

Multi-functional Timer relay. (Version V8.0 and V9.0)

User Manual



V3.5b

2025/10/19

!!! Warning !!!

DO NOT return the item to the original retailer. Contact the support for any problem with the item or item delivery.

timersshop@gmail.com

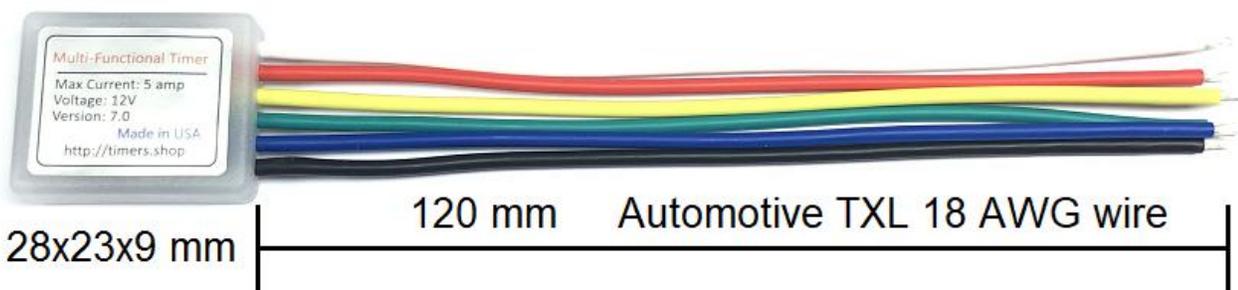
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1. Multi-functional Timer Relay description

The multi-functional Timer delay module is a revolutionary circuit with many commonly used timer delay functions. It is perfect for many applications from hobbies to industrial controls. The *timer* has more than thirty different timing functions with the optional ability to trigger them by application of input voltage to the trigger wire. Dry contacts can be used as well. The *timer* can be used for hundreds of various applications from delaying power to the circuit, supplying power in cycling fashion, or creating a self-latching timed circuit. The *timer* is easy to connect and configure. All the configurations are permanently saved into the internal flash memory. The *timer* works with 3V to 28V supply voltage and can handle up to 5amp/10amp of current (depending on the model). This makes the *timer* applicable to a variety of applications. The *timer's* maximum current can be extended with the use of the external relay. The *timer* can run in Low Power mode which is suitable for battery-powered applications. A built-in fly-back diode allows for a direct connection of inductive loads.

Voltage range:	3-18 V DC – 5 A version 6-28 V DC – 10 A version
Max current:	5 A or 10 A
Output type:	Positive or Sink (Ground). Depending on the model
Minimum time duration:	0.01 second
Maximum time duration:	400 days
Idle current consumption:	800 μ A or 50 μ A (in LOW POWER mode under certain conditions)
Temperate rating	-40 C + 80 C





- Do not short timer's output to the ground. It would cause excessive current, possible device overheating, and smoke.
- Do not exceed the timer's current capacity.
- Do not reverse power supply polarity. It could cause the timer's internal components to fail and overheat.
- Do not put a timer into a hot environment causing it to exceed specified temperature range working conditions.
- Do not disconnect the ground from the timer while under power.

2. Compare Timer versions

Timer name/Features	5 amp	10 amp	10 amp (SINK)
Voltage range	3-18V	6-28V	6-28V
Max current	5A	10A	10A
Positive output	Yes	Yes	No
Sink output	No	No	Yes
Digital trigger input	Yes	Yes	Yes
Analog trigger input	No	No	No
Configuration via GUI	Yes	Yes	Yes
Configuration by	External programmer	External programmer	External programmer
Upgradable	Yes	Yes	Yes

What is the difference between Version V8 and V9?

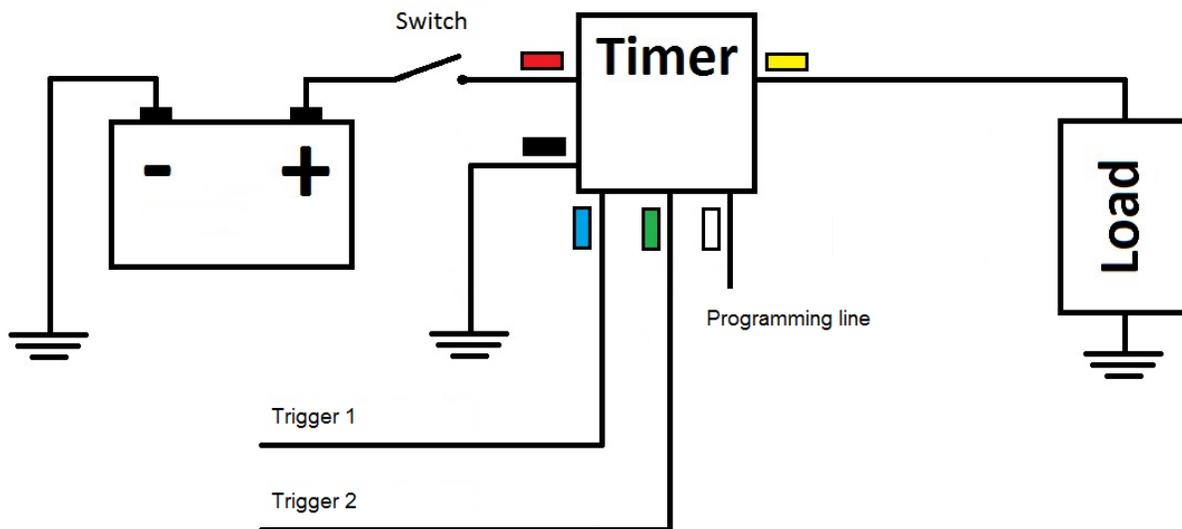
V9 contains more accurate frequency clock with just +/- 2sec per day fluctuation and software correction.

V8 has +/- 2% fluctuation.

V9 PCB is conformal coated providing an extra layer of protection.

