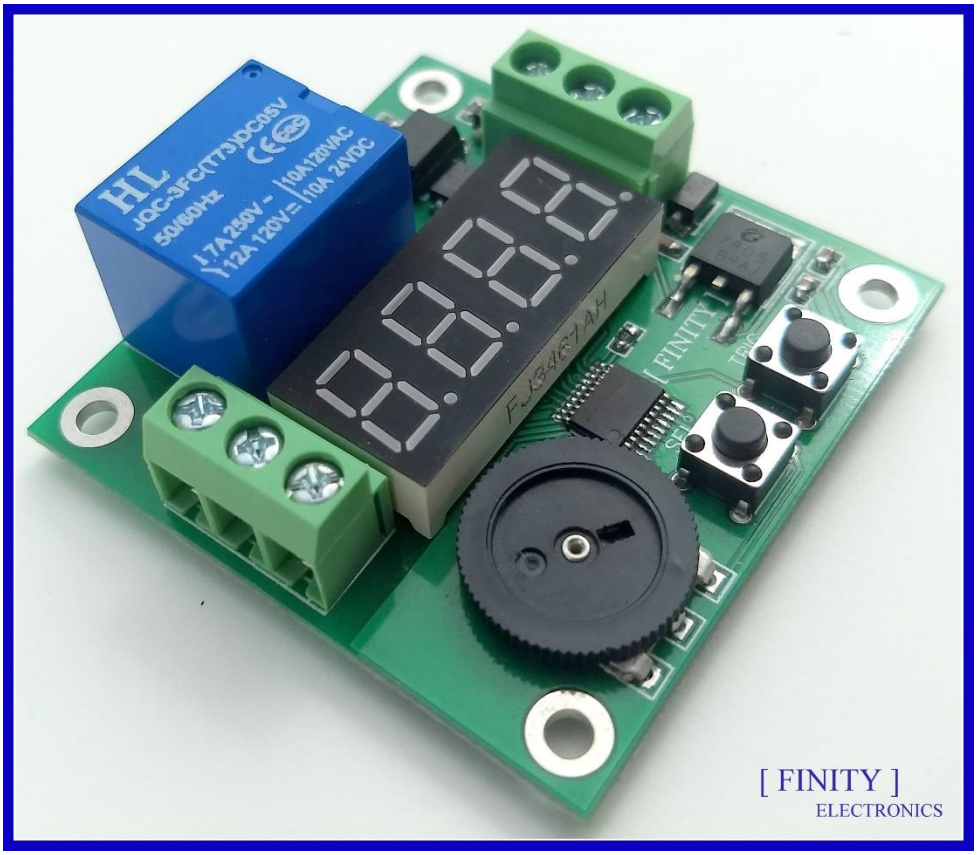
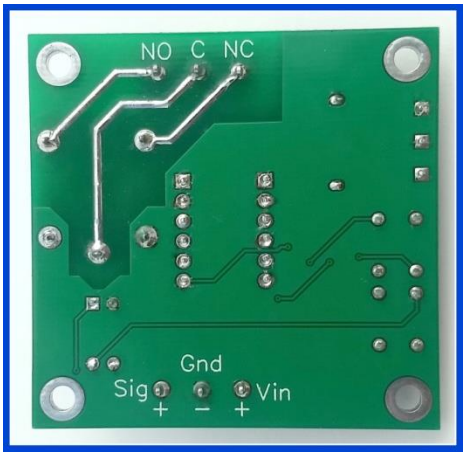


MK2 Digital Multifunction Timer User Manual



To know more about us and our products, visit our website at finityelectronics.com.

Features:

- System:
  - Embedded with a powerful microcontroller for fast & enhanced processing.
  - ADC noise cancellation.
- Technical Specifications:
  - **24** different modes of operations including:
    - 3 status modes……..(Mode 1-3)
    - 14 timer modes……(Mode 4-17)
    - 4 Up-counter modes……..(Mode 18-21)
    - 2 Up-counter and timer modes……(Mode 22,23)
    - 1 continuous variable pulse mode……..(Mode 24)
  - Every timer mode is equipped with **4** time settings:
    - ti-1: 0.01 to 9.99 seconds
    - ti-2: 0.1 to 99.9 seconds
    - ti-3: 1 to 999 seconds
    - ti-4: 1 to 999 minutes
  - Equipped with first in class dial and switch (SEL) arrangement for easy and flawless selection of modes.
  - Has an on-board trigger switch **(TRIG)** in parallel with the external trigger terminal **(Sig)**. Means, mode can be triggered by user from board as well as from any external actuating signal.
  - 4 digit segment display of **RED** colour.
  - System clock very precisely adjusted with real time. **0.1%** error measured.
  - Has ability to remember the last used mode with its time setting for all 24 modes. So no need to set the mode every time you use.
  - Minimum lifetime of **100K** working cycles.
  - On board relay status indication LED (Orange).
- Electrical Technicalities:
  - Wide operating voltage range: 5.5V to 30V DC.
  - Input signal voltage range: 3V to 30 V DC.
  - Low power consumption:
    - While in delay or when relay not latched:
      - 15mA @ 5.5V DC
    - While active or when relay latched:
      - 60mA @ 5.5V DC
  - Relay Contact Ratings:
      - 7A @ 250V AC
      - 10A @ 24V DC
  - Good isolation between Control and Power Circuit.

  - Heavy solder covered PCB traces for relay, ensuring safe conduction of current up to 10A.
  - Got **reverse polarity protection** on both source and trigger terminals.
  - **Opto-coupled** trigger input.
- Design Parameters:
  - Compact, crisp and easy to use design.
  - Detailed visible markings.
  - Weight: 25 grams.
  - Length : Width : 50 mm : 50 mm
  - Height: 20±2 mm
  - 3 mm dia screw hole. Perfect for **M3** screws.
- Temperature Range:
  - 0 to 55 °C.

Mode Setting Instructions:

- After **power ON** MK2 will be already in the previously selected mode, with its selected time settings and will work accordingly.
- If user wishes to escape and select another mode, he should keep the SEL button pressed for at-least **1.5 seconds**. So that he will enter mode selection module displayed as "**PG**" on segment display.
- After that by turning dial user can surf for the desired mode number from "**PG-1**" to "**PG-24**"and press SEL when he wishes to select it.
- **Note**: While setting or escaping a mode, user is advised to keep trig signal **LOW**.

