Vizible Technologies

SupaBrake
Third Brake Light Modulator 4K

(SBT-4K)
aka. **SBT-4096**

User Guide
Rev 1.1

Contact email@vizi-tec.com for more information

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WARRANTY & SPECIFICATION:

3 Year Limited Warranty!

We take pride in our products and stand 100% behind our design, workmanship and most importantly customer satisfaction. We offer a full 3 year limited warranty with this product.

Firmware History:

10/12/17: [v1.0x] Ported over from v3.52 SB3 to new SBT hardware. SB3 engine designed to be access slide switches.
05/08/18: [v1.1x] Tweaked timing and minor bugs. Updated CANBus protocol.

Mechanical Dimensions:

Unit body:

- Height = 8mm (0.315 inches)
- Length = 24mm (0.945 inches)
- Width = 35mm (1.378 inches)

Wire length:
175mm +/-10mm (7 inches +/-0.5) *Exclude connectors

Electrical Dimensions:

Wire gauge = 20 AWG.

Red = Input brake signal(+)
Black = Ground(-)
White = Modulated output

Input Voltage = 9.5VDC to 16VDC
Constant load current = 3.00 Amps @ 23C
Quiescent current = 700 uA

Operating Temperature = -30C to +50C
Storage Temperature = -40C to +95C

Fully compatible with all OEM light devices (bulbs or LEDs)

2 wire configuration with or without PWM technique

CANBus compliant

FEATURES & FUNCTIONS:

Product Application:

The SBT-4K (*Supabrake-Third Brake Light Modulator*) is based on our popular, best in class, third generation SB3. The SBT-4K comes packed with over 4 thousand profiles(4096 total) that are configurable on the fly through a 12 position toggle switch located on device. *Figure 1* shows the 12 selectable position toggle switch. From left to right are positions 1 thru 12.

The SBT-4K is specifically designed to work with any two-wire brake light devices - bulbs or LEDs. Such as those commonly found on the rear window of cars and trucks; Also known as a third brake light or high mount brake light. Most third brake lights operate on a simple two wire scheme and only active when the brakes are applied. They remain off at all other times. This results in a lack of constant power to run the SBT's time based algorithm. That is where the SBT comes in. It utilizes super capacitor technologies to quickly store a tiny amount of power in a very short period of time, thus allowing its internal micro-controller to process the algorithm.

Smart Algorithm:

(Standard)
(Usage = Automatic)
Upon applying the brake(s), the unit will send a burst of pulses to the vehicle's brake light(s). The duration of the burst is a function of the time elapsed between the current braking cycle and the previous brake cycle. After this initial burst, this unit allows the brake light(s) to function normally (solid brake light). (This algorithm is designed to eliminate target fixation as found in cheaper, passive products that continuously "blink" the brake light(s) even though the vehicle is at a complete stop.) A time domain chart can be viewed at the end of the document or at www.vizi-tec.com. The duration of the burst varies based on the profile selected. The SupaBrake-Third Brake Light Modulator offers over 4096 different profile combination.

4096 Profiles:

(Standard)
(Usage = Manual)
User can select from over four thousand profiles on the fly via numerous slide switches. No need to remove or plug in a USB cable or any external hardware to configure the kit. Full access to the algorithm is granted via the 12 slide switches. See page 5 to for switch definitions and address.

Easy Plug and Play:

(Standard)
No need to cut, splice into the vehicle's electrical harness. Simply unplug the stock connector that interfaces the third brake light from the main harness. Plug the device in series. Done!

We have been manufacturing brake light modulators for over a decade and offer a wide selection for many popular motorcycles and cars/trucks rear window third brake light. Chances are we have a plug and play kit for your vehicle. If you don't see one listed contact us at email@vizi-tec.com and we'll work with you to make a custom kit at a discount.

Grace Period:

(Standard)
(Usage = Automatic)
The SBT-4K will not modulate the brake light if the brakes are applied more than once within a certain time period. This is very useful in heavy traffic so as not to annoy the person in the vehicle following behind. Its attribute can be set to 0 seconds, 3 seconds, 6 seconds or 12 seconds. Selecting 0 seconds defeats this function and allow the SBT-4K to modulate the brake light on each and every brake application. See page 9 for more details.

