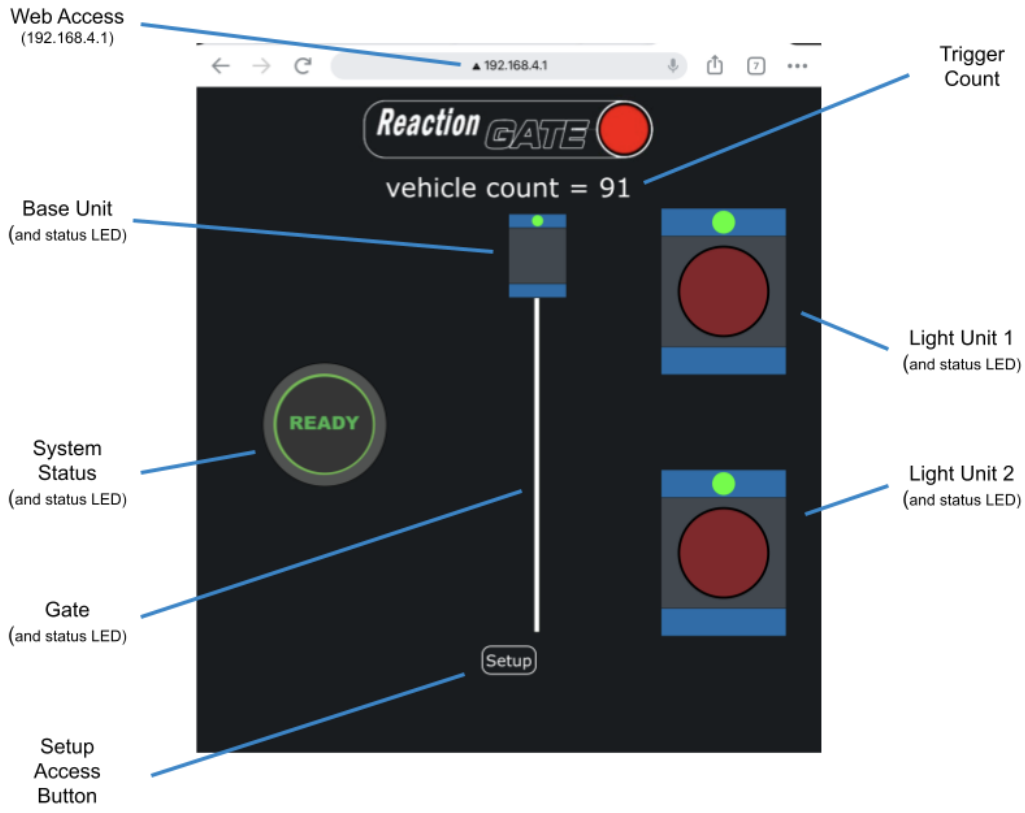
iOS access: /Settings/Wi-Fi/

iOS access to Wi-Fi

Once successfully logged in to the WiFi, use a Browser (Chrome, Safari, Firefox, etc.) to browse this address:

IP Address: 192.168.4.1

Using Chrome to access *ReactionGate*™



Home Interface of the *ReactionGate*

Web Access: Browser search bar. Enter 192.168.4.1 *AFTER* connecting to the RG WiFi.

Trigger Count: Number of times that Gate has been triggered. Use <*Setup*> to reset to zero.