Time Setting Instructions:

- Once the user has selected a mode he will enter the time setting menu.
- By turning the dial user can surf for time settings from "**ti-1**" to "**ti-4**", as described above and press SEL when he wishes to select it.
- After the time setting is selected user needs to set his desired time as follows:
  - The **decimal dot** will be displayed accordingly on its intended place as per the time setting selected.
  - The user needs to set his desired time value in form of three digits **D1**, **D2** and **D3**. The **delay notation** is for convenience of user showing him the notation associated with the delay, mentioned in their respective modes.

- First the **D1's** place of desired time value needs to be set. Turn the dial to surf for digits from 0-9 on D1's place, seen on display. Once you get the desired digit on display, press SEL.
- Then it's turn for **D2's** place. Again turn the dial to surf for the required digit as above and press SEL when you get it on display.
- Then surf for the **D3's** place accordingly and press SEL. After you press SEL "**trig**" will be displayed on the segment display. It means now the timer is ready to receive a **triggering pulse,** either from on-board TRIG switch or from external source (Sig).
- **Note:** If the user commits a **mistake** or wishes to change the delay time, then he can long press SEL and will start from selecting the mode.

Connection Instructions:

- **Vin** and **Gnd** are for connecting positive and negative terminals of DC source.
- **Sig** is for connecting the positive end of external trigger. Its negative should be connected to Gnd.
- The relay has three terminals for connection **NO** (normally open), **NC** (normally close) and **C** (common).
- When the **output** is high from controller, the relay latches connecting NO and C. When it is not latched, NC and C are connected. User should choose terminals for connecting the load wisely and as per the type of delay he requires.

Modes Description:

- **Mode1:**
  - This is a status mode. Here the output remains high **till** the trig signal is high and low otherwise.
  - The display and output have following relation:
    - trig: Output LOW
    - OE: Output HIGH
  - To **escape** the mode, long press SEL.

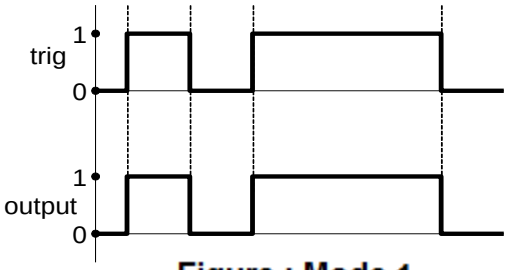


Figure : Mode 1

- **Mode 2:**
  - This status mode is dedicated for **toggling** output as per trigger events.
  - Here the output toggles after every **rising edge** detection of trigger and remains in the same state unless edge detected again.

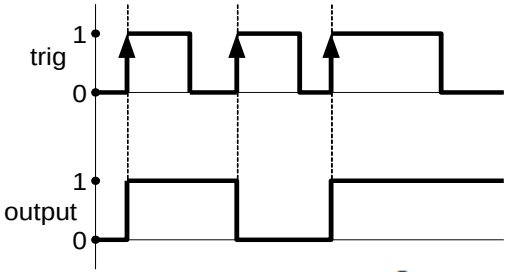


Figure : Mode 2

- The display and output has following relation:
  - OFF: Output LOW
  - OE: Output HIGH
- To **escape** the mode, long press SEL with trig LOW.

- **Mode 3:**
  - This last status mode is dedicated for **toggling** output as per trigger events.
  - Here the output toggles after every **falling edge** detection of trigger and remains in the same state unless edge detected again.
  - The display and output have following relation:
    - OFF: Output LOW
    - OE: Output HIGH
  - To **escape** the mode, long press SEL with trig LOW.

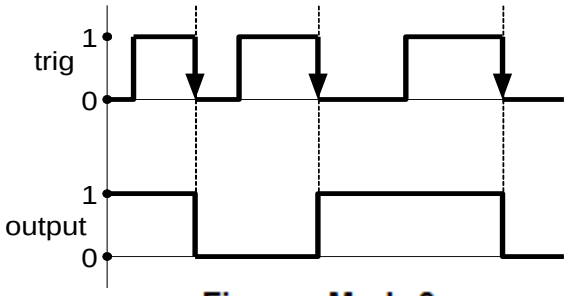


Figure : Mode 3

- **Mode 4:**
  - This is a general-purpose timer mode. In this mode the output will be HIGH for required delay **(t)** after the trigger. User can trigger it again, once the output is low.
  -

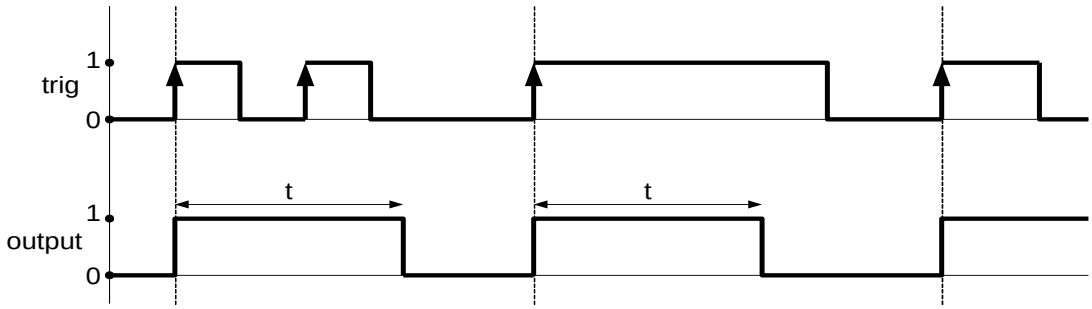


Figure : Mode 4

  - First here, user needs to set delay (t). While in delay if user wishes to **reset** the delay, he can short press SEL and can trigger it again.
  - **Note**: For this mode, while in delay any change in the trigger signal, would not impose any change on output, till the output is not LOW.
  - To **escape** from mode, user should long press SEL with trig LOW.

- **Mode 5:**
  - This timer mode requires no trigger. Hence the delay will start instantly after **power ON** and output will be high just after the delay finishes.
  - Setting this mode for first time, will start the delay just after (t) has been set. Once the delay is finished the output will **remain** HIGH till the mode is not escaped or the timer is not powered ON again.