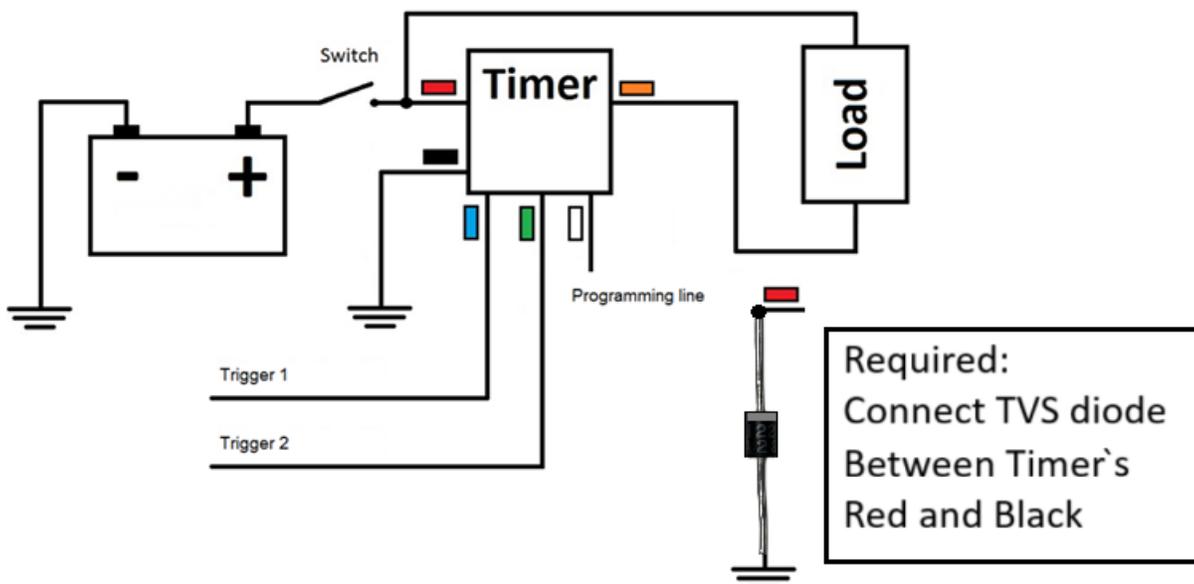
3. Timer's wiring diagram

3.1 Connecting the timer with Positive output

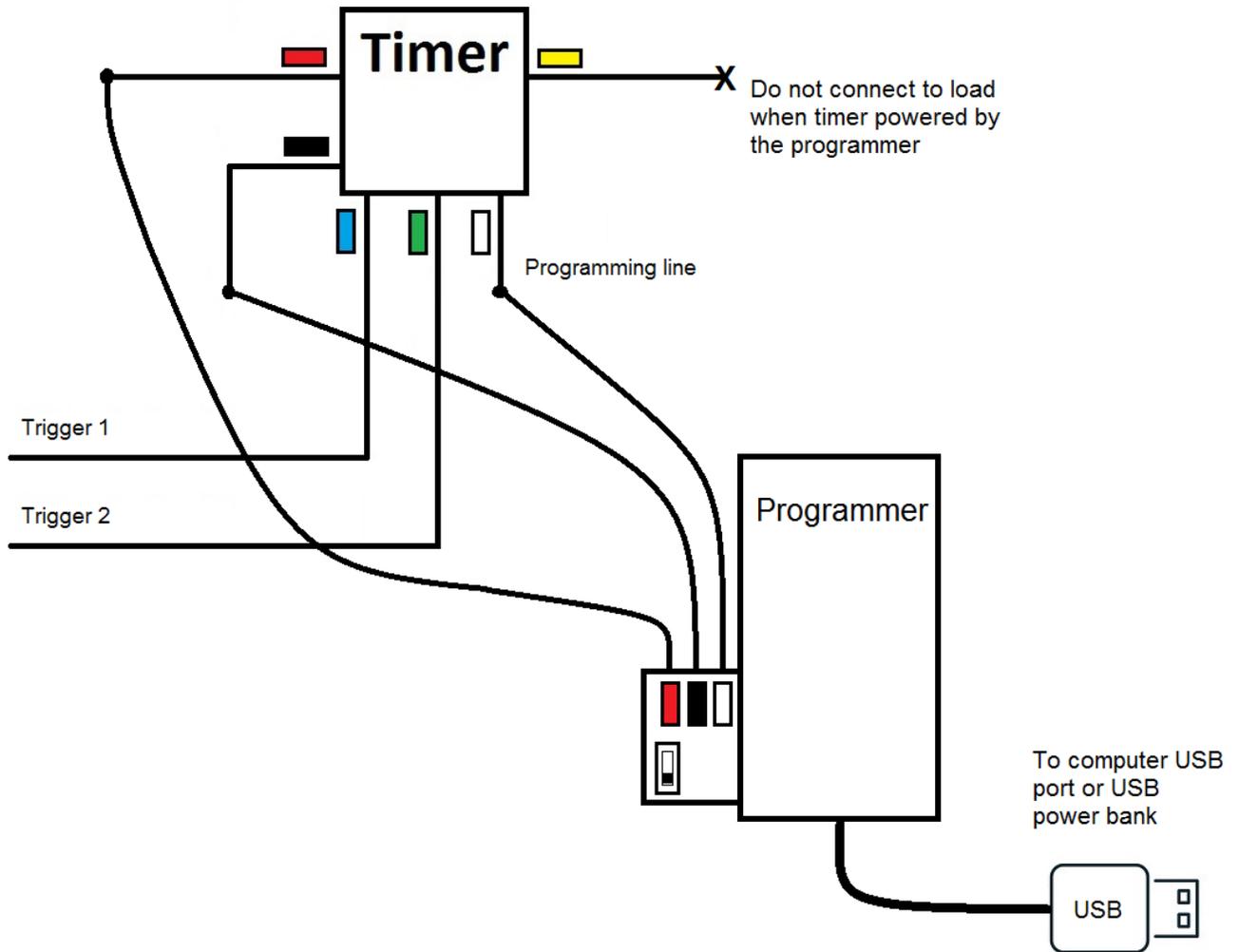


*** For up-to-date installation instructions and videos, visit <http://doc2.us/main>
View Timer's Cookbook at http://timers.shop/Timer-Cook-Book_ep_43-1.html

3.2 Connecting the timer with Sink (Ground) output

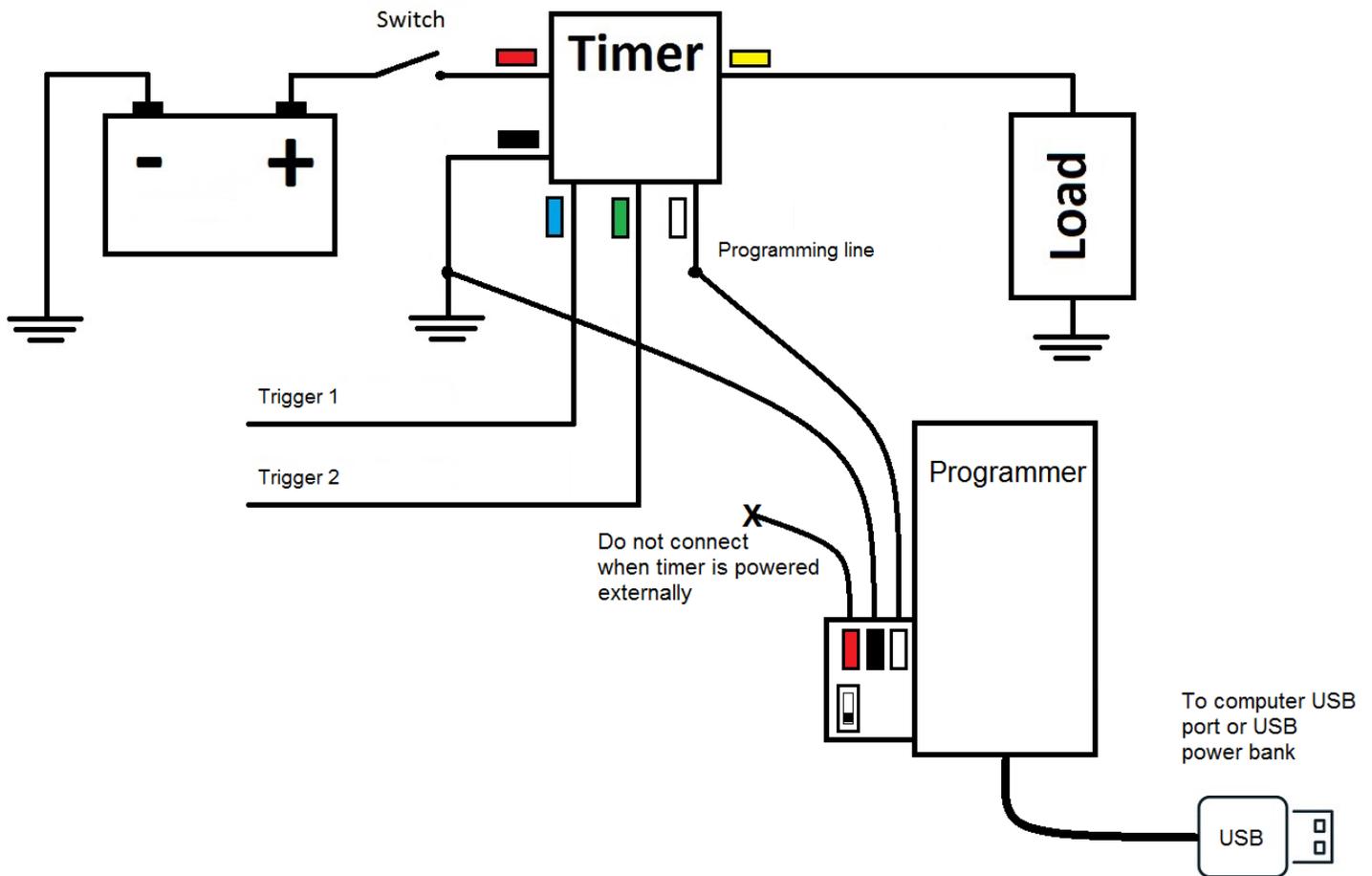


3.3 Connecting timer to the programmer.



Warning!!! When powering the timer from the programmer does not connect the load as the load could overload the USB supplied power. Do not connect external power to the timer as the power will be routed back to USB power source. It might destroy the USB power source as well as the programmer's circuit.

3.4 Connecting timer to the programmer for in-circuit programming.



Warning!!! When powering the timer from the external source, do not connect the programmer's power line. It might destroy the USB power source as well as the programmer's circuit.

1. Understanding Timer Delay Relay Function.

Understanding all the time delay relay functions available in multifunctional timer can be an intimidating task. During the circuit design with the timer relay and variety of timer configurations, questions such as what initiates the timer delay functions, does the timing starts with the application of the power or trigger signal, for how long output power should stay on, etc., could arise and must be answered.

The timer is simply a logic control circuit to control the output power based on the events. Typically, the timer is initiated or triggered by one of two methods:

- Application of power voltage
- High or low trigger signal

The trigger signal can be one of the following:

- A control switch (dry contacts): limit switch, push-button, the float switch
- Voltage (power trigger): signal output from another device, power signal

To help understand the timer functionality let’s look at the common terminology used throughout this manual.

- **Input Voltage** – power voltage applied to the timer. Depending on the selected function, the input voltage will either initiate the timing event or power the timer to be ready to accept the trigger signal.
- **Trigger Signal** – in certain timing functions, a trigger is used to initiate a timing event after the input voltage has been applied. As noted above this trigger can either be a control switch (dry contact switch) or a power trigger (voltage).
- **Output** – output voltage from the timer. The timing of the output voltage is controlled by the selected timing event and trigger method.

Below (**Figure 1**) is a description of the timing functions. A timing chart shows the relationship between Input Voltage, Trigger Signal, and Output. Note that Trigger Signal is optional for some of the timer functions and mandatory for others. Before going through all the available functions look at the first one in detail.

Figure 1.

#	Function	Operation
1	ON DELAY	<p>Upon the application of input voltage, the time delay (t) begins. At the end of the time delay (t), the output is energized. Input voltage must be removed to reset the time delay relay & de-energize the output.</p> <p>Diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....lh.....l' }, { name: "output", wave: 'l.h.....l.h.....l' }, }, { { name: "power", wave: 'lh.....lh.....l' }, { name: "trigger", wave: 'l.H.l.....H.l.....' }, { name: "output", wave: 'l.h.....l.h.....l' }} </pre>

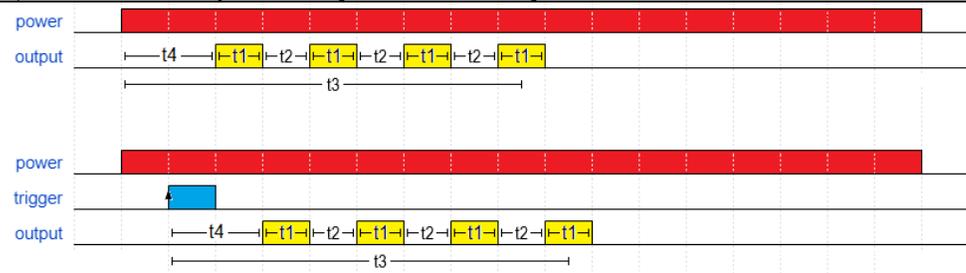
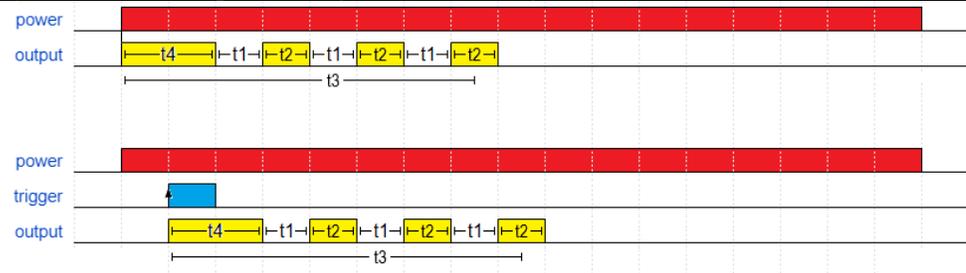
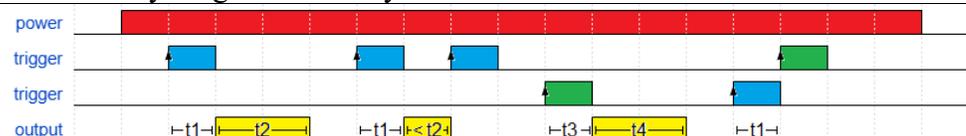
The timer function #1 is **ON DELAY**, it allows to supply power after some time (t). There are two timing charts, one without a trigger and one with a trigger. Trigger selection can be done during timer configuration. Let's look at the first chart where the timer is triggered by the supplied input voltage. Once power is supplied to the timer, the time delay (t) begins, at the end of the time delay (t) output is energized and stays on until power to the timer is removed. Removal of the power resets the timer circuit, and the timer is ready for another cycle. The second chart is applicable when a trigger option is selected. In this particular case, the trigger on High (positive) voltage is selected. More on trigger options can be found later in the manual. Upon application of power, the timer is ready to accept the trigger signal. When the trigger is applied, the time delay (t) begins. At the end of the time delay (t) output is energized and stays on until power to the timer is removed. Another application of the trigger during time delay (t) or the output energized period, does not affect the timer function. Only the first application of the trigger matters. The diagrams can also be viewed or edited online at <https://wavedrom.com/editor.html> page.

