Narsil Triple Flashlight Operation (side electronic switch)

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The user interface's design goal is to be fast and simple, but with many advanced features to support the latest innovations, and allow the user to configure the light's operation to his/her liking. The configuration settings are stored permanently. There are two choices for primary use: Ramping or Mode Sets, Ramping is defaulted.

Summary of Features

- Ramping – smooth 150 level ramping, simple click&hold ramps, 1 click ON to last level, 1 click OFF, direction of ramping will toggle unless you remain at a level more than 1.2 seconds
- Mode Sets - Simple 1 click ON, 1 click OFF, navigate to next and previous modes
- 8 mode sets to choose from, 1 to 7 modes/output levels can be configured, and then saved
- Modes can be arranged for low to hi, or hi to low
- Multiple strobe and beacon modes can be accessed, total of 5 special modes (16 Hz strobe, police strobe, bike strobe, 2 sec beacon, and 10 sec beacon)
- Low Voltage Protection (LVP) – output is decreased starting at ~3.2V, shut off at ~3.0v, both with blink warnings
- Temperature Regulation: drops output at high temps, with blink warnings, blink out temperature in C
- Turbo timeout can be enabled/disabled, and the time be set (works for high output levels in Ramping too)
- When power is applied, 2 blinks indicate it's ready
- An Indicator LED (SMD LED) is supported as a locator LED and low voltage indicator
- Battery Check – blink out the voltage level (ex: 3.7V would be 3 blinks, pause, then 7 blinks)
- Very low standby power (parasitic drain) without Indicator LED on
- Lock-out feature for the side switch – enabled and disable by a special click sequence
- 20 second button press safety lock-out feature (engages lock-out after 20 secs being held)
- Mode memory can be enabled to quickly restore the last used mode setting, but not recommended
- A power tail switch can be used to change modes w/memory

Configuration Settings Summary

1. Primary mode setting of Ramping or Mode Set
2. 8 sets of modes to choose from with 1 to 7 output levels
3. Moonlight mode can be optionally added (enable/disable), and the moon output level custom set
4. Set the mode order, default is low to hi, hi to low can be enabled
5. Enable or disable mode memory
6. Enable/disable turbo timeout and sets the length of time from 30 secs to 10 minutes
7. Enable/disable the Locator LED feature (locate the flashlight in the dark)
8. Set the moon mode brightness from 1-7 (3 is recommended, but 2 may work, and 4-7 used to make it brighter)
9. Configure where Battery voltage level blinks - both on the Indicator LED and primary LED, or just the Indicator LED
10. Enable/Disable temperature regulation
11. Enable/disable the Indicator LED – disabled it if it's not wired up or to disable it's use completely
12. Enable/disable a power tail switch for switching modes with memory. An OTC (Off Time Cap) is not needed, but may not work with all hardware designs.

Ramping Operation

- From OFF, click&hold ramps up with a pause at moon level -- click to turn ON at last level
- From ON, click&hold ramps up or down, toggling direction unless paused for at least 1.2 sec – click to turn OFF
- Double-click from OFF or ON to turn on max level (the max level does not override the last level)
- Triple-click from OFF or ON to engage Battery Check mode
- 4X-click from OFF or ON to Lock-Out the light
- When at max level, a double-click will turn the 1st Strobe ON
- When in Strobe, clicks without pausing will skip to the next special mode (strobe or beacon). The special mode navigation works just like normal mode set operation: click&hold goes to the previous special mode, paused in a mode will lock it in
- While in Battery check mode, a double-click will blink out the firmware version # (v1.1 is 1 blink followed by 1 more)

Mode Set Operation

- From OFF, a click goes to 1st mode, while a click&hold (~1/3 sec) goes to last mode
- When ON, a click goes to next mode, while a click&hold goes to the previous mode
- if paused in a mode (over 1.2 secs), the mode locks in and then a click will turn the light OFF
- If you are locked in a mode, a click&hold will still work to go to previous mode, and the lock-in cancels
- in any mode, including OFF, a long hold (over 1.1 sec) will turn the 1st Strobe ON
- When in Strobe, clicks without pausing will skip to the next special mode (strobe or beacon). The special mode navigation works just like normal modes: click&hold goes to the previous special mode, paused in a mode will lock it in

Low Voltage Protection

With the light ON, when the battery voltage falls below 3.0V, it blinks three times, then drops the output level. This will be repeated until it's at the lowest output level. If at the lowest level, and voltage falls at or below 2.6 V, it blinks 8 times, then turns the light OFF.

If the Indicator LED is enabled, it blinks three times as well every time the modes are dropped down, and will also blink twice every 8 seconds while the light is ON. Once the light is turned OFF after low voltage has been detected, the Indicator light will continue to blink twice every 8 seconds for 6 minutes after being turned OFF, then the light goes into power saver mode. The Indicator LED will be turned OFF if the battery voltage is below 3.0V prior to going into power saver mode to save battery charge.

Note: When the 3.0 V level is reached, and the amps are reduced, the cells partially recover some voltage, so the output will stay there for a while before the next drop. If you have cells on the bench that read below 3.0V, chances are it will go thru several drops one after another, at 4 second iterations.