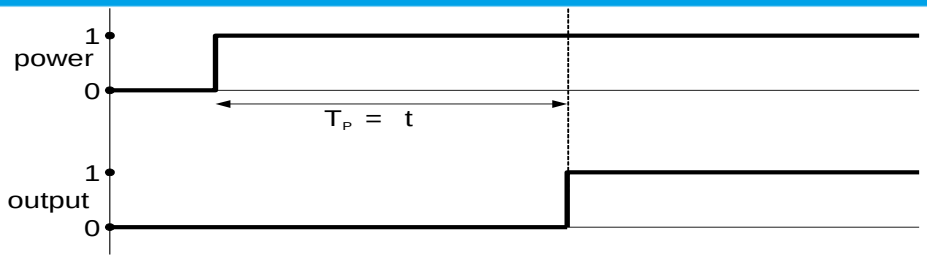


Figure : Mode 5

- To escape from mode, short press SEL.

- **Mode 6:**
  - This is a general-purpose timer mode with an exception, that it **resets** the delay (t) if the trig pulse is not LOW before the original delay (t) finishes.

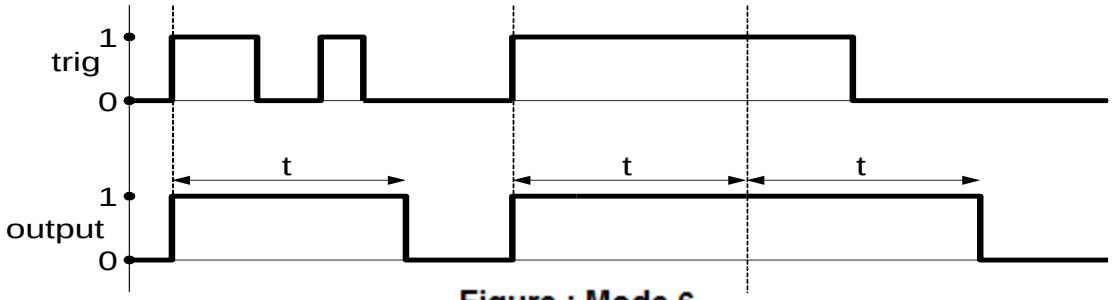


Figure : Mode 6

- When delay (t) finishes, if the **trig pulse** is LOW then output would be LOW.

Action	SEL	Trig
Reset Mode	Short Press	LOW
Reset only Delay	Short Press	HIGH
Escape Mode	Long Press	LOW

- **Mode 7:**
  - This is a general-purpose timer mode with **falling edge detection**. Here the delay (t) begins after the falling edge in trig is detected.
  - To trigger the delay **again**, another falling edge is required after the delay is finished. While in delay, any change in trig will have no change in output.

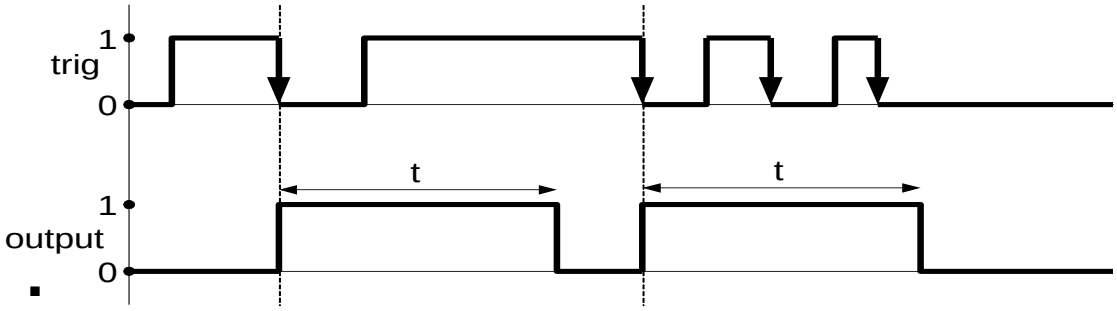


Figure : Mode 7

- To **reset** the mode short press SEL and long press to escape the mode.

- **Mode 8:**
  - This is a timer mode. It begins the delay (t) after detecting a rising edge in the trig signal with output as HIGH. While in delay, if there is **another** rising edge in trig then it resets the mode and output gets LOW.

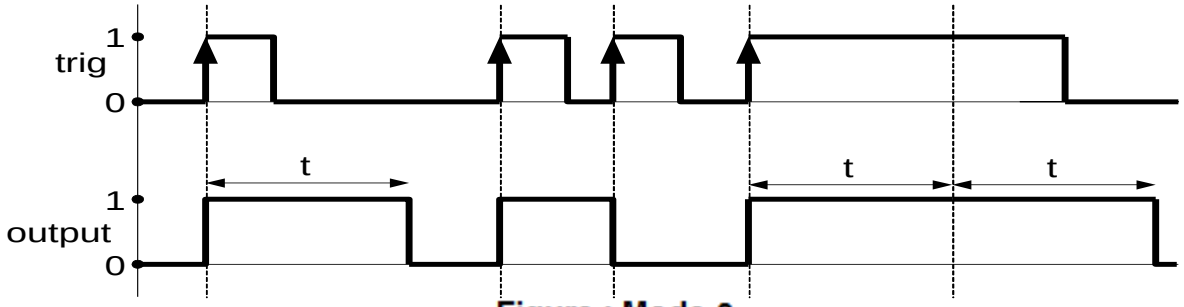


Figure : Mode 8

  - If the trig pulse is left HIGH **till** the delay (t) finishes, then it resets the delay (t) and if it is LOW then the output gets LOW and user can trigger again.

Action	SEL	Trig
Reset Mode	Short Press	LOW
Reset only Delay	Short Press	HIGH
Escape Mode	Long Press	LOW

- **Mode 9:**
  - This is a timer mode with **two** different user required delays (t) and (A). Both of this delays are set into continuation one after the other.
  - Here delay (t) is where the output will be HIGH and for delay (A) output will be low. Both of them **repeat** one after the other just after they are triggered.

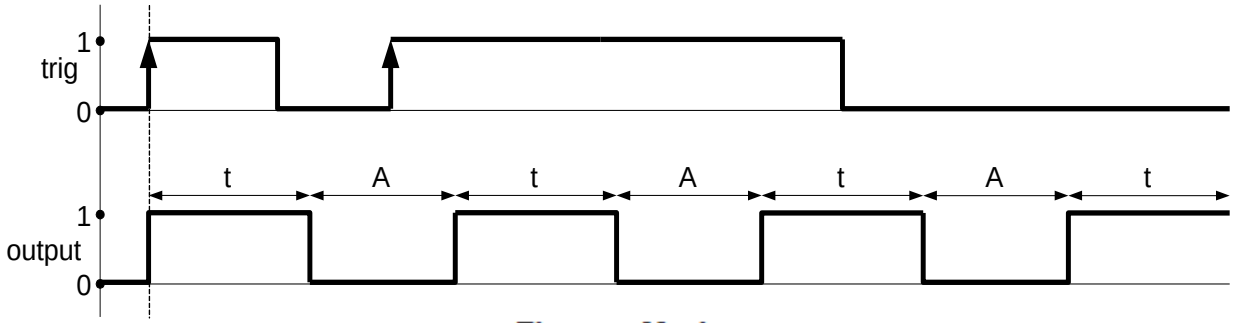


Figure : Mode 9

  - Here user will first set delay (t) and then delay (A). Remember, both delays have the same time settings, but can have different **time values**. Then with the first trigger, delays will start and any further change in the trig won't have a change in the output.