2. Timer function table with charts

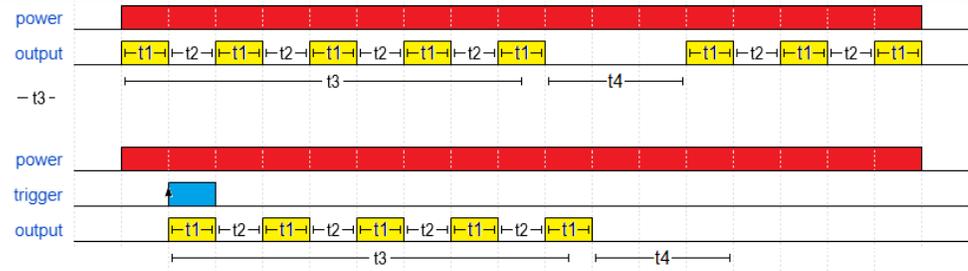
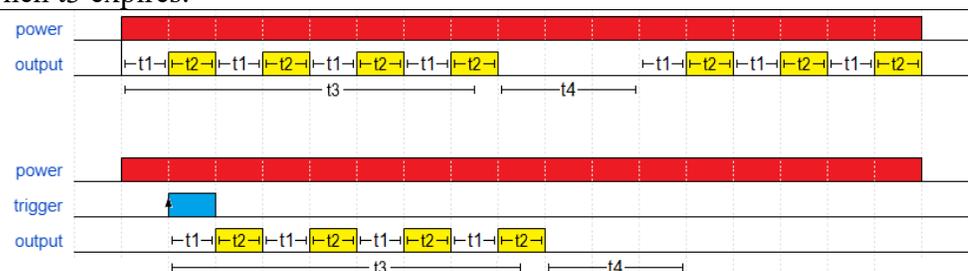
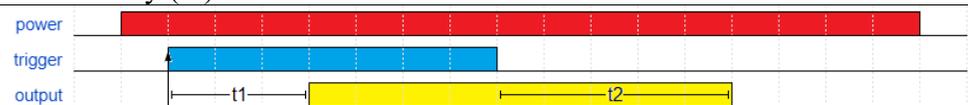
(Note that function number # will be used during timer configuration.)

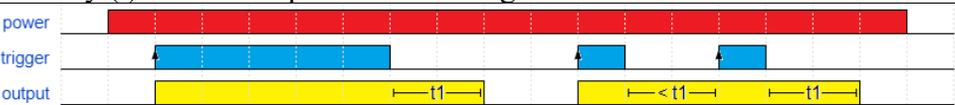
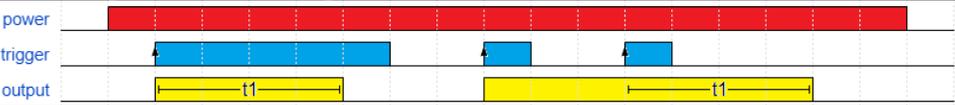
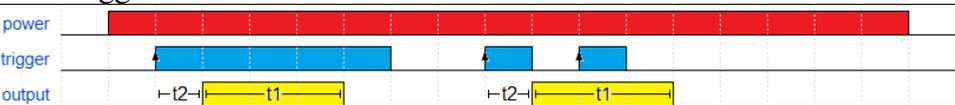
Figure 2.

#	Function	Operation
1	ON DELAY	<p>When input voltage is applied, the time delay (t1) starts. After the time delay (t1) completes, the output becomes energized. To reset the time delay relay and de-energize the output, the input voltage must be removed.</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....lh.....l' }, { name: "output", wave: 'l.h.....l.h.....l' }, }, }, { name: "power", wave: 'lh.....lh.....l' }, { name: "trigger", wave: 'l.H.l.....H.l.....' }, { name: "output", wave: 'l.h.....l.h.....l' }]}</pre>
2	INTERVAL ON	<p>Upon the application of input voltage, the output becomes energized, initiating the time delay period (t1). Once the time delay (t1) concludes, the output is then de-energized. To reset the time delay relay, the input voltage must be disconnected.</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....lh.....l' }, { name: "output", wave: 'lh..l.....h..l.....' }, }, }, { name: "power", wave: 'lh.....lh.....l' }, { name: "trigger", wave: 'l.H.l.....H.l.....' }, { name: "output", wave: 'l.h..l.....h..l.....' }]}</pre>

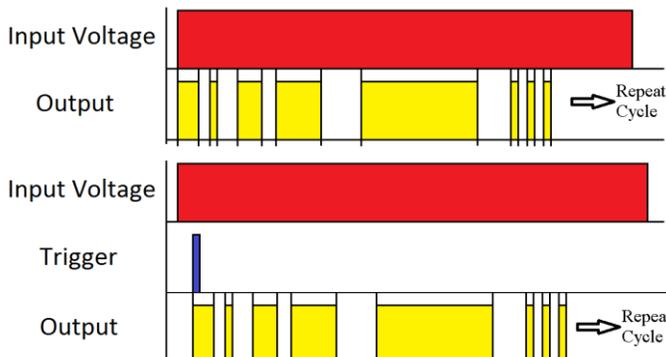
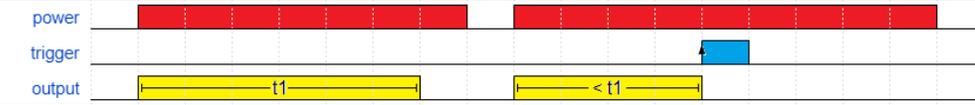
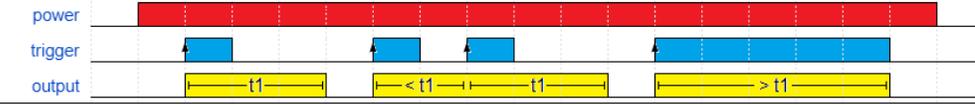
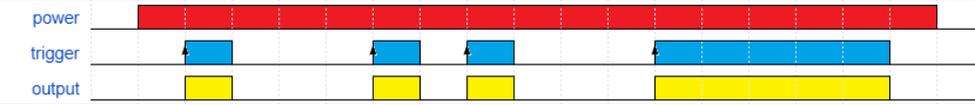
#	Function	Operation
3	REPEAT CYCLE WITH INITIAL DELAY	<p>Upon application of voltage, time delay (t3) begins, and the output is delayed for (t4), then energized for the time delay (t1) and de-energized for (t2) until (t3) timeout is reached. (t3) set to 0 will repeat the cycle indefinitely.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="462 556 860 756"> { signal: [{ name: "power", wave: 'lh.....! ' }, { name: "output", wave: 'l.hlhhlhhlhhlhhl.' }, }, }, { name: "power", wave: 'lh.....! ' }, { name: "trigger", wave: 'l.Hl.....! ' }, { name: "output", wave: 'l.hlhhlhhlhhlhhl.' } }] </pre>
4	REPEAT CYCLE WITH INITIAL DELAY (On first)	<p>Upon application of voltage, time delay (t3) begins, and the output is energized for (t4), then de-energized for the time delay (t1) and energized for (t2) until (t3) timeout is reached. (t3) set to 0 will repeat the cycle indefinitely.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="462 1207 860 1407"> { signal: [{ name: "power", wave: 'lh.....! ' }, { name: "output", wave: 'lhhlhhlhhlhhlhhl.' }, }, }, { name: "power", wave: 'lh.....! ' }, { name: "trigger", wave: 'l.Hl.....! ' }, { name: "output", wave: 'lhhlhhlhhlhhlhhl.' } }] </pre>
5	TRIGGERED DELAY INTERVAL 2 Single Cycle	<p>Upon application of input voltage, the timer relay is ready to accept the trigger. When the trigger is applied, the time delay (t1) begins. At the end of the time delay (t1), the output is energized and remains energized for the time delay (t2). At the end of the time delay (t2), the output is de-energized, and the relay is ready to accept another trigger. During both time delays (t1) and (t2), the trigger is ignored. When activated with a secondary trigger, the time delays are set to t3 and t4.</p> <p>Notes: Older documentation refers to function 5 as cycling. See functions 3, 4, 8, and 9 for cycling functionality.</p> 