Temperature Regulation

An internal temperature sensor in the MCU is used to monitor the temperature at the driver. The output will be lowered up to 3 times, each time dropping output by 1/3. The Indicator LED will blink 3 times each time it happens. The calibration can be off up to 5C, perhaps more, and a default threshold of 50C is used. For more accuracy, it's recommended to calibrate the offset and adjust the 50C limit in the firmware according to the specific flashlight design.

Battery Check/Temperature Check/Version

To Activate, **Mode Set operation:** from OFF, do a click quickly followed by a click&hold and keep holding for 2.5 secs. **Ramping operation:** triple-click. The voltage reading of the cell will be blinked out continuously – 1 click will terminate the voltage reading. For example, a 3.7V reading will results in 3 blinks, short pause, then 7 blinks. This pattern will continue forever until a click terminates it. This mode can double as a long term beacon. **Only in ramping:** Double-click to advance to temperature, and double-click again to display the firmware version #.

Lock-Out Feature

Often a light will be carried in a pocket, bag or holster where the switch might be accidentally engaged. To avoid accidental activation, sometimes the tailcap can be loosened to break the battery connection. For lights that don't work that way, or another method preferred (avoid wear and tear on the threading), you can enter a special sequence to lock-out the light as follows:

- **Ramping operation:** From OFF or ON, 4 clicks in quick sequence. The light will blink 4 quick times to acknowledge Lock-Out has been engaged, then the normal operation of the switch should be disabled.
- **Mode Set operation:** From OFF, 2 clicks in quick sequence followed quickly by a click&hold. The light will blink 4 quick times to acknowledge Lock-Out has been engaged, then the normal operation of the switch should be disabled. If you see strobe instead of the 4 quick blinks, you know lock-out did not get set (you probably were too slow).
- To restore normal operation, do the same Lock-Out sequence. The 4 quick blinks should appear to acknowledge the action.

For both Ramping and Mode Set operation, lock-out will automatically be activated after 20 seconds of the button being held. This is meant as a safety precaution if physically stuck, but can also be activated manually.

Indicator LED

When enabled, the Indicator LED can be used for the following:

- to locate the flashlight in the dark (Locator feature)
- to blink out the battery level
- as a secondary indicator of blinking when the main LED blinks

When the Locator feature is enabled, the LED can be temporarily turned OFF (only in Mode Sets), with the main LED OFF, 1 quick click followed by a click&hold til the main LED goes off. To toggle it back on, repeat the same procedure (OFF -> quick click, click&hold). Note the locator feature is turned OFF when the light is in Lock-Out.

Configuration UI Operation

For Ramping, the button is held for 8 seconds, and for Mode Sets, the button must be held for 2.5 seconds to activate the main Configuration UI settings. The light will blink 2 times quickly, and once slowly to indicate the Configuration UI mode is active. There are 7 settings, listed in the table below. You can change or leave any of these settings – there's no need to set each one. Clicks choose the value for each setting, and each click will blink the light to acknowledge the click. If no clicks are entered in 4 seconds, the light jumps to the next configuration setting indicated by 2 quick blinks and slow quicks of the number for what setting it is (ex: 3 slow blinks means the 3rd setting). You can bypass the timeout by doing a click&hold to skip to the next setting. If you continue to hold it, it will exit configuration UI settings mode altogether, indicated by 4 quick blinks.

Configuration Settings

Setting #	Function	Clicks	Defaults
1	Ramping Mode	1=disable, 2=enable	2
2	Choose Mode Set	1-8 (1-7 is # of modes) – see Mode Sets	4
3	Moon Mode	1=disable, 2=enable	2
4	Mode ordering	1= sets lo→hi, 2=sets hi→lo	1
5	Mode Memory	1=disable, 2=enable	1
6	Turbo Timeout	1=disable, 2=30 secs, 3=60 secs, 4=90 secs, 5=2 mins, 6=3 mins, 7=5 mins, 8=10 mins	1
7	Blinky mode	1=disable, 2=one strobe, 3=all strobes/beacons	3

Mode Sets

Mode Set Order	Mode Count	Mode Approx. Percentages	Notes
1	1	full only	(full is always max FET, no 7135)
2	2	10-full	max 7135, max FET
3	3	10-50-full	Max 7135, max 7135bnk, max FET
4	4	1.2-10-50-full	
5	5	1.2-5-10-50-full	
6	6	0.8-2-5-10-50-full	
7	7	0.5-2.5-5-10-25-50-full	
8	2	60-full	All 7135's, max FET

Advanced Configuration UI Operation

The Advanced Configuration UI settings is activated from Battery Check mode by doing a click& hold for at least 1.1 seconds. The battery voltage reading will be interrupted, then the light will blink 2 times quickly, and once slowly to indicate the Adv. Configuration UI mode is active. There are 5 settings summarized below, and operates the same as the main configuration UI.

Setting #	Function	Clicks	Defaults
1	Set Moonlight Level	1 - 7 (PWM value)	3
2	Active Temperature Regulation	1=disable, 2=enable	2
3	Locator LED feature	1=disable, 2=enable	2
4	Batt/Temp/Vers Ind. LED Only	1=disable, 2=enable	2
5	Indicator LED Enable	1=disable, 2=enable	2
6	Power switch modes w/mem	1=disable, 2=enable	1