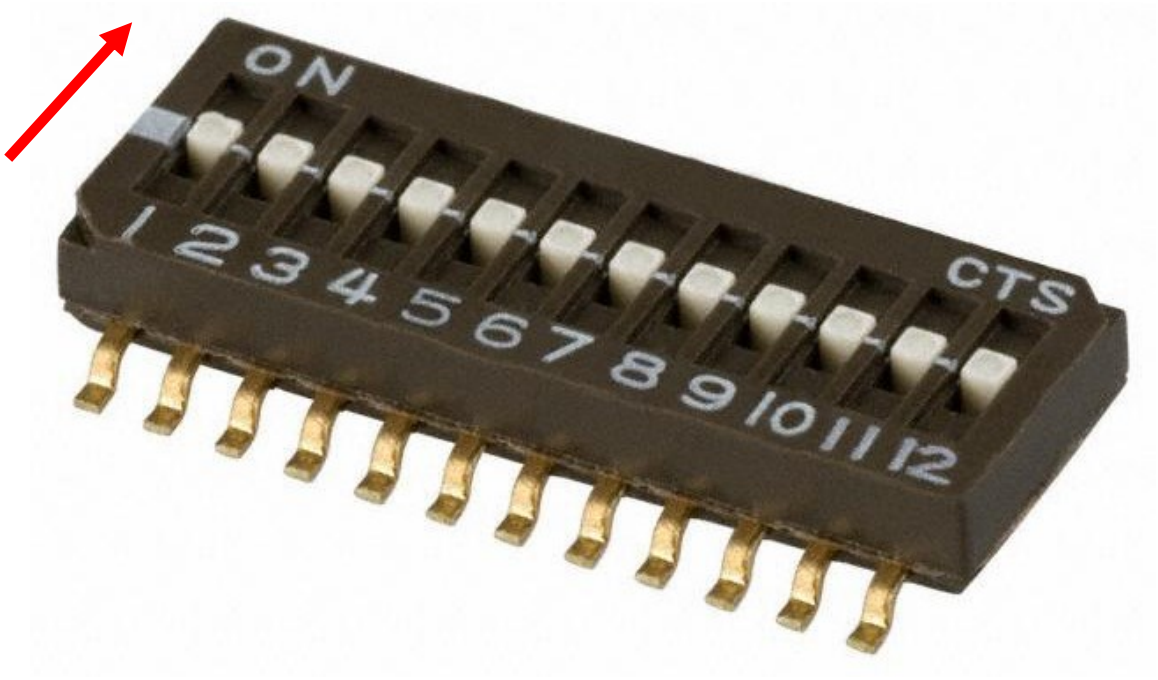
Decaying Flash Routine:

(Standard)
(Usage = Automatic)
The burst of pulses is such that the period of the first pulse is slightly shorter than the following pulse and so on. This means that the initial pulses will be faster whereas the later pulses towards the end of the burst will be slower. When viewed at speed and following from behind, the impressing of decreasing speed is enhanced. There are 4 preset levels for this. Ranges from NONE to roughly 10% compounded decay. If 'None' is selected the Decay level is defeated. Thus all pulses will have same period. See profile attribute for more details on page 12.

Profile Selector:

(Usage = Manual)

The SBT-4K allows the user to reconfigure the behavior of the profile on the fly with its 12 selectable slide switches. Figure 1 shows the slide switch. From left to right are positions 1 thru 12. The red arrow depicts toggle position 1 located far left. Shown in the "ON" up position.



(Figure 1)

Below is the order of the 5 attributes and number of variables associated within:

Attribute #1	GRACE_PERIOD	position 1, 2	4 variables	*(Page 6)*
Attribute #2	FREQUENCY	position 3, 4, 5	8 variables	*(Page 7)*
Attribute #3	MODULATION	position 6, 7, 8	8 variables	*(Page 8)*
Attribute #4	SLOPE	position 9, 10	4 variables	*(Page 9)*
Attribute #5	DECAY	position 11, 12	4 variables	*(Page 10)*

To see a detailed listing of their variables go to page number as listed above.

Caution:

Testing the attributes may cause the battery to discharge. Consider running the engine while doing such configuration. Make sure to have good air ventilation when performing such tests inside.