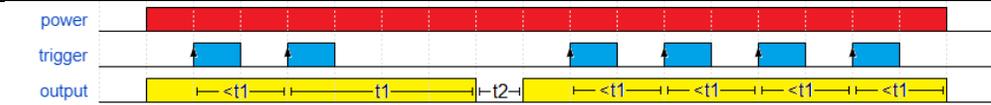
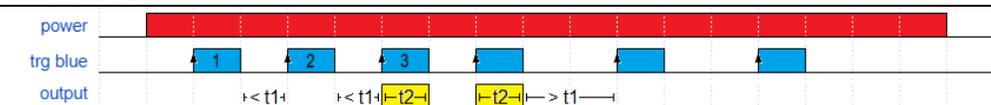
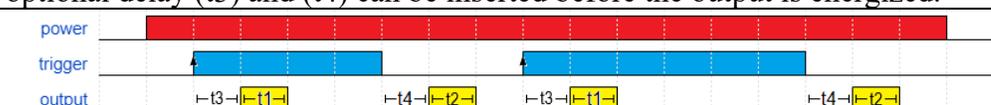
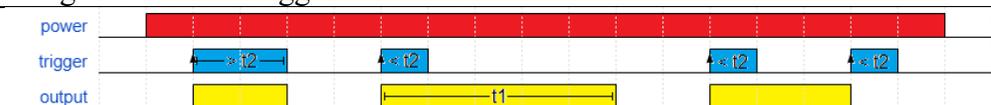
#	Function	Operation
		Display diagram online: https://wavedrom.com/editor.html <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.Hl..HlHl....Hl..' }, { name: "trigger", wave: 'l.....Hl..Hl..' }, { name: "output", wave: 'l..h.l.h.l.h.l.....' }] } </pre>
6	REPEAT CYCLE WITH INITIAL DELAY	Upon application of voltage, time delay (t3) begins, and the output is delayed for t4. Then t1 and t2 cycle start. The output is de-energized for the time delay (t1) and energized for (t2) until (t3) timeout is reached. When trigger 1 is activated, the cycle advances to the start of the t1 duration. And when trigger 2 is activated, the cycle advances to the start of t2 duration. (t3) set to 0 will repeat the cycle indefinitely.
		Display diagram online: https://wavedrom.com/editor.html <pre> #Function 06 { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.....Hl.....' }, { name: "trigger", wave: 'l.....Hl.....' }, { name: "output", wave: 'l..h.l.h.l.h.l.....' }] } </pre>
7	DELAYED INTERVAL Single Cycle	Upon the application of input voltage, the initial time delay (t1) starts. After the completion of this initial time delay (t1), the output becomes energized and stays energized for the duration of the second time delay (t2). Following the conclusion of this second time delay (t2), the output is de-energized. To reset the time delay relay, the input voltage must be removed.
8	REPEAT CYCLE (On First)	Upon application of voltage, time delay (t3) begins, and the output is energized for the time delay (t1). At the end of the time delay (t1), the output is de-energized for the time delay (t2) and continues to cycle until (t3) is reached. t3 set to 0 will repeat the cycle indefinitely. t4 is used to insert an inactive phase. t4 set to 0 will force the cycle to end when t3 expires.

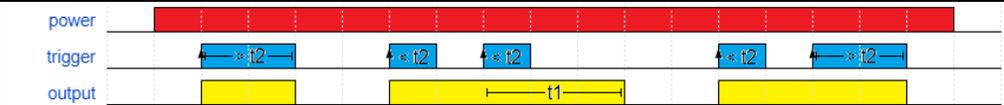
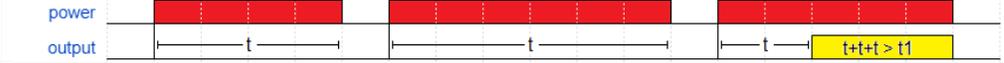
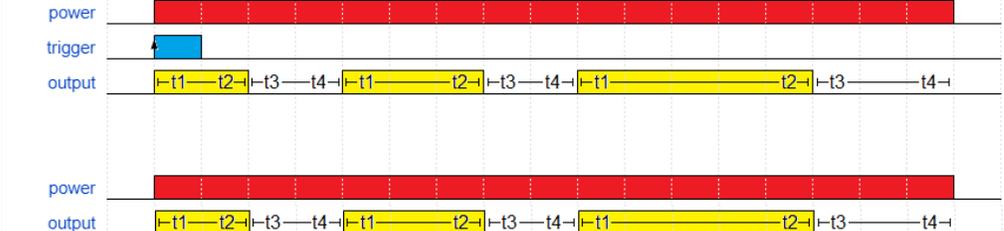
#	Function	Operation
		 <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="462 409 966 609"> { signal: [{ name: "power", wave: 'lh.....!'}, { name: "output", wave: 'lhhlhhlhhlhhlhhl.'}, }, {}}, { name: "power", wave: 'lh.....!'}, { name: "trigger", wave: 'L.Hl.....!'}, { name: "output", wave: 'L.hhlhhlhhlhhlhhl.' }] </pre>
9	REPEAT CYCLE (Off First)	<p>Upon application of voltage, time delay (t3) begins, and the output is de-energized for the time delay (t1). At the end of the time delay (t1), the output is energized for the time delay (t2) and continues to cycle until (t3) is reached. t3 set to 0 will repeat the cycle indefinitely. t4 is used to insert an inactive phase. t4 set to 0 will force the cycle to end when t3 expires.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="462 1121 966 1323"> { signal: [{ name: "power", wave: 'lh.....!'}, { name: "output", wave: 'L.hhlhhlhhlhhlhhl.'}, }, {}}, { name: "power", wave: 'lh.....!'}, { name: "trigger", wave: 'L.Hl.....!'}, { name: "output", wave: 'L.hhlhhlhhlhhlhhl.' }] </pre>
10	ON/OFF DELAY	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the time delay (t1) begins. At the end of the time delay (t1), the output is energized. When the trigger is removed, the output remains energized for the time delay (t2). At the end of the time delay (t2), the output is de-energized, and the time delay relay is ready to accept another trigger. If the trigger is removed during the time delay period (t1), the output will remain de-energized, and the time delay (t1) will reset. If the trigger is re-applied during the time delay period (t2), the output will remain energized, and the time delay (t2) will reset.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="462 1795 966 1911"> { signal: [{ name: "power", wave: 'lh.....!'}, { name: "trigger", wave: 'L.H.....L.....!'}, { name: "output", wave: 'L...h.....L...' }] </pre>

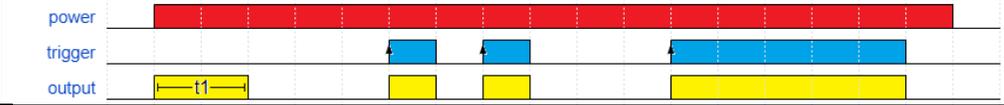
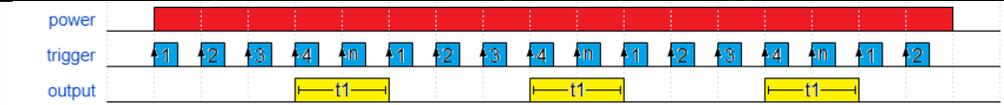
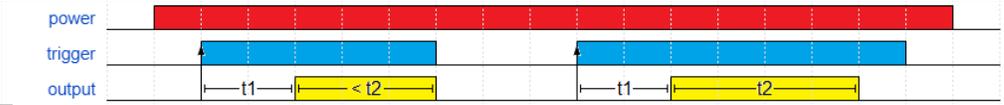
#	Function	Operation
11	TRIGGERED ON DELAY	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the time delay (t) begins. At the end of the time delay (t), the output is energized and remains in that condition as long as either the trigger is applied, or the input voltage remains. If the trigger is removed during the time delay (t), the output remains de-energized, and the time delay (t) is reset.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lH.....H.l...' }, { name: "output", wave: 'l...h..l.....l' }]} </pre>
12	OFF DELAY	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized. Upon removal of the trigger, the time delay (t) begins. At the end of the time delay (t), the output is de-energized. Any application of the trigger during the time delay will reset the time delay (t) and the output remains energized.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lH....l..Hl.Hl...' }, { name: "output", wave: 'l.h.....l.h.....l' }]} </pre>
13	SINGLE-SHOT WITH TIME RESET	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized, and timer delay (t) begins. Any application of the trigger during the time delay will reset the time delay (t) and the output remains energized.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lH....l.Hl.Hl.....l' }, { name: "output", wave: 'l.h...l.h.....l' }]} </pre>
14	SINGLE-SHOT	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized, and the time delay (t) begins. During the time delay (t), the trigger is ignored. At the end of the time delay (t), the output is de-energized, and the time delay is ready to accept another trigger.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lH....l.HlHl.....l' }, { name: "output", wave: 'l.h...l.h.....l' }]} </pre>

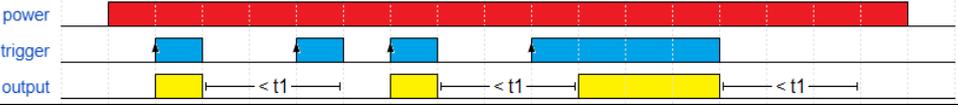
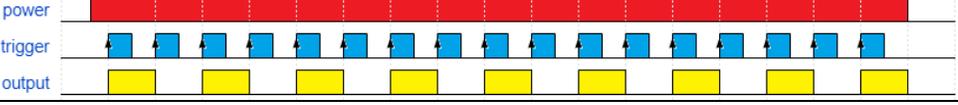
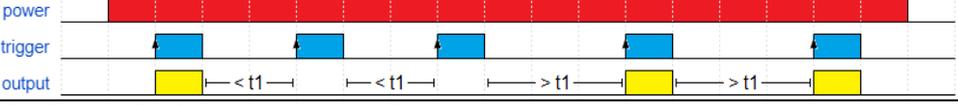
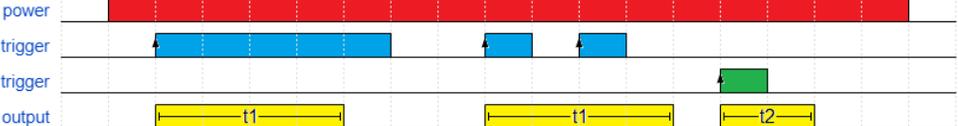
#	Function	Operation
15	TRIGGERED DELAY INTERVAL Single Cycle	<p>Upon application of input voltage, the timer relay is ready to accept the trigger. When the trigger is applied, the time delay (t1) begins. At the end of the time delay (t1), the output is energized and remains in that condition for the time delay (t2). At the end of the time delay (t2), the output is de-energized, and the relay is ready to accept another trigger. During both time delay (t1) and time delay (t2), the trigger is ignored.</p> <p>power</p> <p>trigger</p> <p>output</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.Hl.Hl.H.....l.' }, { name: "output", wave: 'l...h.l...h.l....' }]}</pre>
16	INTERVAL ON WITH OFF TRIGGER	<p>Upon application of input voltage, the timer relay is ready to accept the trigger. When the trigger is applied, the output is energized, and the time delay (t) begins. At the end of the time delay (t), the output is de-energized. Application of trigger during time delay (t) will cause time delay (t) to expire and output is de-energized.</p> <p>power</p> <p>trigger</p> <p>output</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.Hl.Hl.H.....l.....' }, { name: "output", wave: 'l.h..l.h...l.....' }]}</pre>
17	INTERVAL ON TRIGGER CONTROLLED	<p>Upon application of input voltage, the timer relay is ready to accept the trigger. When the trigger is applied, the output is energized, and the time delay (t) begins. At the end of the time delay (t), the output is de-energized. Removal of the trigger during time delay (t) will cause time delay (t) to expire and output is de-energized.</p> <p>power</p> <p>trigger</p> <p>output</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.H..l.H.....l.....' }, { name: "output", wave: 'l.h..l.h...l.....' }]}</pre>
18	FREE FORM ONE TIME (Up to 48 configuration points)	<p>Upon application of voltage, time delay begins, and free-form pattern programmed by the user is executed. When the pattern is completed it can be retriggered again.</p> <p>Input Voltage</p> <p>Output</p> <p>Input Voltage</p> <p>Trigger</p> <p>Output</p>