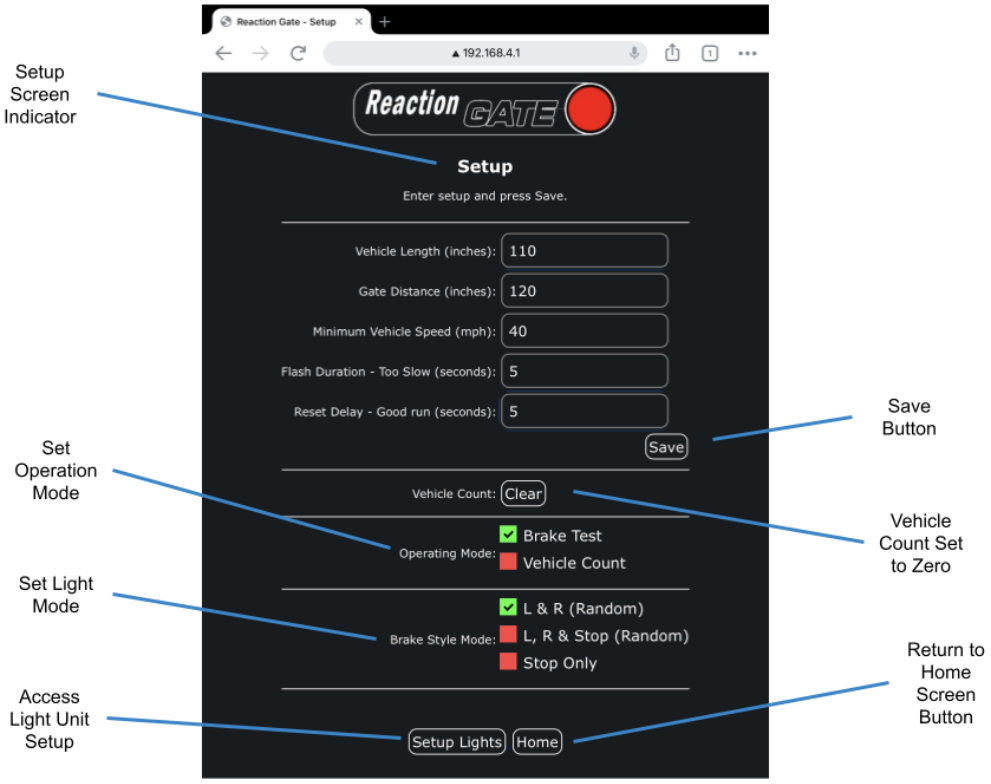
Base Unit: Status LED indicates battery power status. Press icon to trigger all lights.

Gate: This indicator shows the status of the beam. White = clear, Green = broken. Press the Gate to trigger the system manually.

Light Units: Status LED indicates battery power status. Press icon to illuminate light.

System Status: Green “Ready” indicates self test complete and all components are ready. After the Gate is triggered, this will display vehicle speed or fault status.

Setup: Press this button to access system configuration and information.



Setup Screen of the *ReactionGate*

Setup Parameters

Factory defaults are listed below. For accurate representation of vehicle velocity, the length of the actual vehicle (measured at the height that the gate is set) will yield the most accurate results. This value is utilized to determine a faulted run (velocity below 40 mph).

- Vehicle Length (Default 110 inches)
  - The length of the vehicle is used in determining the speed of the vehicle.
  - $Fault\ Speed\ =\ 0.057\ *\ \frac{Vehicle\ Length\ (in)}{Time\ in\ Gate\ (seconds)}$
  - Typical full-dress motorcycle length = 94 in
  - Typical full-sized car length = 212 in
- Gate Distance (Default = 120 inches) - This value (10” - 120”) sets the distance from the Base Unit where an object will be detected.
- Minimum Vehicle Speed (Default = 40 mph) - Sets the “Fault Trigger” where rider is not moving fast enough when passing through the Gate.
- Flash Duration (Default = 2 s) - Defines how long the fault will flash.
- Reset Delay (Default = 2 s) - This is the number of seconds after the Gate is triggered that it cannot be triggered again. This prevents false triggering.

Vehicle Count

This button is used to reset the counter to zero. Each time the Gate is triggered this counter is incremented by one.

Operation Mode (Default = Brake Test)
The default Operation Mode is the “Brake Test”. In this mode, the Gate is triggered when the beam is broken. If the object passing through the beam is moving at a speed faster than the “Minimum Vehicle Speed” then one of the two Light Units will illuminate, indicating a condition to be avoided by the rider. After the lights flash, the system resets to ready for the next rider.

“Vehicle Count” mode provides a larger display for showing an indication of the number of times that the system has been triggered. *Light Units* will not illuminate in this mode.

Brake Style Mode (Default = L & R random)

This field is how the Light Units will respond to a Trigger.

L & R (random)
Left or Right Light Unit will illuminate - randomly selected.

L, R & Stop (random)
This mode has three states for a modified version of the Brake and Escape where there are three options. Randomly, the left or right Light Unit will illuminate or a third option is for both Light Units to illuminate. This third state is used by some courses to indicate a complete stop instead of passing through one of the lanes.