ATTRIBUTE DEFINITIONS:

Attribute#1 – GRACE PERIOD definitions:

(switch location)

SWT 1	SWT 2	SWT 3	SWT 4	SWT 5	SWT 6	SWT 7	SWT 8	SWT 9	SWT 10	SWT 11	SWT 12

Toggle Switch Position	Value
1=Off 2=Off	0 seconds
1=Off 2=On	3 seconds
1=On 2=OFF	6 seconds
1=On 2=On	12 seconds

This is the first of five SBT profile attributes. It determines the offset of the algorithm. Meaning the delay at which the first pulse will appear after the previous brake cycle. Setting this to “0 seconds” removes the offset and allows the modulation◊ to be generated right away on each press of the brake.

Setting this attribute to “6 seconds” will not allow the modulation to happen until a period of 6 seconds or greater has elapsed. We recommend keeping this value above “6 seconds” setting to not annoy the vehicle behind. From factory this is set to “12 seconds”. This is a great feature during heavy stop and go traffic. Use it!

Note: Profile updates do not take effect until after the next brake cycle.

Attribute#2 - FREQUENCY definitions:

(switch location)

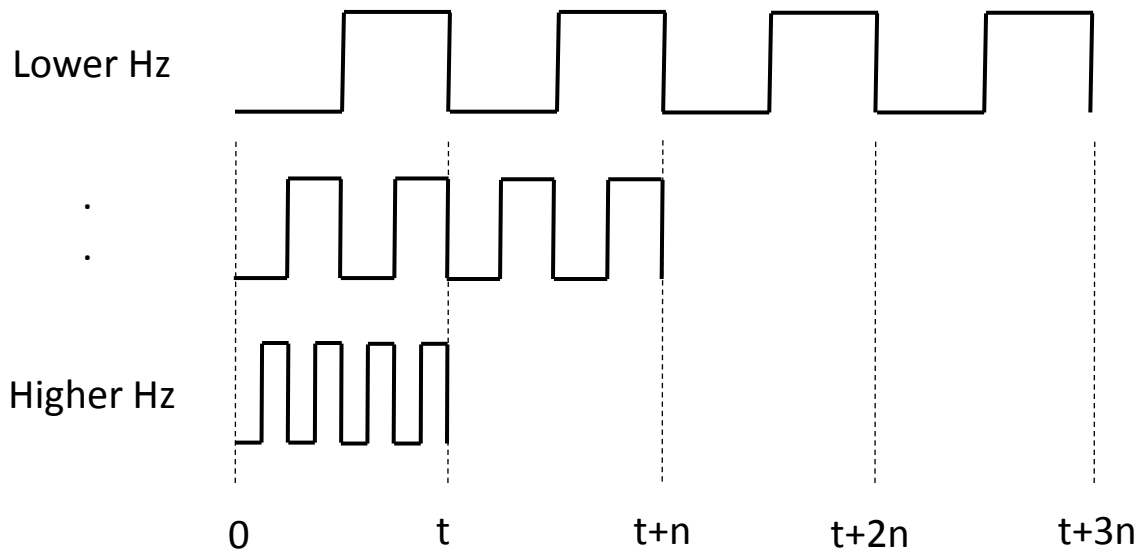
SWT 1	SWT 2	SWT 3	SWT 4	SWT 5	SWT 6	SWT 7	SWT 8	SWT 9	SWT 10	SWT 11	SWT 12

Toggle Switch Position	Value
3=Off 4=Off 5=Off	4 Hz
3=Off 4=Off 5=On	6 Hz
3=Off 4=On 5=Off	8 Hz
3=Off 4=On 5=On	10 Hz
3=On 4=Off 5=Off	12 Hz
3=On 4=Off 5=On	14 Hz
3=On 4=On 5=Off	16 Hz
3=On 4=On 5=On	20 Hz

This attribute speaks for itself. It determines how fast or slow the modulation will be. The lower the frequency the slower the pulses. The higher the frequency the quicker the pluses. Where 1 Hz = 1 pulse per second. 8 Hz = 8 pulses per seconds.

Note: If using filament bulbs such as the 1156 or 1157, best select the lower end of this spectrum due to the internal delay of the bulbs switching between their ON and OFF states. If running LEDs this is not an issue as they switch much faster.

Example:
The lower the setting the more time (t) it will take. The higher the setting the less time it will take to output the same amount of pulses.



Note: Profile updates do not take effect until after the next brake cycle.