#	Function	Operation
19	FREE FORM REPEATED (Up to 48 configuration points)	<p>Upon application of voltage, time delay begins, and free pattern cycle programmed by the user is executed. Once started the cycle will be repeated over and over.</p> 
20	CANCELED INTERVAL	<p>Upon application of input voltage, the output is energized, and the time delay (t) begins. At the end of the time delay (t), the output is de-energized. If the trigger is applied during the time delay (t) the output is de-energized and the delay canceled. Input voltage must be removed to reset the time delay relay.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="470 871 828 1008"> { signal: [{ name: "power", wave: 'lh.....lh.....l' }, { name: "trigger", wave: 'l.....HL....' }, { name: "output", wave: 'lh.....lh...l.....' }]} </pre>
21	SINGLE SHOT TIME RESET HOLD ON TRIGGER	<p>Upon application of input voltage, the timer is ready to accept a trigger. When the trigger is applied, the output is energized, and timer delay (t) begins. Any application of the trigger during the time delay will reset the time delay (t) and the output remains energized. If the trigger still applied after the delay (t) the output remains energized until the trigger is removed.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="470 1312 860 1444"> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.Hl..HlHl..H....l' }, { name: "output", wave: 'lh..lh....lh....l' }]} </pre>
22	FOLLOW	<p>Upon application of input voltage, a standard relay is ready to accept a trigger. When the trigger is applied, the output is energized. The output continues to be energized until the trigger is removed, at which point the output is de-energized.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="470 1711 860 1845"> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.Hl..HlHl..H....l' }, { name: "output", wave: 'l.hl..hlhl..h....l' }]} </pre>

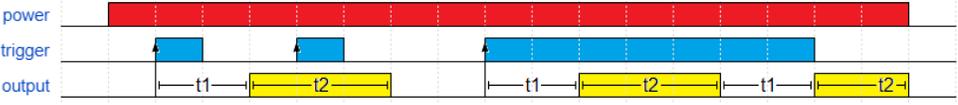
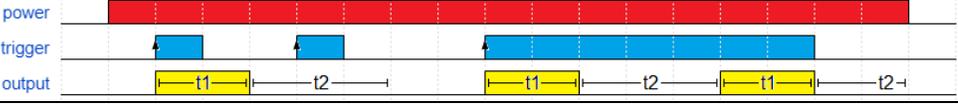
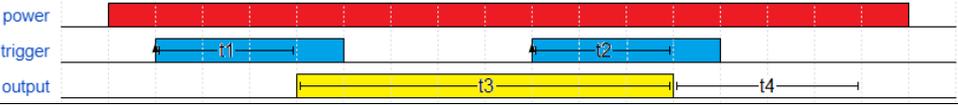
#	Function	Operation
23	WATCHDOG 1	<p>When an input voltage is applied, the timer relay's output becomes energized, and the relay is primed to receive a trigger signal. If the trigger is activated at any point during the first-time delay period (t_1), this action will reset the timer for t_1, and the output continues to remain energized. Once the time delay period t_1 concludes without further triggers, the output is then de-energized for a second time delay period (t_2) and then the cycle repeats.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.HlHl...HlHlHl.' }, { name: "output", wave: 'lh.....lh.....l' }]} </pre>
24	FUNCTION 24	<p>When an input voltage is applied, the timer is ready to accept trigger input. If the duration between triggers is less than t_1 and timer counts n consecutive triggers then output follows the trigger until the duration between triggers exceeds t_1.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trg blue", wave: 'l.HlHlHlHl.HlHlHl.' }, { name: "trg green", wave: 'l.....HlHlHl.' }, { name: "output", wave: 'l.....hhl.....l' }]} </pre> <p>Practical use. This function can be used as a turn signal alarm configured to be activated after set number of cycles. The timer output will be activated for t_2 or the duration of the trigger. The blue and green triggers are connected to turn signal bulbs on each side. The trigger is configured to mode 2 and the trigger function set to XOR. Function XOR will allow either blue or green trigger to activate the alarm, but the simultaneous execution during hazard activation would cancel the trigger.</p>
25	OUTPUT ON TRIGGER CHANGE	<p>Upon application of input voltage, the timer relay is ready to accept trigger input. When the trigger is applied the output is energized for the time delay (t_1). The release of the trigger also energizes the output for time (t_2). The optional delay (t_3) and (t_4) can be inserted before the output is energized.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.H...l.H.....l...' }, { name: "output", wave: 'l.hl..h.lhl....h.l' }]} </pre>
26	BUTTON INTERFACE WITH TIMEOUT	<p>Upon application of input voltage, the timer relay is ready to accept trigger input. With short ($< t_2$) application of trigger the output is energized for the time delay (t_1). The second application of the trigger will de-energize the output. With long ($> t_2$) application of trigger, the output is energized and held energized until the trigger is removed.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.H.l.Hl.....Hl.Hl.' }, { name: "output", wave: 'l.h.l.h....l.h.l.' }]} </pre>

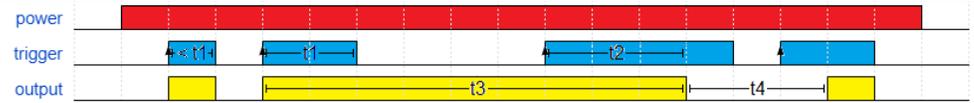
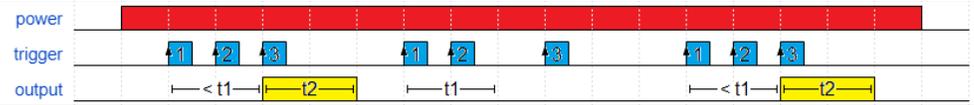
#	Function	Operation
28	FUNCTION 28	<p>Upon application of input voltage, the timer relay is ready to accept trigger input. With short ($< t_2$) application of trigger the output is energized for the time delay (t_1). The second application of the trigger will reset delay (t_1). With long ($> t_2$) application of trigger, the output is energized and held energized until the trigger is removed. With long ($> t_2$) application of trigger during the active output, the timeout is canceled and output stays energized until the trigger is removed.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="454 483 1458 621"> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.H.l.HlHl...HlH.l' }, { name: "output", wave: 'l.h.l.h....l.h..l.' }]} </pre>
29	INTERVAL WITH LOCKOUT Single Cycle	<p>Upon application of input voltage, the timer relay is ready to accept the trigger. When the trigger is applied the output is energized and the time delay (t_1) begins. At the end of the time delay (t_1), the output is de-energized and remains in that condition for the time delay (t_2). During both time delay (t_1) and time delay (t_2), the trigger is ignored.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="454 924 1458 1062"> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.Hl.Hl.H.....l.' }, { name: "output", wave: 'l.h.l.l....h.l.....' }]} </pre>
30	POWER INDEPENDENT TIMER	<p>Timer operation is intended as a countdown timer. The countdown stops when power is removed but continues when power is reapplied. To run the timer in this mode first configure timer time, function and trigger. Activating trigger for > 5 secs resets the timer and countdown starts. When the sum of the time is greater than the preset time the output becomes active. Activating trigger for > 5 secs resets the countdown.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="454 1365 1458 1482"> { signal: [{ name: "power", wave: 'lh...lh.....lh...l' }, { name: "output", wave: 'l.....h..l' }]} </pre>
31	REPEAT RANDOM CYCLE	<p>The function is similar to Function #5 (Repeat cycle). The duration of the first active phase of the cycle is randomly calculated with the range set between t_1 and t_2. The passive phase is between t_3 and t_4.</p> 

#	Function	Operation
		Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lHl.....l' }, { name: "output", wave: 'lh.lh..l.h....l' }, {}, {}, { name: "power", wave: 'lh.....l' }, { name: "output", wave: 'lh.lh..l.h....l' }]}</pre>
32	FOLLOW WITH INITIAL ON	Upon application of input voltage, the output is energized, and the time delay (t) begins. At the end of the time delay (t), the output follows the trigger level. When the trigger is applied, the output is energized and continues to be energized until the trigger is removed. When the trigger is removed the output is de-energized.  <pre>Display diagram online: https://wavedrom.com/editor.html { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l....HlHl.H....l' }, { name: "output", wave: 'lh.l.hhlh.l.h....l' }]}</pre>
33	COUNTER	Upon application of input voltage, the timer is ready to accept the trigger. Once the trigger is detected preset number of cycles (n) the output is activated for the duration (t1). The trigger is ignored during the active output. At the end of the time delay (t1), the timer is ready to accept the trigger.  <pre>Display diagram online: https://wavedrom.com/editor.html { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lP.....l' }, { name: "output", wave: 'l..h.l.h.l.h.l.h.l.' }]}</pre>
34	DELAY ON WITH TIMEOUT	Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the time delay (t1) begins. At the end of the time delay (t1), the output is energized. The output remains energized for a period of t2 unless the trigger is removed. If trigger is removed the output de-energized and cycle ends.  <pre>Display diagram online: https://wavedrom.com/editor.html { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lH....l.H....l' }, { name: "output", wave: 'l..h.l.l....h....l.' }]}</pre>
35	OFF DELAY WITH INITIALIZATI ON	Upon application of input voltage, the output is energized for t2. The timer relay is ready to accept a trigger. When the trigger is applied, the output is energized. Upon removal of the trigger, the time delay (t) begins. At the end of the time delay (t), the output is de-energized. Any application of the trigger during the time delay will reset the time delay (t) and the output remains energized. 