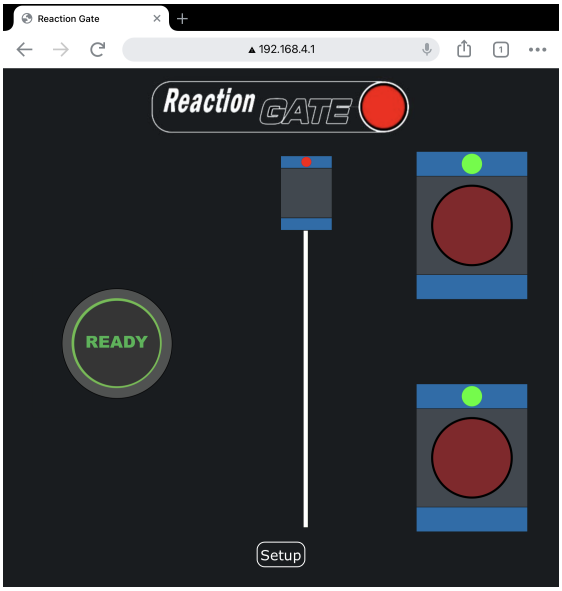
Stop Only
Both lights illuminate whenever the Gate is triggered. This can be used at a checkpoint where the system is being used to count vehicles. Each time a vehicle approaches, the red lights illuminate, indicating a stop request.

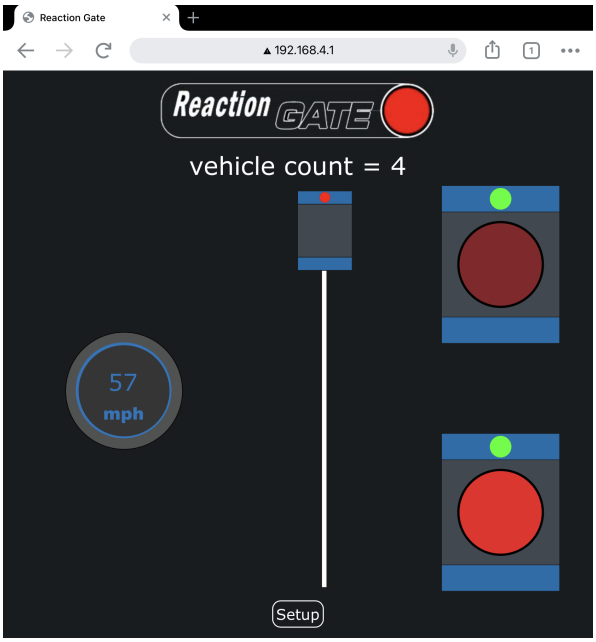
Setup Lights
There are no user adjustable settings in this menu. This is where the MAC address of each *Light Unit* it set to communicate with the *Base Unit*.

Home
This button leaves this screen without making any changes and returns to the Main screen display.

Operating the System

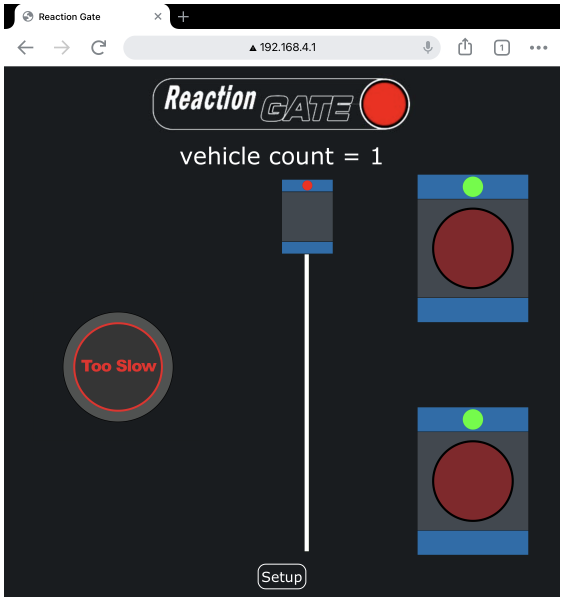
With the system ready and *Light Units* communicating with the *Base Unit* the <Ready> light will illuminate. The Gate is represented by the vertical white bar and when an object blocks the Gate, this icon will flash.





A successful trigger of the Gate at a speed at or above that set in <SETUP>, one of the Light Units will illuminate and this will also be shown in the display. Additionally, an actual speed rating will be shown on the <Ready> button.

