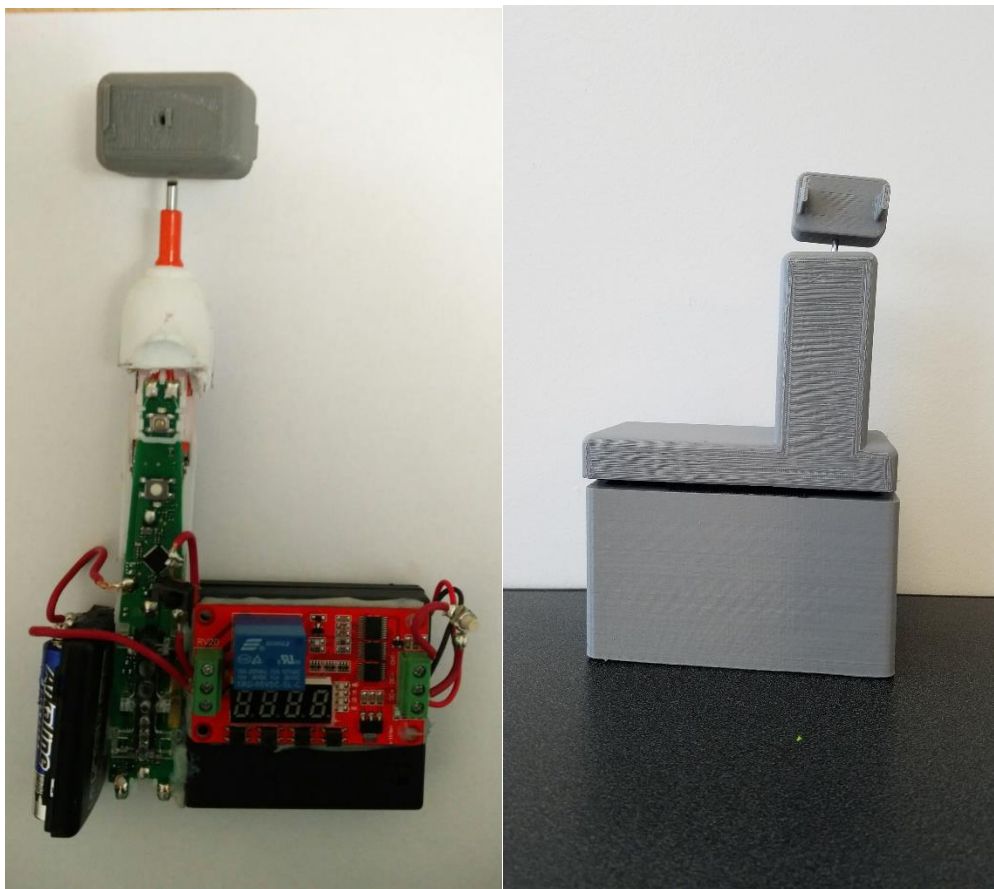




# NAU Dental Hygiene Capstone Project

## Dental Triturator Operations Manual



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## I. Introduction

The scope of this document is to instruct the users of the device how to properly use and maintain the triturator. Section II explains how to properly operate the triturator. Section III explains how to properly maintain the triturator.

## II. Operation

Figure 1 displays location of the power switches and the trigger. Refer to this figure when referencing this section.