#	Function	Operation
		Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L...HL...HHL....' }, { name: "output", wave: 'lh.l.h.l.h...l...' }]}</pre>
36	FOLLOW WITH LOCKOUT	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized and continues to be energized until the trigger is removed. When the trigger is removed the output is de-energized and period t1 starts. During the t1 period the timer will not respond to the trigger.</p>  <p>Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L.HL.HHL.H...l...' }, { name: "output", wave: 'l.hl...hl.h...l...' }]}</pre></p>
37	FLIP FLOP WITH COUNTER	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. Once the trigger is detected preset number of cycles (n) the output is flipped.</p>  <p>Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lP.....l' }, { name: "output", wave: 'lhlhlhlhlhlhlhlhlhlhl' }]}</pre></p>
38	FOLLOW WITH LOCKOUT 2	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized and continues to be energized until the trigger is removed. When the trigger is removed the output is de-energized and period t1 starts. During the t1 period the timer will not respond to the trigger and the lockout time t1 will reset.</p>  <p>Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L.HL.HL.HL.HL.HL.' }, { name: "output", wave: 'l.hl.....hl.hl.' }]}</pre></p>
39	SINGLE-SHOT WITH TWO TRIGGERS	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized, and the time delay (t1) begins. During the time delay (t1), the trigger is ignored. At the end of the time delay (t1), the output is de-energized, and the time delay is ready to accept another trigger. The same applies to trigger 2 (Green)</p>  <p>Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L.H...L.HHL....' }, { name: "trigger", wave: 'L.....HL...' }, { name: "output", wave: 'l.h...l.h...lh.l.' }]}</pre></p>

#	Function	Operation
40	SINGLE-SHOT WITH TWO TRIGGERS 2	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized, and the time delay (t1) begins. During the time delay (t1), the trigger is ignored. At the end of the time delay (t1), the output is de-energized, and the time delay is ready to accept another trigger. Application of the trigger 2 would reset the time delay to t2.</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....!'}, { name: "trigger", wave: 'LH...LHL.....'}, { name: "trigger", wave: 'L.....HL.....'}, { name: "output", wave: 'Lh...Lh.....L.'}]}</pre>
41	ACCUMULATOR	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized, and timer delay (t) begins. Any application of the trigger during the time delay will reset the time delay (t) and the output remains energized. Each consecutive trigger application increases the timer delay (t1).</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....!'}, { name: "trigger", wave: 'LHL.HIHL.HIHLHL...'}, { name: "output", wave: 'Lh.IH...IH....L.'}]}</pre>
42	SINGLE SHOT WITH CANCEL	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the output is energized, and timer delay (t) begins. Any application of the trigger during the time delay will reset the time delay (t) and the output remains energized. Each consecutive trigger application sets the next time delay until reached the timer delay (t4). The next application of trigger will cancel the output. The output is also cancelled if time delay is set to 0.</p> <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre>{ signal: [{ name: "power", wave: 'lh.....!'}, { name: "trigger", wave: 'LHL.HIHL...HL.HL.'}, { name: "output", wave: 'Lh.lh....L.h.l...'}]}</pre>
43	WATCHDOG 2	<p>When an input voltage is applied, the timer relay's output becomes energized, and the relay is primed to receive a trigger signal. If the trigger is activated at any point during the first-time delay period (t1) the time delay period (t1) is reset, and stays reset while trigger is active. The output stays energized. When trigger goes inactive the time delay (t1) starts. Once the time delay period t1 concludes without further triggers, the output is then de-energized for a second time delay period (t2). Trigger application is ignored during delay period (t2). Upon completion of delay period (t2) the output is energized, and delay period (t1) is reset.</p>

#	Function	Operation
		Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L.HI.HI.HI.HI.HI.L' }, { name: "output", wave: 'lh....l.h.....l' }]}</pre>
44	TRIGGERED DELAY INTERVAL Multiple Cycles	<p>Upon application of input voltage, the timer relay is ready to accept the trigger. When the trigger is applied, the time delay (t1) begins. At the end of the time delay (t1), the output is energized and remains in that condition for the time delay (t2). At the end of the time delay (t2), the output is de-energized, and the relay is ready to accept another trigger. During both time delay (t1) and time delay (t2), the trigger is ignored.</p>  <p>Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L.HI.HI.H.....L' }, { name: "output", wave: 'L...h.l...h.l...l' }]}</pre></p>
45	INTERVAL WITH LOCKOUT Multiple Cycles	<p>Upon application of input voltage, the timer relay is ready to accept the trigger. When the trigger is applied the output is energized and the time delay (t1) begins. At the end of the time delay (t1), the output is de-energized and remains in that condition for the time delay (t2). During both time delay (t1) and time delay (t2), the trigger is ignored.</p>  <p>Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L.HI.HI.H.....L' }, { name: "output", wave: 'L.h.l...h.l.h.l...l' }]}</pre></p>
46	ON/OFF DELAY WITH CANCEL	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied, the time delay (t1) begins. At the end of the time delay (t1), the output is energized. The output remains energized for the time delay (t3). If trigger is applied while output is active the time delay (t2) begins. At the end of the time delay (t2), the output is de-energized. After output is de-energized the time delay (t4) begins during which the trigger application is ignored.</p>  <p>Display diagram online: https://wavedrom.com/editor.html <pre>{ signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'L.H...L...H...L...L' }, { name: "output", wave: 'L...h.....l.....l' }]}</pre></p>
47	ON/OFF DELAY WITH CANCEL AND FOLLOW	<p>Upon application of input voltage, the timer relay is ready to accept a trigger. When the trigger is applied the output is activated and the time delay (t1) begins. At the end of the time delay (t1), the output continues to be energized even if trigger is removed. The output remains energized for the time delay (t3). If trigger is applied while output is active the time delay (t2) begins. At the end of the time delay (t2), the output is de-energized. After output is de-energized the time delay (t4) begins during which the trigger application is ignored.</p>

#	Function	Operation
		 <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="462 241 860 367"> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'l.HlH.l...H...lHl..' }, { name: "output", wave: 'l.hlh.....l.hl..' }]} </pre>
48	COUNTER WITH TIME RESTRICTION	<p>Upon application of input voltage, the timer is ready to accept the trigger. Once the trigger is detected preset number of cycles (n) applied during period shorter than t1 the output is activated for the duration (t2). The trigger is ignored during the active output. At the end of the time delay (21), the timer is ready to accept the trigger.</p>  <p>Display diagram online: https://wavedrom.com/editor.html</p> <pre data-bbox="462 682 876 808"> { signal: [{ name: "power", wave: 'lh.....l' }, { name: "trigger", wave: 'lpppl.pplpl.pppl..' }, { name: "output", wave: 'l..h.l.....h.l..' }]} </pre>

3. Timer trigger.

As described above timer is initiated or triggered by one of two methods:

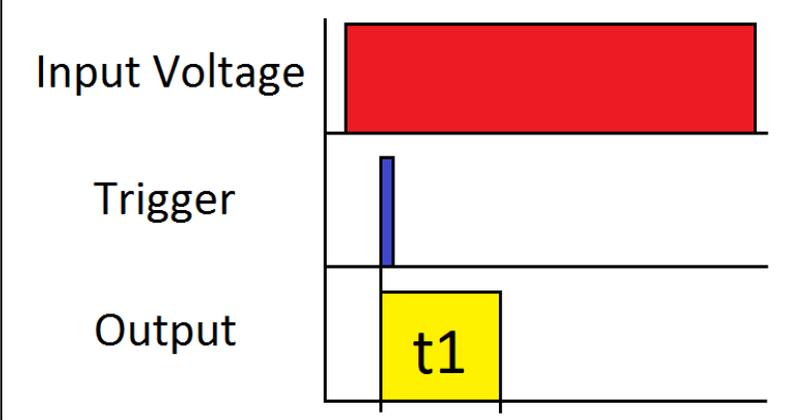
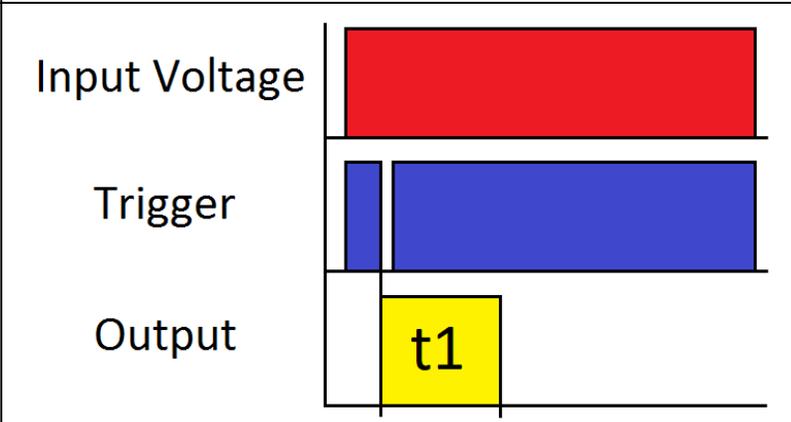
- Application of power voltage
- High or low trigger signal

The trigger signal can be one of the following:

- A control switch (dry contacts): limit switch, push-button, or float switch
- Voltage (power trigger): signal output from another device, power signal

3.1 Timer trigger operation with charts.

Figure 3.

<p>High trigger</p>	<p>Upon application of power the time delay relay is ready to accept the trigger. The transition of the voltage on the trigger wire from low to high will trigger the start of the time delay (t).</p>	
<p>Low trigger</p>	<p>Upon application of power, the time delay relay is ready to accept the trigger. The transition of the voltage on the trigger wire from high to low will trigger the start of the time delay (t).</p>	

To use trigger input with dry contact (like switch or button), trigger wire would need to be ‘pulled’ to either High or Low voltage. Timer configuration allows for trigger wire to be set to either be pulled to High, where a small current is applied to keep the wire at High voltage or grounded keeping the trigger wire at Low voltage. The following table demonstrates when to configure trigger wire pull to High or to Low.

3.2 Example of trigger setup.

Figure 4.