Action	SEL	Trig
Reset Mode	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 10:**
  - This timer mode is similar to mode 9. The only exception here is that it **doesn't require** any trigger. This mode starts the repeating delays just after MK2 has been powered ON.

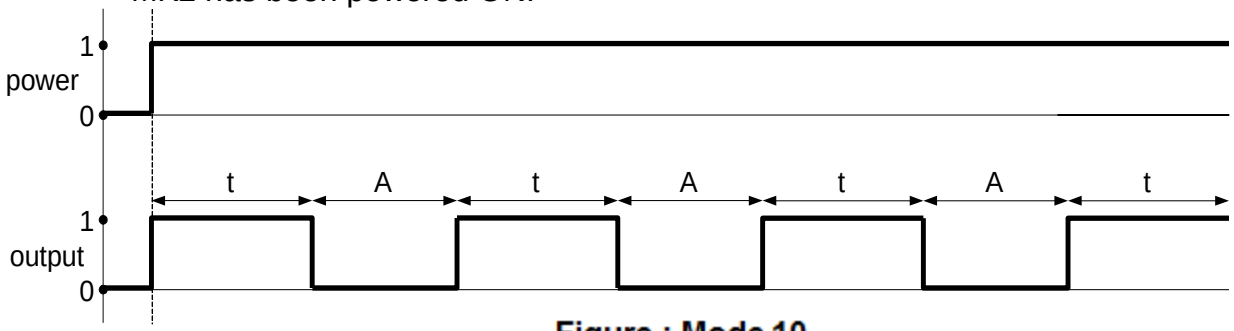


Figure : Mode 10

  - Here once the delays (t) and (A) are set, they will start **instantly** for the first time. For the next power ON it will work as mentioned before and seen in the figure. Here any change in trig won't have any effect on the output.
  - To escape the mode short press SEL.
- **Mode 11:**
  - This is also a timer mode with two delays (t) and (A) with a count (C) representing the number of **repetitions** of delays the user wants i.e. the delays will repeat the number of times (C) as set by user.
  - Here user can set counts (C) from 1 to 999.

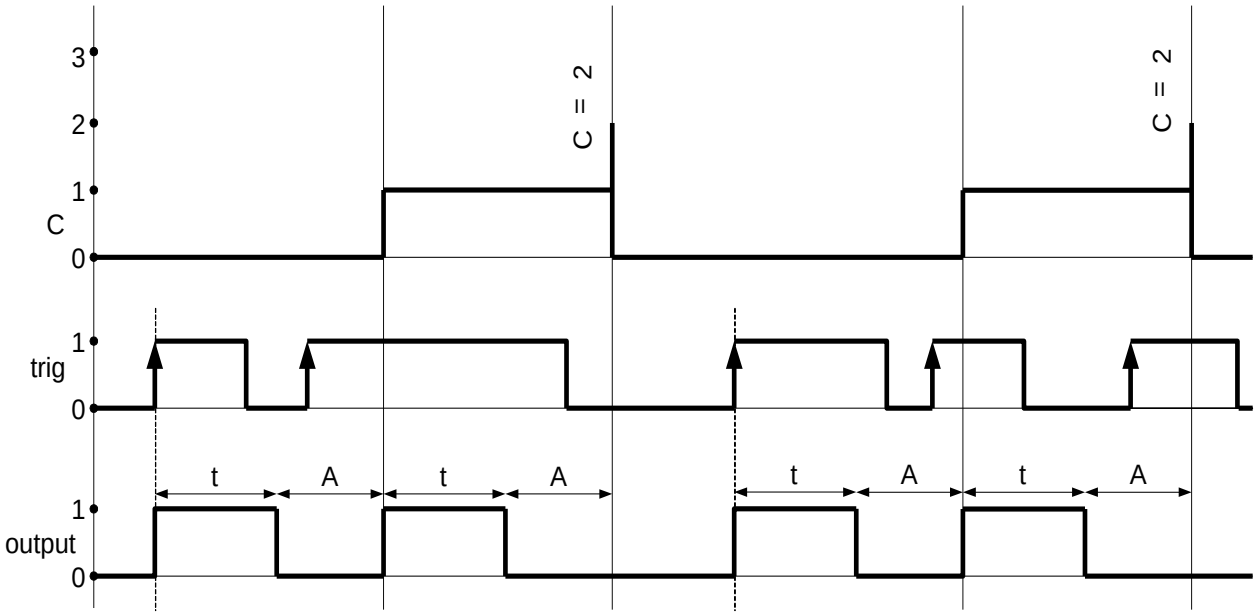


Figure : Mode 11

  - Here user will set delay (t), delay (A) and then count (C). After the trigger, delays will repeat as per count. Meanwhile any change in trig won't have any effect on output. After the counts finishes, user can trigger again.

Action	SEL	Trig
Reset Mode	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 12:**
  - This mode is similar to mode 9. The only exception here is that the delays (t) and (A) keeps on repeating **till** the input of trig pulse is HIGH. Once the trig pulse is LOW, the delays stop and then user has to trigger them again.