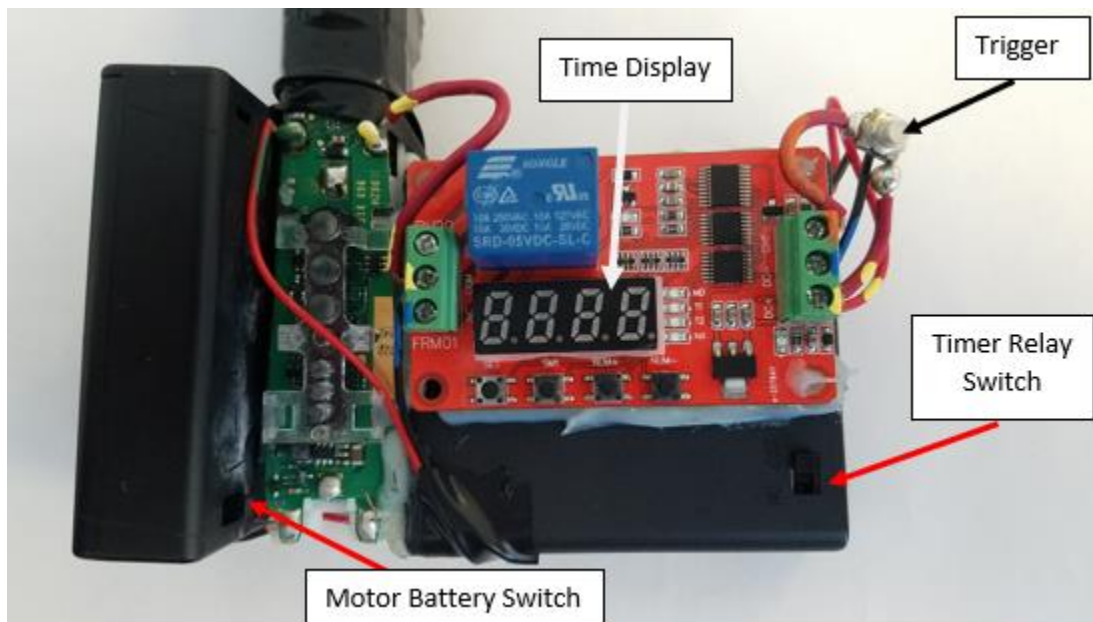


Figure 1: Triturator Switch Configuration

### a. Powering on the Triturator

1. Turn on the power to the Timer relay with the switch located on the large battery pack.
2. Wait for the timer to count down to zero
3. Turn on the power to the motor with the switch on the small battery pack.

### b. Using the Triturator

1. Make sure attachment and all parts are secured.
2. Activate and insert a dental capsule into the attachment.
3. Click the trigger located at the top right of the case.
4. Wait for the triturator to mix the capsule then remove and use.
5. Repeat steps 1 – 4 for all capsules used.

### c. Turning Off the Triturator

1. Make sure triturator is finished mixing.
2. Turn off the power to the motor with the switch on the small battery pack.

3. Turn off the power to the timer relay with the switch locate on the large battery pack.

### III. Maintenance

#### a. Battery Replacement

1. When timer relay or motor start to look or sound weaker, battery replacement is required.
2. Open small battery pack and replace with 2 brand new AA batteries.
3. If operation is still dysfunctional, replace the batteries in the large battery back with 4 AA batteries.

#### b. Attachment/Capsule Holder Replacement

1. If attachment is loose or broken, attachment replacement is required.
2. Remove attachment from the shaft of the toothbrush. Discard of broken attachment.
3. Retrieve a new attachment and line up shaft and attachment hole to fit onto the shaft.
4. Press the attachment onto the shaft until it will not go down any further.

#### c. Taking the Case Off

1. Remove the attachment from the top of the shaft
2. Pull off the top part of the case

Refer to Appendix for disassembled figure of case.

#### d. Putting the Case On

1. Line up yellow line on bottom case and device, shown in the Appendix in Figure 5.
2. Place top case over device and firmly press down so the Velcro attaches.

#### e. Wiring Configuration

This section shows the wiring diagram for the timer relay. The wires are color coded to show proper locations, Figure 2. If a wire is removed or cut, the device will not work. Refer to troubleshooting section.

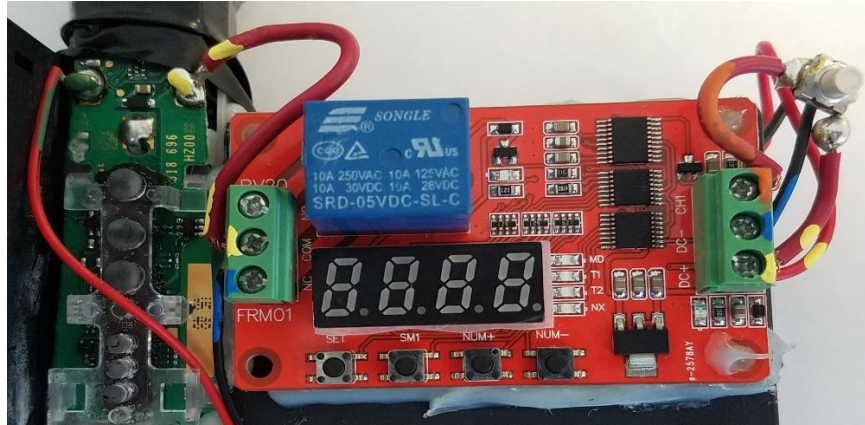


Figure 2: Color Coding and Wiring Configuration

f. Troubleshooting

This section covers any trouble that the device might have and proper action to take to repair the device.

1. If the timer does not power on, remove and check all batteries and battery placement. Battery replacement may be required.
2. If the timer still will not power on, check that all wires are connected and in the proper colored locations.
3. If there is power to the timer but not the motor, check wires, batteries, and motor placement. If everything is in the correct position, the motor may need replacement. In this case, a new device will have to be used.

g. Timer Program Trouble shooting

The timer has many functions and right now it is using function 1 with 12 seconds. Function 1 make the toothbrush turn off after 12 sec and can turn it back on for another 12 seconds by pressing the trigger.