Trigger pull configuration	Description	Wiring diagram and trigger chart
<p>Trigger pulled to Low</p>	<p>The trigger is set to be pulled to Low. Upon button or switch engagement the trigger voltage jumps to High (positive voltage).</p> <p>The trigger could also be a positive voltage from the external source applied to the trigger wire.</p> <p>Note: event could be triggered either by applying or removing power.</p> <p><i>The shown Pull-down resistor is built into the timer and does not need to be connected externally.</i></p>	
<p>Trigger pulled to High</p>	<p>The trigger is set to be pulled to High. Upon button or switch engagement the trigger voltage jumps to Low (grounded).</p> <p>The trigger could also be the Ground applied to the trigger wire.</p> <p>Note: event could be triggered either by applying or removing ground.</p> <p><i>The shown Pull-up resistor is built into the timer and does not need to be connected externally.</i></p>	

3.3 Timer trigger configuration table.

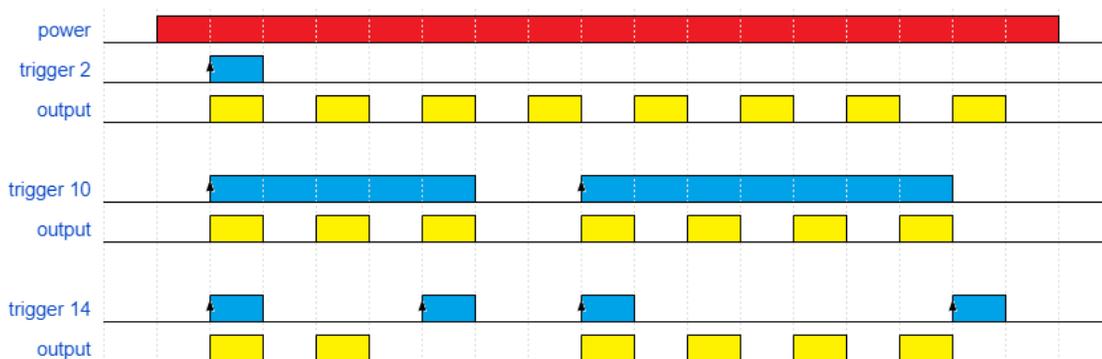
(Note that timer trigger function number # will be used during timer configuration.)

Figure 5.

Trigger configuration				Trigger pull	Active Trigger	Description
	*	**	***			See notes below
1						Trigger is disabled
2	6	10	14	Low	High	For dry contacts between trigger wire and positive.
3	7	11	15	Low	Low	For a case where the voltage is applied to a trigger.
4	8	12	16	High	Low	For dry contacts between trigger wire and ground.
5	9	13	17	High	High	For a case where the ground is applied to the trigger.

* Trigger functions ensure the trigger transition from inactive to activate state upon startup. Applies to functions: all
**Trigger acts as an enable/disable switch. Applies to function: 5, 6, 8, 9, 18, 19, 31
***Trigger utilizing flip-flop operation. Applies to functions: all

Example of the Trigger settings at 2, 10, and 14 using Function 5. When the Trigger is set to 2, it initiates the cycle. Setting the Trigger to 10 toggles the function on and off. Setting it to 14 acts as a flip-flop trigger, which turns the function on with the first trigger and off with the second. This flip-flop mechanism is applicable to all functions.



3.4 Multi-trigger operation.

The circuit features two trigger inputs: Blue and Green. To use both triggers at the same time set triggers to appropriate configurations and select trigger function from one of the following:

Trigger Function Name	Description
Blue only	Blue acts as a function trigger. Green is enabled for two trigger functions such as Function 38.
Green only	Green acts as a function trigger, Blue is ignored
AND	Logical AND operation. For a timer to be triggered both triggers must be Active.
OR	Logical OR operation. For a timer to be triggered, only one of the triggers needs to be Active.
XOR	Logical XOR operation. For a timer to be triggered only one of the triggers has to be in Active, not both.
Blue main / Green cancel	Blue acts as a function trigger, Green cancels the function execution by resetting the timer.
Blue main / Green cancel V2	Blue acts as a function trigger, Green cancels the function execution only if Blue trigger is inactive by resetting the timer.
AND then OR	Logical AND operation. For a timer to be triggered both triggers must be Active. Then active trigger maintained with Logical OR where only one if the triggers need to be active.

< **Timer's Configuration-1**

Firmware: T_H2_F02_V2.02
Checksum: 17854
Bootloader: V2.0.02 HW2.0

WiFi ID:

Function: 2

Time t1 sec:

Trig Blue: ▼
Threshold sec:
Initial ignore sec:

Trig Green: ▼
Threshold sec:
Initial ignore sec:

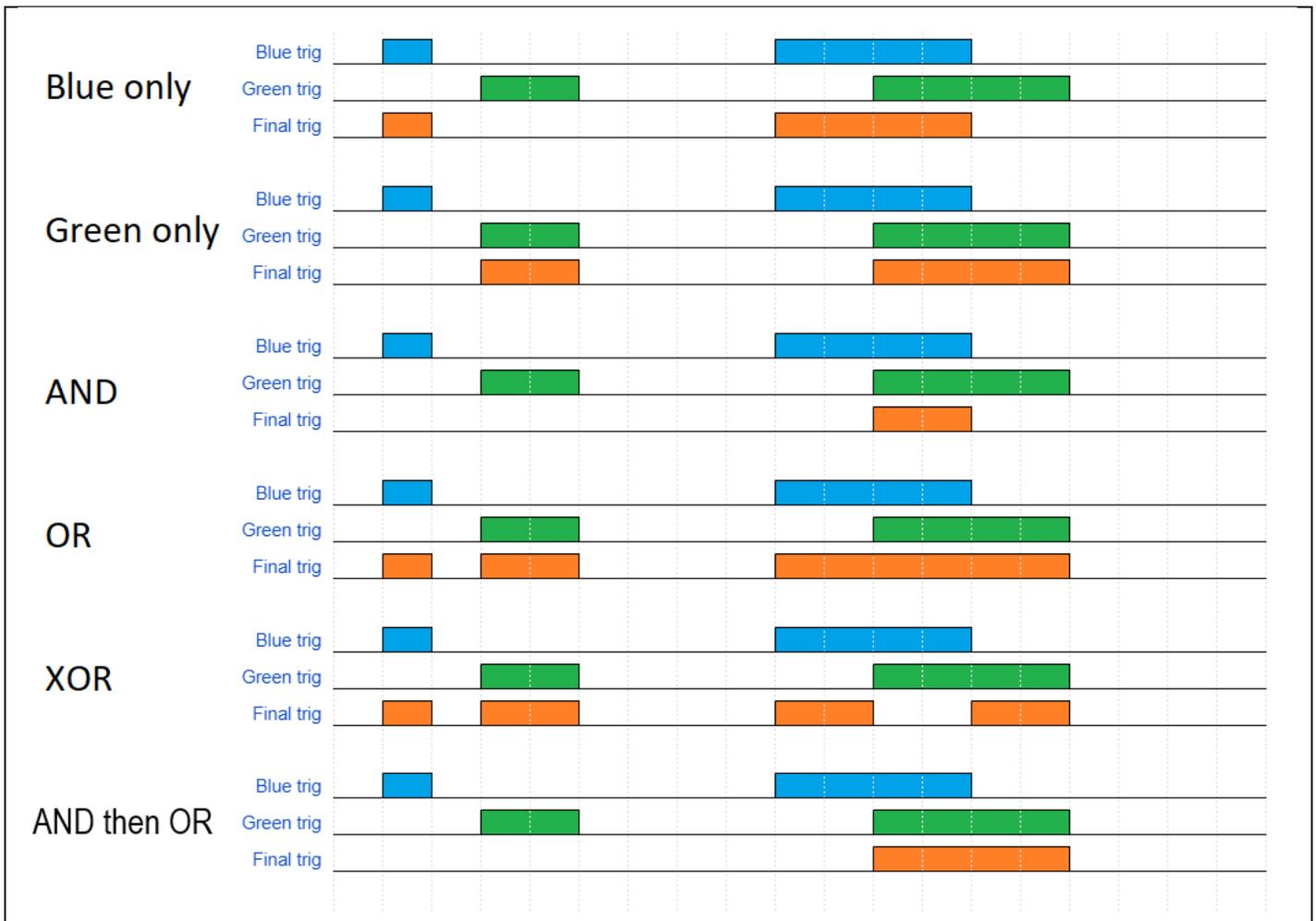
Trig logical func: ▼

Output:
Gradual:
Reversed:

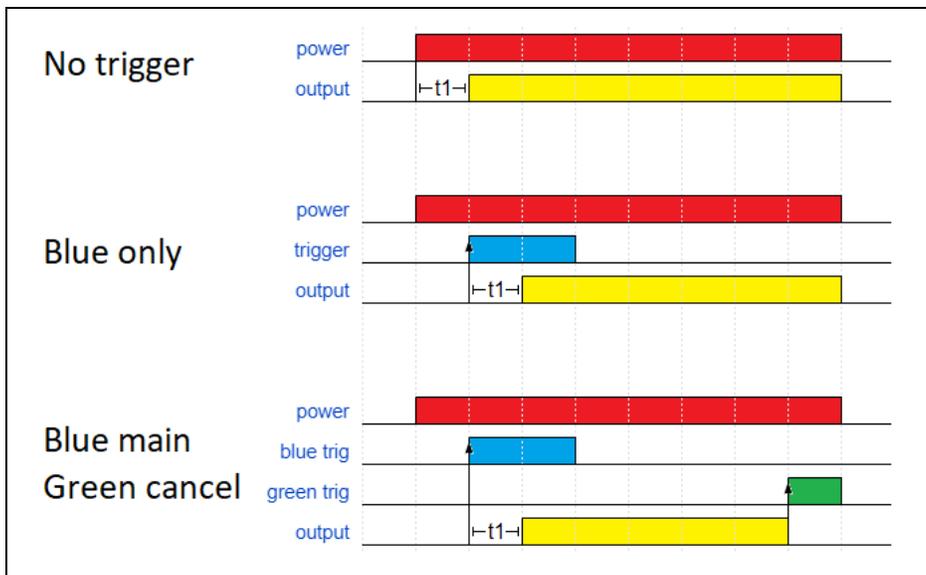
Low Power:

Save

The following diagram illustrates the composite final trigger generated for each chosen trigger function. The timer computes this final trigger value by integrating the Blue and Green triggers, and then applies this calculated value to the respective function.



The functionality of the 'Blue Main/Green Cancel' trigger operates in a unique manner. To illustrate, consider Function #01 as a representative example. Activating the blue trigger commences the operation of the function, while engaging the green trigger serves to reset the ongoing function activity.