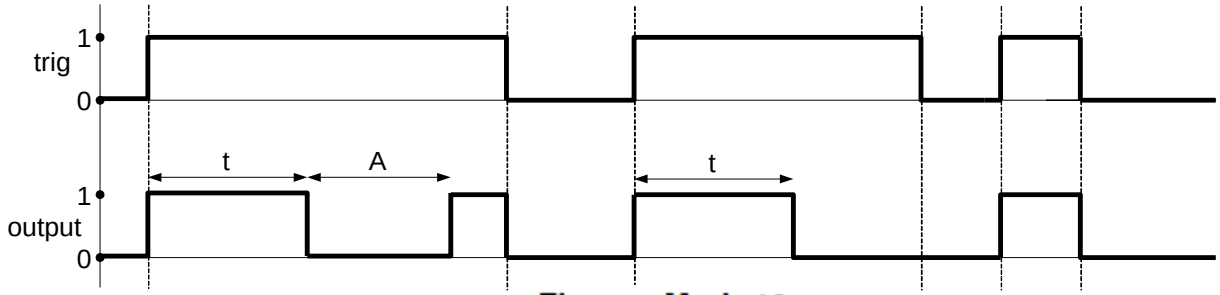


Figure : Mode 12

  - Once the trig pulse is LOW, the mode will **reset** and will wait for trig signal to go HIGH again. The delays will keep repeating till the signal is HIGH.

Action	SEL	Trig
Reset Mode	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 13:**
  - This is a timer mode with HIGH interval detection. Here the output gets HIGH after the trig pulse is HIGH for an **interval** set by the user. The output then remains HIGH until the mode is not reset.

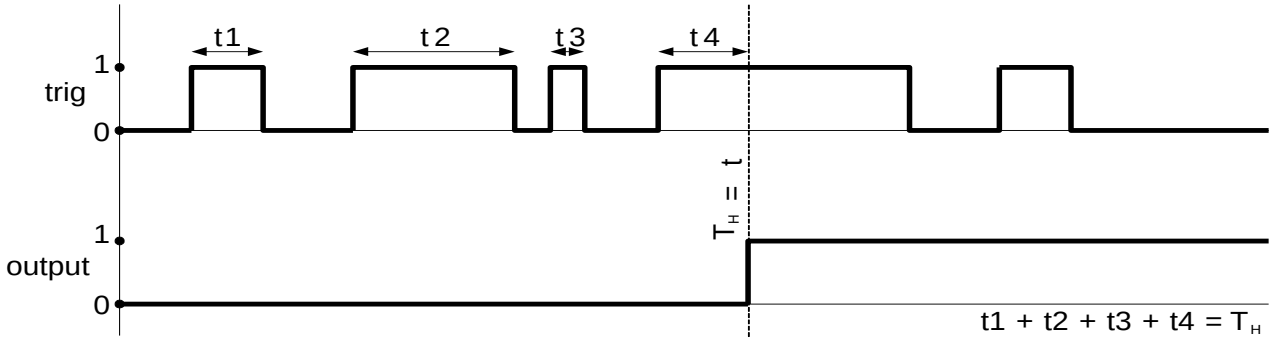


Figure : Mode 13

  - Here **T_H** is the total time for which the trig signal remained HIGH. When this T_H will be equal to delay (t) set by the user, then the output will go HIGH and will remain HIGH until mode is not reset or escaped. Any further change of trig pulse after the output is HIGH, will not affect output, until the mode is not reset by the user.

Action	SEL	Trig
Reset Mode	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 14:**
  - This is a timer mode similar to mode 13. The only exception here is that the output gets **toggled** after every time the HIGH interval has been elapsed.
  - Here **T_H** is the time which the user will set as the total time for HIGH interval. So like mode 13, once the trig signal is HIGH for given interval in total, then the output goes HIGH. After this, if the trig pulse remains HIGH again for given interval, then the output goes LOW. And the cycle continues.

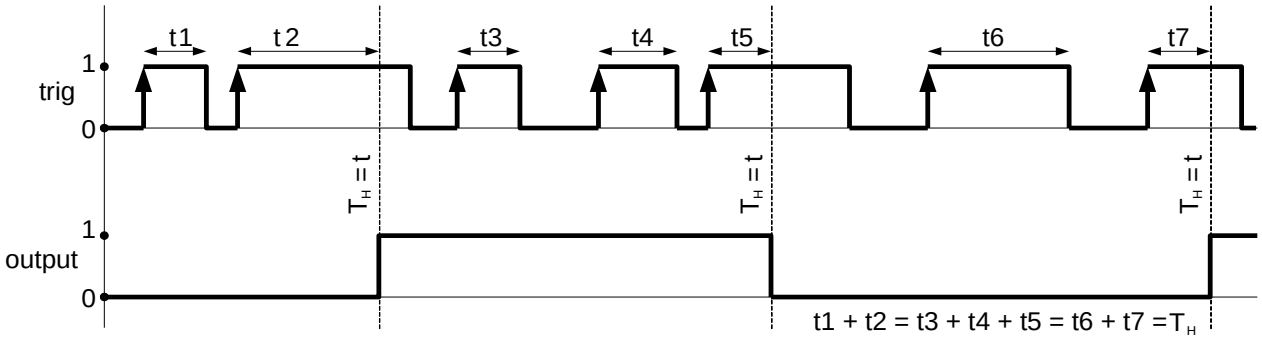


Figure : Mode 14

  - **Note**: Here the countdown for next HIGH interval starts, after the trig signal gets HIGH again for the next interval.

Action	SEL	Trig
Reset Delay	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 15:**
  - This is also a timer mode with HIGH interval detection. Here, like mode 13 a HIGH interval **T_H** is needed to get output HIGH. Meanwhile output will remain HIGH for given delay (A) and then will be LOW, so that user can trigger again.

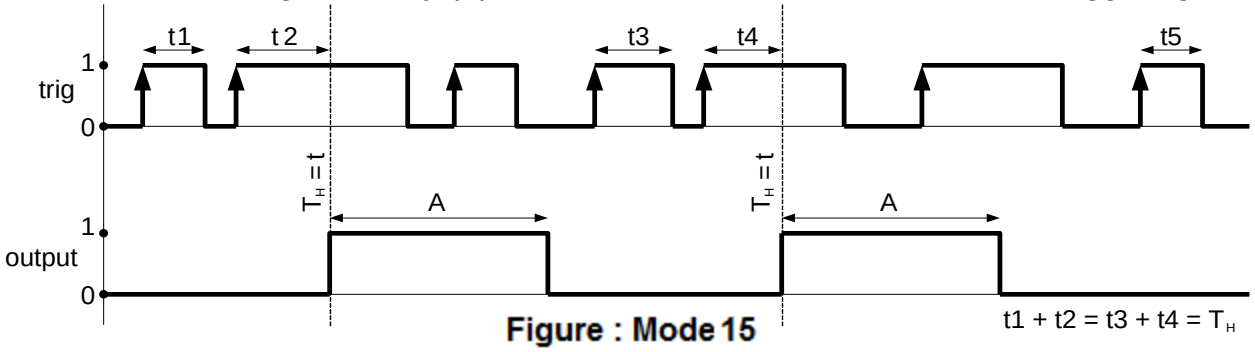


Figure : Mode 15

  - While in delay (A), changes in trig will have **no effect** on output.
  - In this mode, user will have to set the required HIGH time interval **(t).** Then he will set the output delay (A) and can then have a HIGH interval in trig signal.
  - Here t and A will have same time settings, but can have different time values.