Attribute#3 - MODULATION definitions:

(switch location)

SWT 1	SWT 2	SWT 3	SWT 4	SWT 5	**SWT 6**	**SWT 7**	**SWT 8**	SWT 9	SWT 10	SWT 11	SWT 12

Toggle Switch Position	Value
6=Off 7=Off 8=Off	Standard
6=Off 7=Off 8=On	Aggressive A
6=Off 7=On 8=Off	Aggressive B
6=Off 7=On 8=On	Aggressive C
6=On 7=Off 8=Off	Aggressive D
6=On 7=Off 8=On	Berserk A
6=On 7=On 8=Off	Berserk B
6=On 7=On 8=On	Berserk C

The third attribute. This can also be called the *gain* or *rise* of the profile. The lower the variable, the less modulation for a given profile. The higher the variable, the more modulation. See *appendix B (Pg.12)* for a table of how the pulse number varies with the profile time segments.

Examples:
If set to “0 0 0”= Standard” with grace period of 12 seconds and wait 36 seconds into the profile. 4 pulses will happen.

If attribute is set to “0 1 1” = Aggressive C and repeat above. 6 pulses will show.

From factory attribute may be set to “2=Standard”. This setting was carried over from SB1 and SB2 product default.

Note: Profile updates do not take effect until after the next brake cycle.

Attribute#4 - SLOPE definitions:

(switch location)

SWT 1	SWT 2	SWT 3	SWT 4	SWT 5	SWT 6	SWT 7	SWT 8	**SWT 9**	**SWT 10**	SWT 11	SWT 12

Toggle Switch Position	Value
9=Off 10=Off	None
9=Off 10=On	Slope 4
9=On 10=OFF	Slope 7
9=On 10=On	Slope 10

Attribute #4. Changes how much the 7 time segments of the profile will stretch.

The lower the variable, the more compressed or sooner the modulation happens.
The higher the variable, the more stretched out over time the profile becomes. This takes longer for the modulation to reach its max. See *appendix A* for a detailed view of how the time segments (T1 – T7) play out depending on Grace Period selected.

Example:
Assume profile attributes are:

GRACE PERIOD = '12 seconds'
MODULATION = 'Standard'
SLOPE = 'Slope5'

The algorithm profile will max out at 84 seconds.

GRACE PERIOD = '12 seconds'
MODULATION = 'Standard'
SLOPE = 'Slope**6**'

The algorithm profile will max out at 102 seconds.

We recommend keeping this in the middle for the chart. If you wish to experience the entire profile sooner then set to lower value or higher to stretch it out.

Note: Profile updates do not take effect until after the next brake cycle.

Attribute#5 - DECAY definitions:

(switch location)

SWT 1	SWT 2	SWT 3	SWT 4	SWT 5	SWT 6	SWT 7	SWT 8	SWT 9	SWT 10	**SWT 11**	**SWT 12**

Toggle Switch Position	Value
11=Off 12=Off	None
11=Off 12=On	Decay 4
11=On 12=OFF	Decay 7
11=On 12=On	Decay 10

This is where the MODULATION period gets stretched out. This attribute helps to give the appearance of a slowing down of the motorcycle when brakes are applied. The frequency decreases as the motorcycle slows down.

The lower the variable, the less the decay. The higher the variable the longer the pulses will seem to be during the end of its burst.

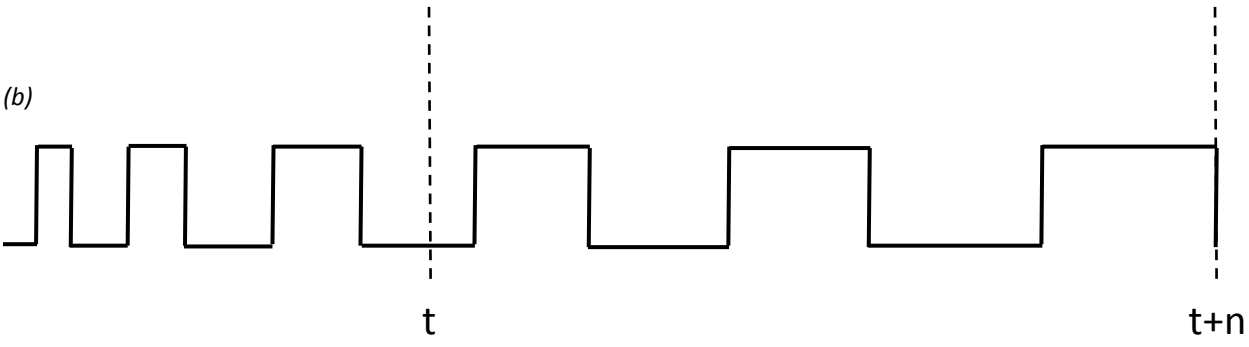
Choose “1” to keep the frequency constant. “10” for max decay. Note that selecting a high DECAY variable and high MODULATION variable can cause the pulses on the brake light to take a much longer time to play out.