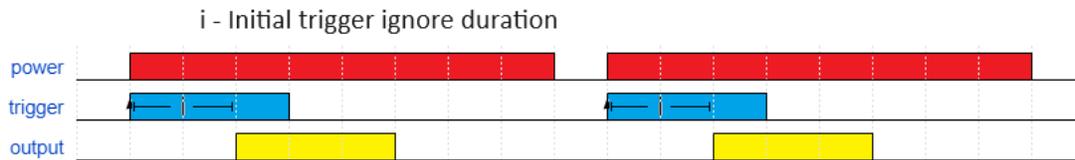


Trigger threshold

The threshold determines the duration for which the trigger must remain active or inactive before the timer acknowledges it.

Initial trigger ignore

The duration immediately following the initial power-up during which the timer remains unresponsive to the trigger signal.



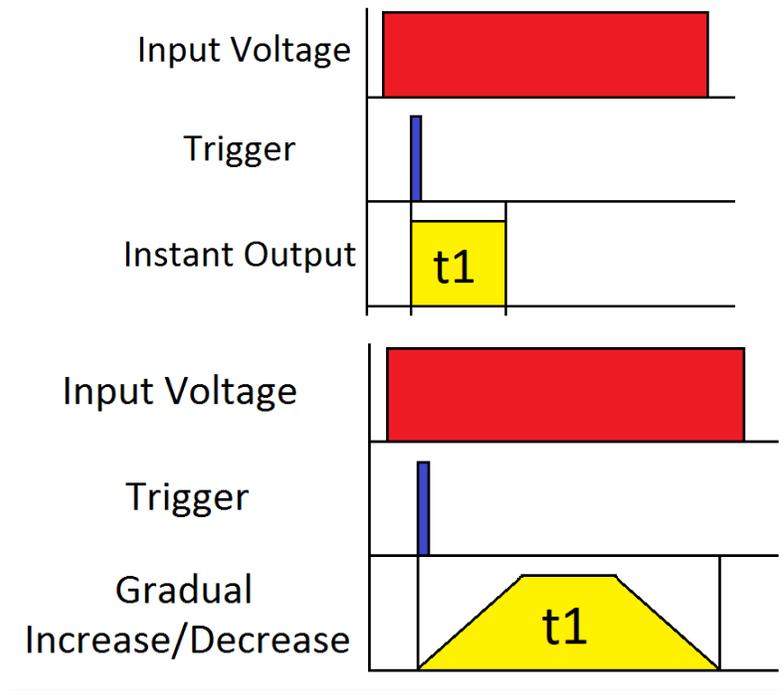
Trigger voltage

The trigger voltage can reach the supply voltage. The table below shows the levels at which the trigger threshold is reached.

<u>Trigger config</u>	<u>Threshold (Approx.)</u>	<u>Edge Direction</u>	<u>Event generated when</u>
Active when high	1.2 V	Low -> High	Input crosses 1.2 V
Active when low	1.0 V	High -> Low	Input drops below 1.0 V

4. Timer Output mode

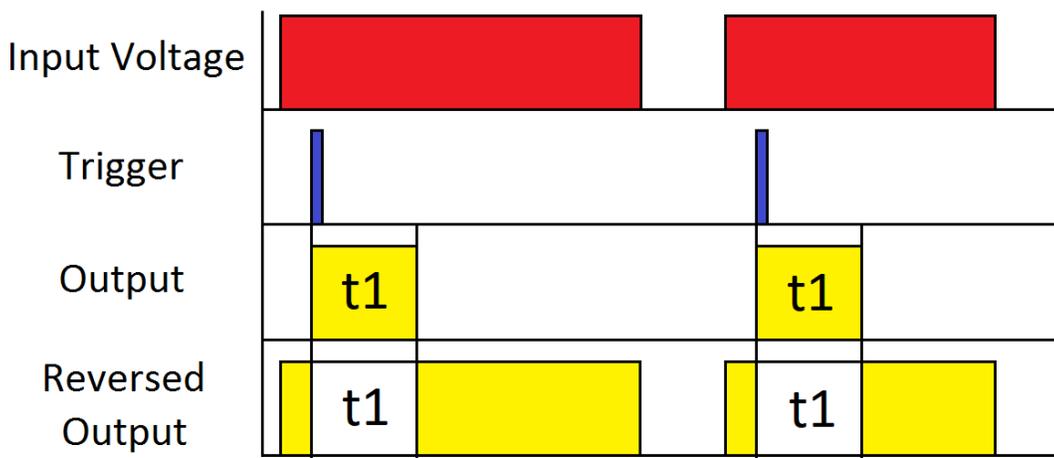
Timer output mode allows the user to set either instant output, where the output comes on and goes off instantly, or gradual increase/decrease, where the output is PWM (Pulse Width Modulation) controlled and ramps up to 100% duty in about 4 seconds. The gradual output is excellent for the lighting system to increase and dim the lights gradually.



5. Timer Output type

In some circumstances, it is required to supply reversed output to the load, so instead of supplying power to the load during the time delay (t), the output is de-energized.

The following diagram shows a sample timer operation with normal and reversed output.



The timer is preconfigured with normal output.

6. Timer programming

The programmer circuit is required to change the timer's configurations.

Programmer is used for:

- Reading timer's configuration.
- Changing timer's configuration.
- Uploading selected function into the timer's memory.
- Controlling timer's output.
- Reading timer's trigger lines.

The timer programming can be done either by connecting the timer directly to the programmer Figure 2.3 or connecting programmer to the timer for in-circuit programming Figure 2.4.

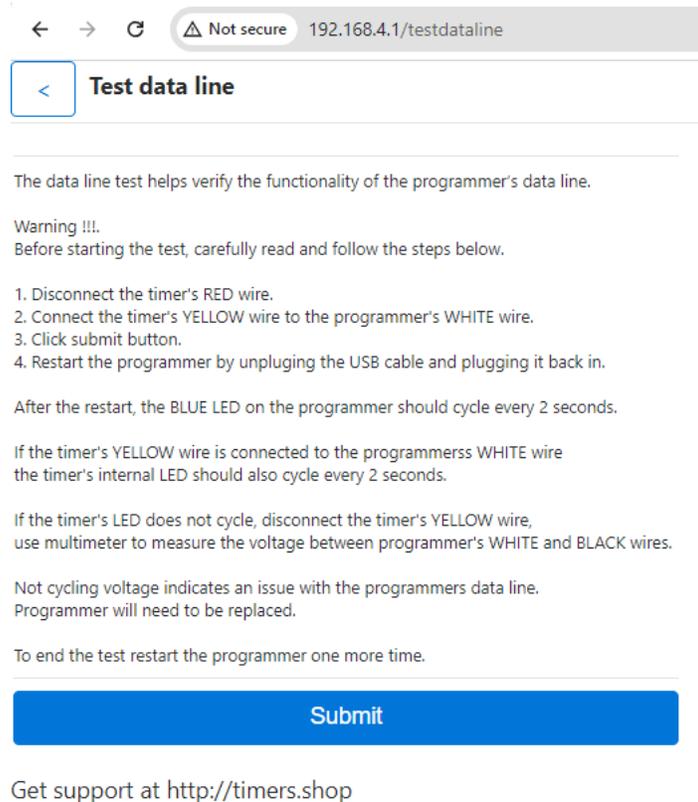
The programming of timer consists of selecting appropriate function, trigger and timing parameters. Follow the steps below to load the function 12 (time off delay), trigger 2 (trigger on rising voltage) and delay of 10 seconds:

- Connect the timer to the programmer.
- Power the programmer by plugging into a computer or USB power bank.
- Move the programmer's switch to ON position to supply the power to the timer. If the switch was in ON position when programmer was powered on then turn the switch to OFF position wait for a couple of seconds and then turn it back on.
- After a couple of seconds, the programmer blue LED would light up confirming the programmer is communicating with the timer.
- Search for timers.shop Wi-Fi network on the laptop or phone and connect to it.
- Open the browser on the phone/computer and enter address 192.168.4.1 into the address bar of the browser.
- Go to the Timer's Config menu and make necessary changes.

7. Troubleshooting

Symptoms	Resolution steps
The timer is not connecting to the programmer, and the programmer's blue LED is not ON.	<ul style="list-style-type: none">• Verify three wires (Black, Red, and White) are properly connected between the programmer and the timer and not shorted. Shorting White and Red might render the programmer inoperable.• Verify continuity of each wire.• Turn the programmer's power switch to the OFF position.• Push the programmer's two buttons located near the USB socket. The buttons could be pushed in any sequence. This will restart the programmer.• Supply power to the timer by moving the switch to the ON position. It might take a couple of seconds for the programmer to communicate to the timer.• Contact the support if you are still having issues with the programmer's connection.
The Select Function menu does not display any available functions, and the Timers Configuration menu is empty, including its functions and timing settings. The configuration seems to have been deleted from the timer.	<ul style="list-style-type: none">• The programmer is not successfully connected to the timer and cannot pull the existing timer information to be displayed. For the programmer to display available functions and settings, the timer must successfully communicate with the programmer, and the blue LED should be ON.
The programmer successfully communicates with the timer, but when going to select the function, the drop-down is empty.	<ul style="list-style-type: none">• The programmer might not have the up-to-date functions list for V9 timers. Make sure the programmer has been updated to the latest version. More information can be found here: https://timers.shop/Universal-Programmer-firmware_ep_61-1.html

Shorting the programmer's red and white wires may damage the programmer's data line. To test the programmer's data line, connect to the programmer's WI-FI, open the following address in the browser: <http://192.168.4.1/testdataline>, and follow the instructions.



8. Low Power Mode

The timer can be configured in Low Power mode, which drops the idle current consumption to a much lower value. This mode makes the timer suitable for battery operation. For example, if we take a 9V battery with 500mAh capacity, we can calculate the duration the timer can run in idle mode. $500\text{mah}/0.020\text{ma} = 25000$ hours. The timer's Low Power mode is enabled by default. But several conditions must be met to have the lowest power draw:

1. The trigger should be configured to #2 (if used), without Pull up. The trigger voltage should be at 0V for low power consumption.
2. The output is at 0V.
3. The following Functions are enabled for Low Power mode: 2, 10, 12 - 17, 20 - 29.

Note: Due to the internal power storage the timer will not reset with a brief power interruption. To reset the timer configured with Low Power mode, the power outage should be more than 3sec.

9. Accessories

9.1 Timer programming circuit (sold separately)



10. YouTube Videos

https://timers.shop/Timer-V8-Videos_ep_57-1.html



11. Useful links

Latest firmware and function updates: https://timers.shop/Universal-Programmer-firmware_ep_61-1.html