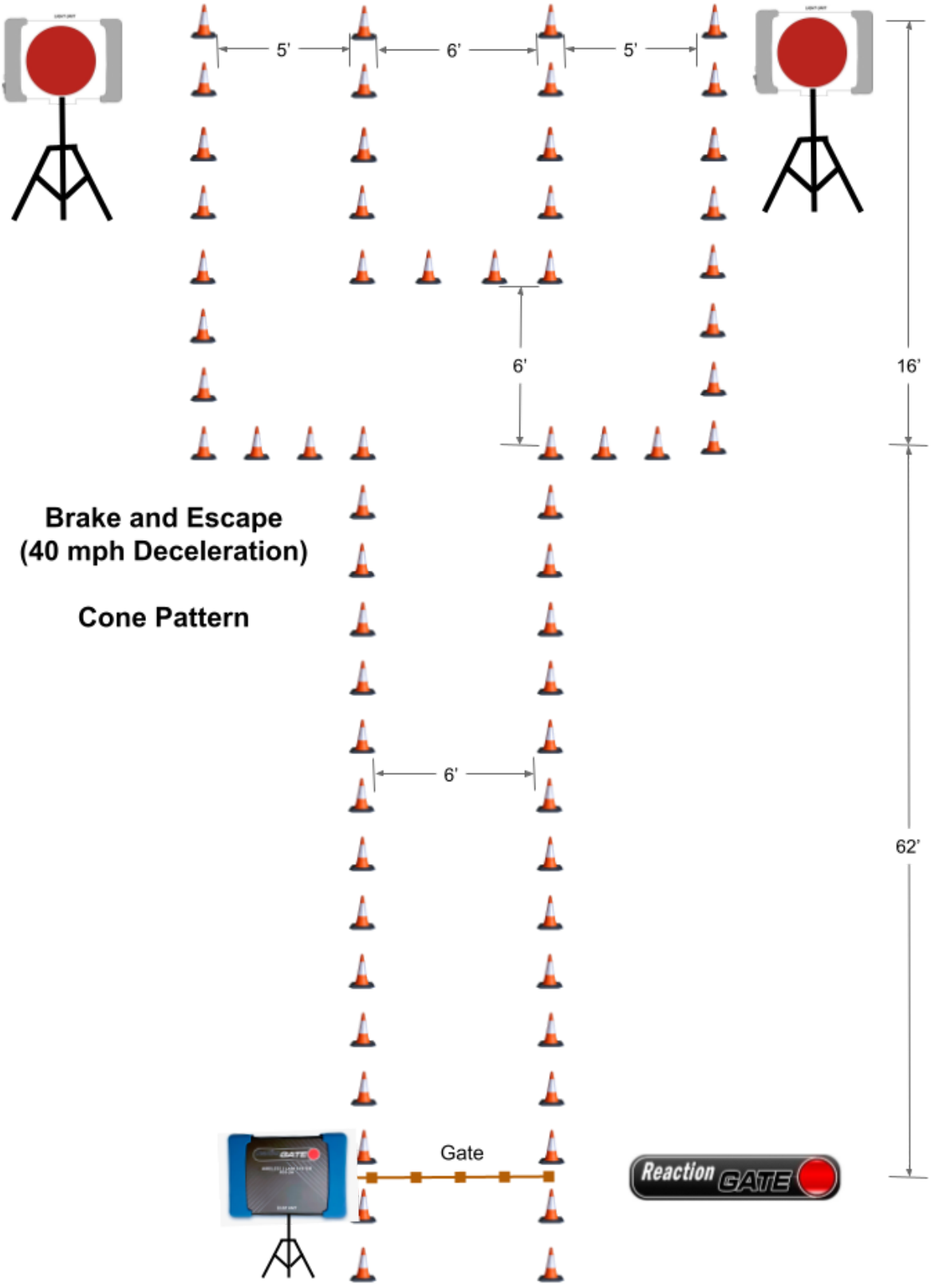
If the rider passes through the Gate at less than the speed threshold set in <Setup>, the system will flash both Light Units simultaneously and will display "*Too Slow*" on the display:



Specifications

Dimensions L x W x H	TBD
Unit Dimensions L x W x H	7 3/8 Lx2 1/8 Wx5 3/8 H per unit
Weight	TBD
Unit Weight	Base Unit - 22.5 oz (637 g) Light Unit - 25.2 oz (714 g)
Base Unit standby power	130 mA, (1.6 W)
Base Unit triggered power	120 mA, (1.5 W)
Approximate run time (Base Unit)	15 hours
Vehicle Length	1 - 500 in
Gate Distance	10 - 120 in
Vehicle Speed	5 - 120 mph
Light Unit standby power	70 mA (0.8 W)
Light Unit triggered power	180 mA (2.2 W)
Approximate run time (Light Unit)	20 hours
Flash Duration	1 - 60 s (default 5 s)
Reset Delay	1 - 60 s (default 5 s)

Cone Pattern - Brake and Escape / Forty mph Deceleration



Service

Troubleshooting

Range Degradation

If the range of the system seems degraded, first check ***batteries*** or replace with fresh AA Lithium-Ion or Alkaline Batteries.