Example:
Figure (a) shows how a burst of 6 pulses will look without decay when attribute is set to “1”. The period of wave form (burst) is constant.

Figure (b) shows same burst when attribute is set between 2-10. The higher the number the longer the decay ratio. Notice how each pulse is longer than the previous to give a faster frequency at the start of the burst and slower towards end. (Figures below not to scale).

(a)

(b)



Note: Profile updates do not take effect until after the next brake cycle.

Appendix A:

Time Segments vs. Grace Period (seconds)

	0 sec	3 sec	6 sec	9 sec	12 sec	15 sec	20 sec	30 sec	40 sec	60 sec
Slope3										
T0	0	3	6		12					
T1	6	9	12		18					
T2	12	15	18		24					
T3	18	21	24		30					
T4	24	27	30		36					
T5	30	33	36		42					
T6	36	39	42		48					
Slope4										
T0	0	3	6		12					
T1	9	12	15		21					
T2	18	21	24		30					
T3	27	30	33		39					
T4	36	39	42		48					
T5	45	48	51		57					
T6	54	57	60		66					
Slope5										
T0	0	3	6		12					
T1	12	15	18		24					
T2	24	27	30		36					
T3	36	39	42		48					
T4	48	51	54		60					
T5	60	63	66		72					
T6	72	75	78		84					
Slope6										
T0	0	3	6		12					
T1	15	18	21		27					
T2	30	33	36		42					
T3	45	48	51		57					
T4	60	63	66		72					
T5	75	78	81		87					
T6	90	93	96		102					

Appendix B:

Time Segments vs. Modulation (pulses)

	Relaxed	Standard	Aggressive A	Aggressive B	Aggressive C	Aggressive D	Berserk A	Berserk B	Berserk C	Berserk D
T0		2	3	4	5	6	3	4	5	
T1		3	4	5	6	7	5	7	9	
T2		4	5	6	7	8	7	10	13	
T3		5	6	7	8	9	9	13	17	
T4		6	7	8	9	10	11	16	21	
T5		7	8	9	10	11	13	19	25	
T6		8	9	10	11	12	16	22	29	

INSTALLATION:

Plug & Drive version - Very simple.

1. Before removing or opening the rear window third brake light assembly please verify your brake light is functioning.
2. Locate the stock connector that interfaces the main wire harness to the 3rd brake light. Open this connector and plug the SB-T in series. No need to take to dealer!

Installation examples can be found at http://www.vizi-tec.com/sb-docs/ for download. You may not find one specific to your vehicle. Reason being we stopped making model specific installation as these are very simple; Read one and you've read them all. If you have questions or comments please send us an email at *email@vizi-tec.com*.

Universal version – A more complex.