1. If having trouble with timer functions refer to appendix pg 8 and 9
2. For more information regarding the timer functions refer to the link provided below

<https://cdn.instructables.com/ORIG/FKQ/BV7D/IUHMS1GV/FKQBV7DIUHMS1GV.pdf>

## Appendix

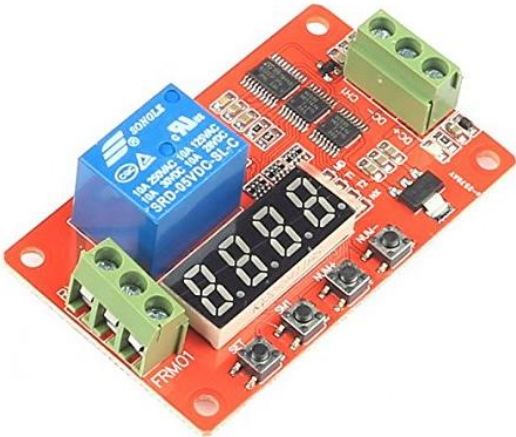


Figure 3: Timer Relay Module



Figure 4: Top and Bottom Cases Disassembled

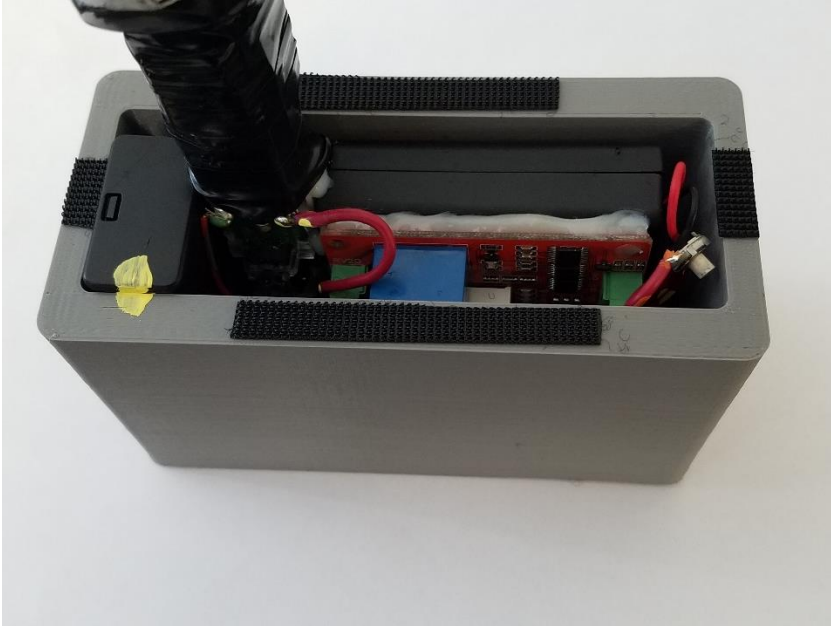


Figure 5: Device with Top Case Removed and Yellow Marking for Proper Location

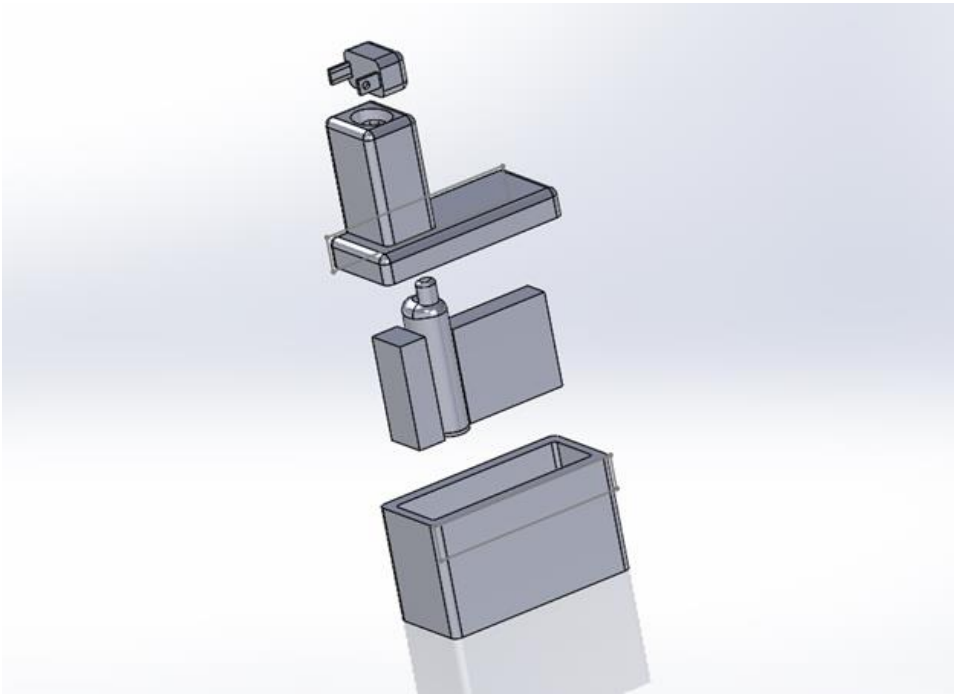


Figure 6: Cad assemblies picture

## II. Operating Instructions

The user can select the operating mode according to keys and display, also can set the timing parameters, all parameters can be automatically saved after setting.

Below is some noun descriptions about parameter setting:

**[Keys]:** there are 4 keys, namely: [SET] [SWI], [NUM +] and [NUM-], the keys have short and long press, short press means press the button less than 1 seconds, long press means press the button more than 1 seconds.

**[Operating mode]:** there are 3 kinds, namely: [Operating Mode], [Parameter view mode] and [Parameter setting mode].

**[Digital tube]:** there are 4 digital display, is used to set or view the user timing parameters.

**[LED ]:** 4 blue parameter indicators, 1 red power indicator.

**[User parameter]:** there are 4 kinds of parameters can be set (4 blue LED light to indicate the following parameters)

**[MD]:** MD Light, digital tube displays the current program function, total 18 kinds display mode to choose from (01-18).

**[T1]:** T1 light, digital tube displays timing time T1, can be 0-9999 seconds.

**[T2]:** T2 light, digital tube displays timing time T2, can be 0-9999 seconds.

**[NX]:** NX light, digital tube display the different meanings in different functions.

1. In function 1-6 and 11-16, [NX] light, the digital tube indicates the time base of T1 and T2, the first two digital tube indicate the timing T1, and behind the two digital tube indicate the timing T2, for example: [NX] indicates "01 01" means the timing time unit is 1 second; another example: [NX] indicates "10 02" means the timing time unit of T1 is 10 seconds, T2 is 2 seconds, so the Max timing time is 9999\*99 seconds, which is about 270 hours.

2. In function 7、8、17、18, [NX] light, four digital tube indicates the number of cycles, at this moment, the timing time unit of T1 and T2 is 1 second, so the Max timing time is 9999 seconds in limited cycle timing mode.

Figure 7: Operation Manual Part 1