Action	SEL	Trig
Reset Mode	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 16:**
  - This is a timer mode with **special** HIGH interval detection. Here the output goes HIGH if and only if there is a single HIGH pulse in trig signal having its HIGH interval T_H greater than or equal to t. If not, then the mode gets a reset.

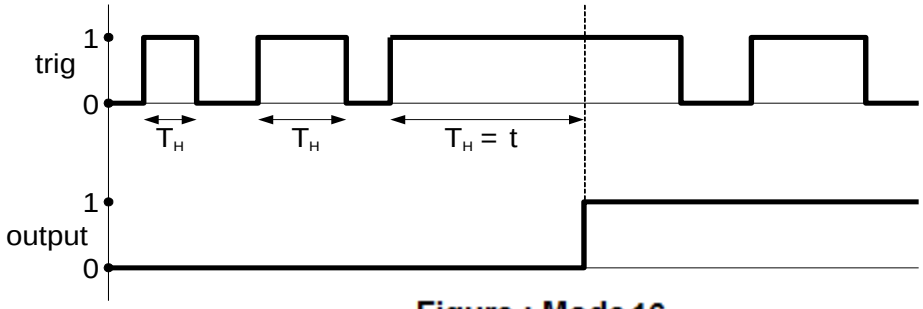


Figure : Mode 16

  - Here user will need to set only t. If the HIGH time of a pulse T_H is not **equal to or greater then** t, then the mode gets a reset.
  - Once $T_H \geq t$, the output will remain HIGH and **won't** have any effect of trig until the mode is not reset.

Action	SEL	Trig
Reset only Delay	Short Press	HIGH
Reset Mode	Short Press	LOW
Escape Mode	Long Press	LOW

- **Mode 17:**
  - This is a timer mode similar to mode 16. The only exception here is that once **$T_H \geq t$**, the output will be HIGH for user required delay (A) and then LOW, thus user can trigger it again.

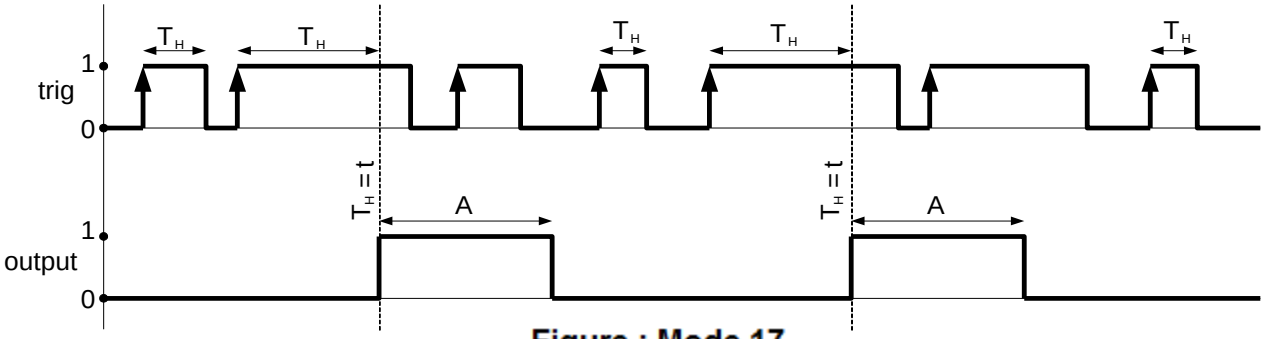


Figure : Mode 17

  - While in delay (A), changes in trig will have **no effect** on output. Here user will have to set (t) and (A) and later can trigger the signal.
  - Here t and A will have same time settings, but can have different time values.

Action	SEL	Trig
Reset Delay (t)	Short Press	HIGH
Reset Mode in (A)	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 18:**
  - This is an Up-counter mode with **rising edge detection**. Here the count is displayed on the segment, which increments after every rising edge detection in the trig signal.

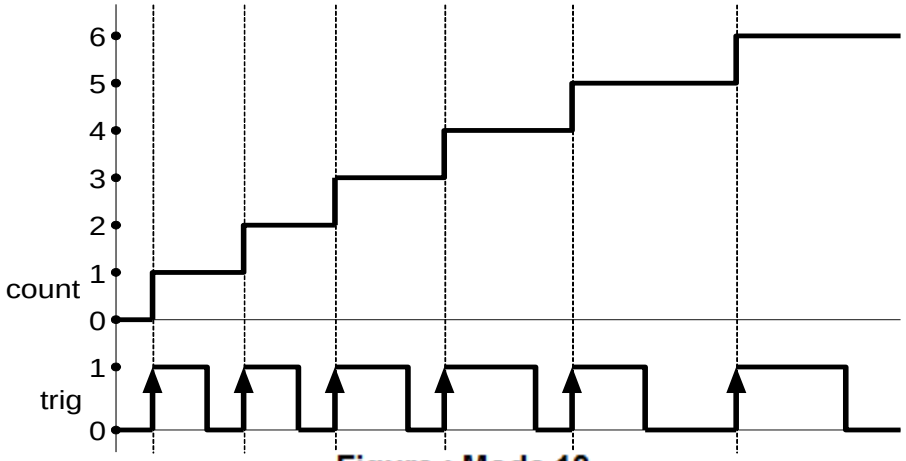


Figure : Mode 18

  - Here user can count from 0 to 9999 distinct events.

Action	SEL	Trig
Reset Count	Long Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 19:**
  - This is an Up-counter mode with **falling edge detection**. Here the count is displayed on the segment, which increments after every falling edge detection in the trig signal.