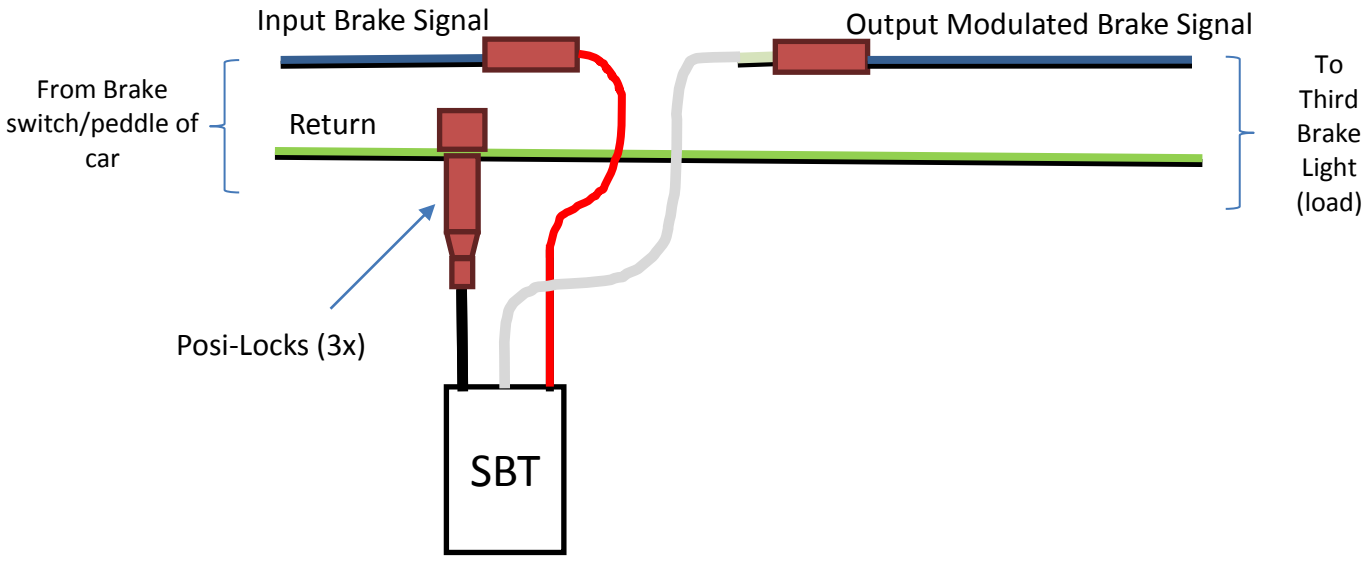
1. Before removing or opening your third brake light assembly please verify your brake light(s) are functioning.
2. See below for wire color and gauge. Use included Posi-Locks connector to quick secure interface.

- Wire gauge = 20 AWG.

- Red = Input brake signal(+)
- Black = Ground(-)
- White = Modulated output

Typical Universal Installation(OEM connector not included):

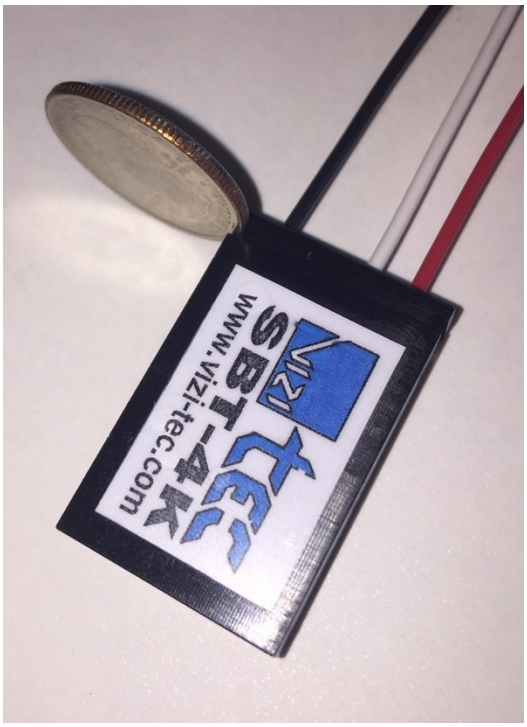
(Please verify that your vehicle's brake light is working before proceeding with this modification)



1. Turn off vehicle. Using included Posi-Lock connectors. Tap into the (-)Return wire of the vehicle's third brake light.
2. Cut and splice open the (+)Hot/Signal wire of the vehicle's third brake light.
    a. Connect the source side with red wire from SBT-4K
3. Connect the load(brake light) side with white wire of SBT-4K..
4. Turn on vehicle and test. Done!

Case Access:

To access the switch use a coin such as a US quarter or a large flat head screwdriver as shown below. The top-cover will pop out with the printed circuit board to allow access to the profile switch. After the preferred profile is set the top-cover will easily slide and snap back into the case.



FAQ:

The SBT-4K can be somewhat of a complex device. It has many functions and features. But very easy to use once understood. It is strongly recommended that you read this manual before installation and/or ordering. Understanding its simplicity is the beauty of it. Installation is simple. Designed to be fully Plug and Play. You do not need to visit your local dealership to make the installation. VIZI-TEC LLC cannot and will not be responsible for charges incurred if installed at dealership.