Radio Interference is possible in some circumstances. This device operates in the 2.4 GHz ISM band which is the same frequency band utilized by wireless routers, microwave ovens, and many modern devices. Due to the low power nature of these devices, they would have to be in close proximity to generate interference but this could be an issue. Particularly in the case where a Police Motor unit is utilizing some form of Wi-Fi for their Mobile Data application. In this case, turn off this particular device during the training session. All Reaction Gates operate on the upper limit of available channels to minimize this sort of interference.

Repair and Exchange

Repairs or returns must first obtain a Return Merchandise Authorization (RMA) via email through PSI, Inc. Equipment will be returned to PSI, Inc. at Customer expense. Return shipping (if required) will be billed appropriately along with any costs for upgrades / repairs.

Software updates

Any software updates must be completed by factory service. If this is required, obtain an RMA and return the system to PSI, Inc. for any required updates and configuration.

Links and Resources

- Reaction Gate Information, PSI https://www.publicsafetyinnovation.com/products_reaction_gate.htm
- MCRider Brake and Escape Video https://www.youtube.com/watch?v=eHU556MK90A
- TOPS Motorcycle Training Video https://www.youtube.com/watch?v=UILe5YDA4B8
- Setcom Police Motor Training (cone pattern) https://setcomcorp.com/course-maps/advanced/police-motorcycle-rodeo-course-brake-evade.pdf
- Braking Capabilities of Motorcyclists - Nathan Rose https://www.nathanarose.com/blog/braking-capabilities-of-motorcyclists-a-literature-review
- Motorcycle Safety Foundation https://www.msf-usa.org/

Limited Warranty

Public Safety Innovation, Inc. (*PSI*), the "Manufacturer" (EIN 41-2036933), provider of the Reaction Gate wireless driver and rider training and evaluation tool, warrants to you, the end-user ("*You*"), that the Reaction Gate hardware will be free from defects in workmanship and materials for a period that concludes one (1) year from the date that the Reaction Gate system was first purchased by You as an original end-user (the "Warranty Period").

This Limited Warranty is not transferable. During the Warranty Period, the Reaction Gate hardware, or one or more of the Reaction Gate components, will be repaired or replaced at PSI's option, without charge for either parts or labor. If the hardware (or component thereof) is repaired or replaced during the Warranty Period, the Warranty Period will expire upon the later of the 91st day after repair or replacement or one year from the date of original purchase.

Warranty claims must be submitted to PSI Customer Support at 1-888-600-3143 or support@publicsafetyinnovation.com within the applicable warranty.

This Limited Warranty does not apply to normal wear and tear or if any component of the Reaction Gate system is opened or repaired by someone not authorized by PSI, and does not cover repair or replacement of any Reaction Gate hardware damaged by misuse, moisture or liquids, proximity or exposure to heat, accident, abuse, neglect, misapplication, or defects due to repairs or modifications made by anyone other than PSI or its authorized service representative. This Limited Warranty does not cover physical damage to the surface of the Reaction Gate hardware, including cracks or scratches on the light or beam optical surfaces.

Reaction Gate should be utilized in controlled training environments under supervision of trained professional instructors. PSI disclaims any liability on its behalf and on behalf of its resellers for events or damages resulting from such reliance or the failure of the system to perform.

This Limited Warranty is governed by the laws of the State of California.

Reaction Gate is registered with the US Patent Office: 60,156,923

If this Limited Warranty is translated into a language other than English, the English version will prevail to the extent that there is any conflict or discrepancy in meaning between the English version and any translation thereof. If there is any inconsistency between this Limited Warranty and any warranty included in the packaging of the Reaction Gate system,
the provisions of this Limited Warranty shall apply to the extent of such inconsistency.

Reaction Gate is a product of Public Safety Innovation, Inc., 9910 Horn Rd #1, Sacramento, CA 95827.