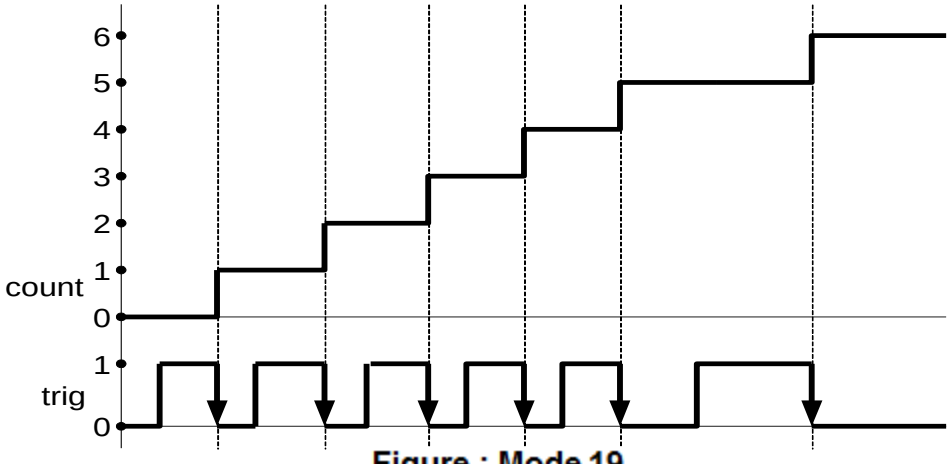


Figure : Mode 19

  - Here too user can count from 0 to 9999 distinct events.

Action	SEL	Trig
Reset Count	Long Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 20:**
  - This Up-counter mode is with rising edge detection and has output HIGH when its **preset count** value equals the live count value.
  - User can preset count value from 0 to 9999 and so is with live count value.

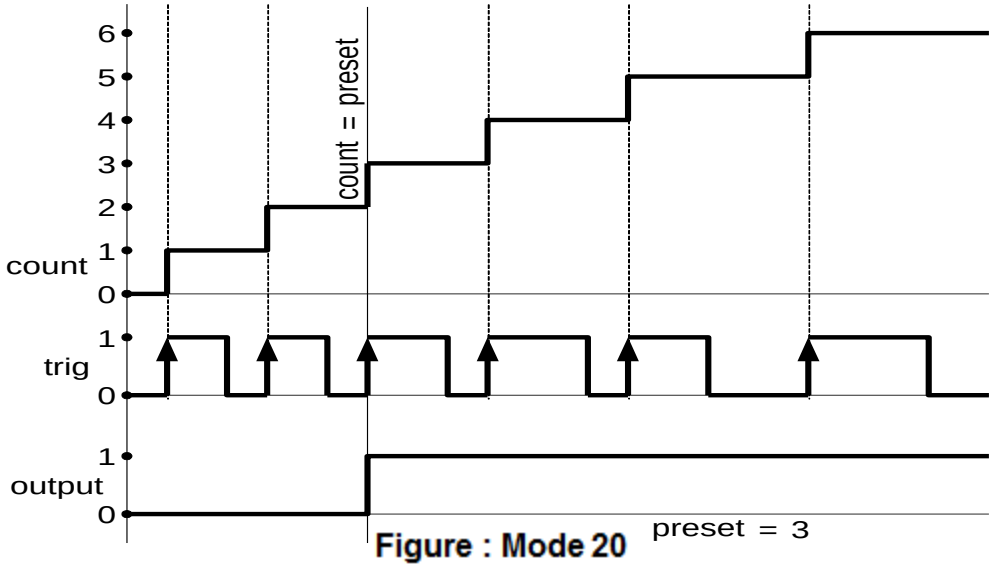


Figure : Mode 20

Action	SEL	Trig
Reset Mode	Long Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 21:**
  - This Up-counter mode is with falling edge detection and has output HIGH when its **preset count** value equals the live count value.
  - User can preset count value from 0 to 9999 and so is with live count value.

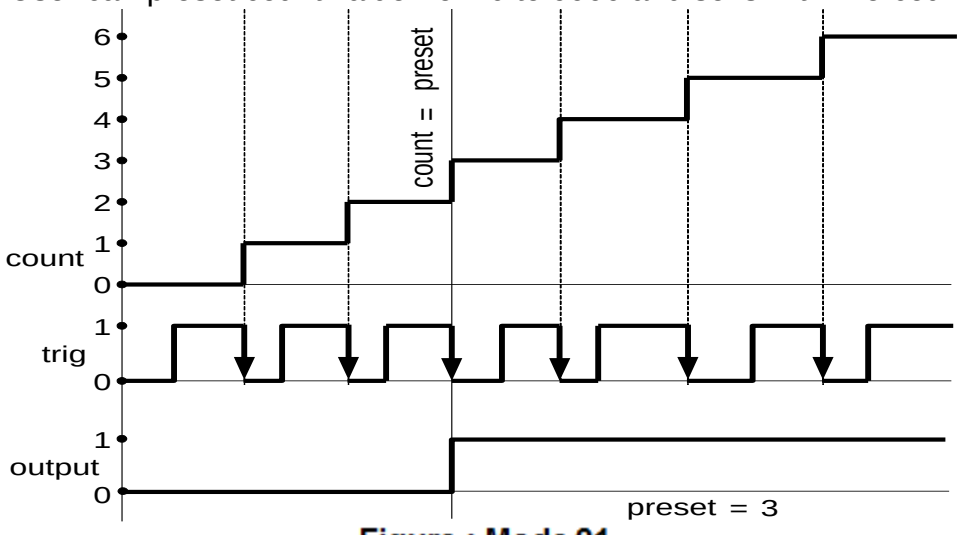


Figure : Mode 21

Action	SEL	Trig
Reset Count	Long Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 22:**
  - This is an Up-counter and timer mode with rising edge detection. In this mode the output gets **HIGH** for required delay (t), after the live count value equals the preset count value.