- **Why isn't the SBT-4K modulating?**
  Firstly you must remember that the SBT-4K has an algorithm (with Grace_Period). The number of blinks (modulation) and frequency will be determined by the profile attributes selected. If the Grace Period has been set to anything thing other then 0 seconds as in the case of factory default, the unit will NOT FLASH EACH AND EVERY TIME you push the brakes. See page 6 for more details on the attribute of the Grace Period.

  Troubleshoot:
  1) *Turn on the car power. No need to start the engine. (Let's assume the Grace_Period is set to 6 seconds.)*
     a) *Do not touch any brakes...*
  2) *Wait about 10 seconds.*
  3) *Press and hold the brakes. The 3rd brake like will modulate. The longer you don't use your brakes the more it will flash the next time you use it.*

- **Why is it only flashing about 3 times?**
  The time period between usage of the brakes will determine the length of the modulation burst. The longer the brakes are not used. The more modulation the output will be the next time around. See pg.16 for attribute settings.

- **I don't see a kit for my car/truck? How do I get one made?**
  Send us an email at email@vizi-tec.com and let us know the year/model of your bike. If the bike model is 5 years or newer we'll work with you to make a custom kit for half the price.

- **Cold Start?**
  The SBT-4K will power up with the algorithm loaded to max (T6).

- **What is "T" and when is the 7 time segments? What is its maximum?**
  Each profile is segmented into 7 parts. Hence (T0 - T6). Only one segment can be active at a given time. After a successful modulation burst the profile resets to (T0) during its GRACE_PERIOD and SLOPE attribute. Then moves on to T1.. T2.. and so forth up to T6 and stays there(T6) until next braking cycle.

  Example:
  Grace Period = '12 seconds'
  Slope = 'Slope5'
  Modulation = 'Standard'

  *Page 17 shows that with SLOPE_5 with a 12s Grace Period. The max values are T0=12s, T1=24s, T2=36s.. T6=84s. That means during T0(between 0s to **12**s) there will be no modulation. Hence "grace period". T0 expires at >12s. Next segment T1(>12s to **24**s) there will be 2 pulses if brake is pressed based on the 'Standard' modulation attribute. T1 expires at 24s. Next segment between T2(>24s to **36**s pules goes up to 3. Last segment T6 and above there will 8 pules.*

- **How can I get more modulation?**
  Change attribute#3. See page16 for a chart.

  Example:
  From above question. Profile had attribute#3 = 'Standard'. If it was set to 'Aggressive B'. Then at T1 it would have generated 4 pulses instead of the 2 from a 'Standard' setting.

- **How is this different than other modulators out there?**
  The low down is that the output is NOT based on a fixed set of pulses as seen on other modulators on the market. But rather how much, how fast, how soon and when you program it to burst.

- **Lost or have questions?**
  Send us an email at email@vizi-tec.com

CHEAT SHEET:

	Attribute #1	Attribute #2	Attribute #3	Attribute #4	Attribute #5
SWT TOGGLE POSITION	**GRACE PERIOD (seconds)**	**FREQUENCY (Hz)**	**MODULATION (# of pulses)**	**SLOPE**	**DECAY**
1=Off 2=Off	0 (no delay)				
1=Off 2=On	3				
1=On 2=OFF	6				
1=On 2=On	12				
3=Off 4=Off 5=Off		4			
3=Off 4=Off 5=On		6			
3=Off 4=On 5=Off		8			
3=Off 4=On 5=On		10			
3=On 4=Off 5=Off		12			
3=On 4=Off 5=On		14			
3=On 4=On 5=Off		16			
3=On 4=On 5=On		20			
6=Off 7=Off 8=Off			Standard		
6=Off 7=Off 8=On			Aggressive A		
6=Off 7=On 8=Off			Aggressive B		
6=Off 7=On 8=On			Aggressive C		
6=On 7=Off 8=Off			Aggressive D		
6=On 7=Off 8=On			Berserk A		
6=On 7=On 8=Off			Berserk B		
6=On 7=On 8=On			Berserk C		
9=Off 10=Off				Slope 3	
9=Off 10=On				Slope 4	
9=On 10=OFF				Slope 5	
9=On 10=On				Slope 6	
11=Off 12=Off					None
11=Off 12=On					Decay 4
11=On 12=OFF					Decay 7
11=On 12=On					Decay 10

Programming:

- Use a coin like a US quarter or large flat head screwdriver to access the case.
- Slide switch up(On) or down(Off) using small jeweler's screw driver, tooth pick or paper clip. (See pg. 16)