**[Operating mode]:**

1. When turned on, the digital display current timing countdown, when time to zero, that displays the current function number, such as: " -- 0 1 " means the function 1
2. Short press [SET] enter into the power saver, the display goes out, but the program to work normally, press again to restore the display;
3. Long press [SET] enter into [Parameter setting mode];
4. Long press [SWI] enter into [Parameter view mode];
5. Long press [NUM+] into 10 seconds automatic power saving mode, the digital tube will blink twice, which means that the setting is successful. After entering the power saving mode, if no operation of any button within 10 seconds, the digital display will turn off, but the program running, you can short press [SET] to restore the display temporarily, you can also long press [NUM+] again to exit the automatic power saving mode, the digital tube will blink three times to indicate the setting is successful.
6. Long press [NUM-] timing reset and stop, again short press [NUM-] to restore timing, after into reset state, LED lights are no longer flashing.

**[Parameter view mode]:**

When turned on, long press [SWI] enter into parameter view mode, under parameter view mode, can view the parameter of the current function, the blue parameter LED indicator will flash to display.

1. Short press the key [SET], cutover the parameters, can choose one from [MOD], [T1], [T2] or [NX], the LED indicator of the selected parameter will flash, the digital tube display the parameters that have been set. Such as: when [T1] light, the digital tube display the content of [ T1].
2. Long press the key [SWI], enter into [Operating mode];

**[Parameter setting mode]:**

When turned on, long press [SET] enter into parameter setting mode, under this mode, you can set various parameters, for example, you can select working mode, also can set the delay time etc.

1. Short press the key [SET], cutover the parameters, can choose one from [MOD], [T1], [T2] or [NX], the LED indicator of the selected parameter will long light, the digital tube display the parameters that have been set. Such as: if users need to adjust the working mode, should press the [SET] to make LED indicators point to [MOD].
2. Short press the key [SWI], cutover the selected digital tube, the relevant digital tube will flash display.
3. Short press the key [NUM+], the selected digital tube numerical +1, add 9 stop;
4. Short press the key [NUM-], the selected digital tube numerical -1, reduced to 0 to stop;

Figure 8: Operation Manual part 2