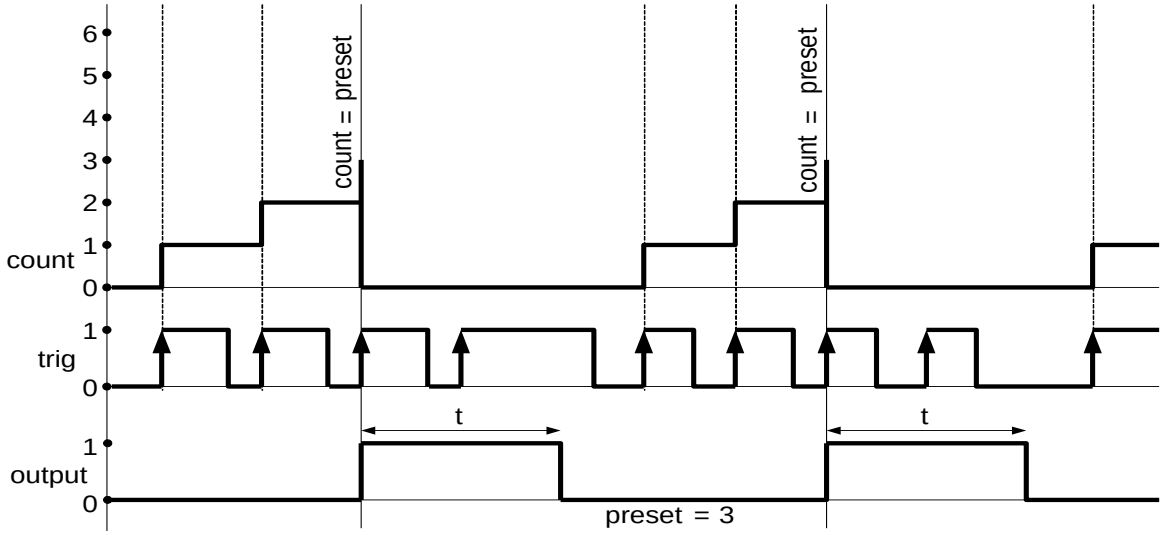


Figure : Mode 22

  - Here user needs to preset the count first and then delay (t). Here while in delay any change in trig signal will have **no effect** on output.
  - Here user can preset count from 0 to 9999 and so is with live count value.

Action	SEL	Trig
Reset Mode(while counting)	Long Press	Don't Care
Reset Mode(while in delay)	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 23:**
  - This is an Up-counter and timer mode with falling edge detection. In this mode the output gets **HIGH** for required delay (t), after the live count value equals the preset count value.

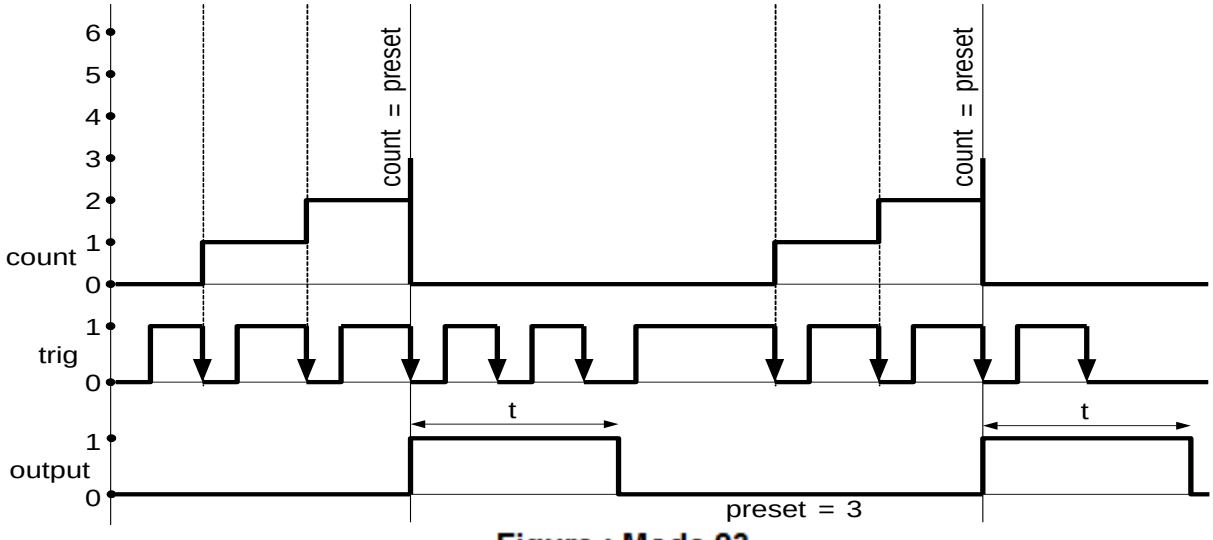
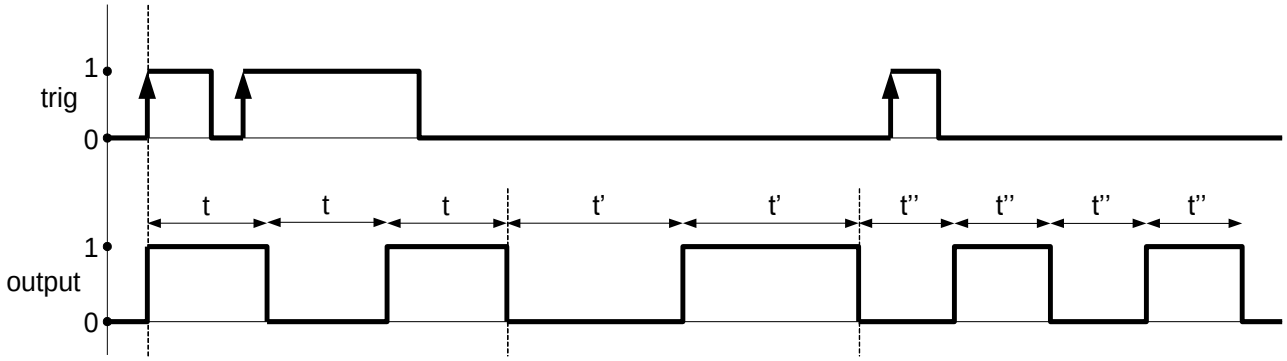


Figure : Mode 23

- Here user needs to preset the count first and then delay (t). Here while in delay any change in trig signal will have **no effect** on output.
- Here too, user can preset the count from 0 to 9999 and so is with live count value.

Action	SEL	Trig
Reset Mode(while counting)	Long Press	Don't Care
Reset Mode(while in delay)	Short Press	Don't Care
Escape Mode	Long Press	LOW

- **Mode 24:**
  - This is a **continuous variable pulse** mode. Here user can select any pulse width (t) ranging from 0.1 to 10.0 seconds.
  - To select this, user just has to turn the **dial** and get the desired pulse width on display. Once the pulse width is set, user can press trig and a pulse train of desired width and toggling output will start.
  - Here user can change the pulse width **in between** of the mode too. Just wait for selected pulse to finish and set the dial as per the need and a new pulse train will start.
  - The pulse train will run endlessly, **toggling** the output after every pulse.



- Here **t** is the width, set before triggering, **t'** is changed width in between the mode. And **t''** is also changed width by user in between the mode.
- Once the mode is triggered the trig has **no effect** on output.
- To escape the mode short press SEL.