

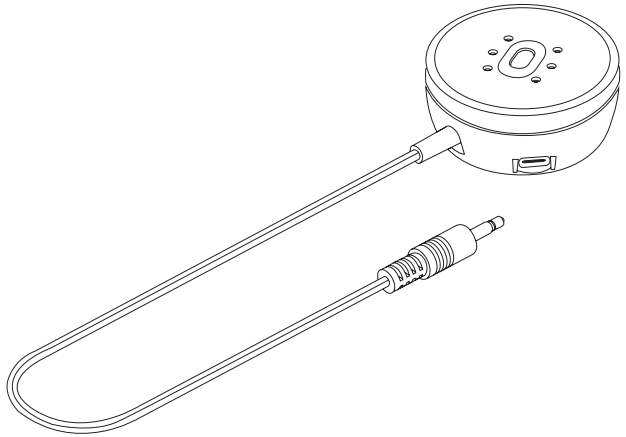
INSTRUCTIONS FOR USE

ToFFEE Wired Switch

Pack Contents

Carefully check the contents of the box, which are:

- **ToFFEE Wired Switch unit**
- **Decal set**
- **USB Charging Cable**
- **These instructions for use**



Product Description

ToFFEE Wired Switch is a unique and highly versatile proximity switch designed for disabled users. It works wherever a mechanical switch would work, and terminates in an industry standard 3.5mm jack plug. Benefitting from ten user-selected detection ranges and output modes for a wide range of use-cases, **ToFFEE** is ideal not only for typical switch applications but also for situations where conventional switches fall short.

Unlike other proximity switches that require contact or very close proximity, **ToFFEE** uses advanced Time-of-Flight (ToF) technology to detect any opaque object, regardless of colour, material, or surface texture. This means it works reliably with any skin tone, and is unaffected by clothing, hair, or coverings.

Optional audible and visual feedback means it can be made to sound just like a conventional switch. The switch is powered by an internal rechargeable lithium battery which gives around 25 hours of use between charges. Programmable power settings allow the user to select if and when the unit goes to sleep due to inactivity.

ToFFEE may be mounted using industry-standard brackets, allowing it to be operated by almost any part of the body such as the user's hand, arm, knee, head or even by puffing out a cheek.

Like all Pretorian products, we've packed in as much functionality as we can, so please take the time to read these instructions to get the most from your **ToFFEE** switch. Your attention is drawn to the Safety Instructions in particular, which are overleaf.

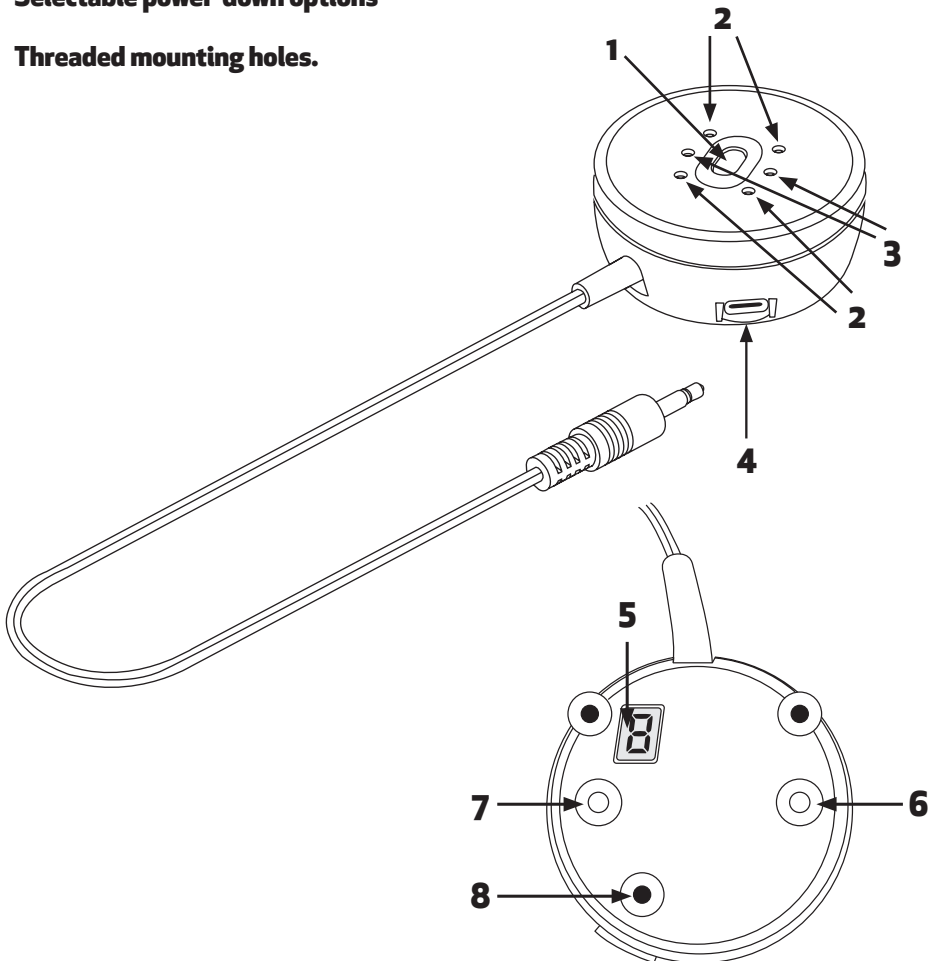
IMPORTANT SAFETY INSTRUCTIONS



- **Read and pay heed to these instructions for use and retain for future reference.**
- **Ensure you are familiar with the devices you plug ToFFEE Wired Switch into by reading their instructions for use and/or using them separately to begin with.**
- **This product contains a laser light source, which is designed to meet Class 1 laser safety limits under all reasonably foreseeable conditions including single faults, in compliance with IEC 60825-1:2014. This product is not considered 'child appealing' within the context of Clause 5 of IEC60825-1:2014. Nevertheless, you should ensure that users do not stare into the beam at very close range. If they are unable to follow such instruction, or the unit cannot be positioned in such a way as to make it impossible, this constitutes a contra-indication for use.**
- **Whilst ToFFEE Wired Switch uses state of the art optical technology, it is still possible for it to be activated unintentionally due to external light sources or electrical interference. Do not use it in applications where unintentional operation may lead to safety concerns.**
- **The cover glass [1] should be kept free of debris and fingerprints for reliable operation. Refer to the cleaning guide in these instructions for use.**
- **There are no user serviceable parts in the unit. Do not disassemble, and do not attempt to replace a worn or damaged cable. Refer to an authorised distributor or the manufacturer for all repairs.**
- **Do not use this unit near water.**
- **This unit is intended for indoor use only.**
- **This unit is not for use as part of a safety critical, mission critical or life-sustaining system.**
- **ToFFEE Wired Switch contains a lithium-ion battery. Never dispose of a battery in fire.**

Features

- **Choice of ten ranges: 0 - 25mm up to 0 - 500mm**
- **Operates with any skin tone or opaque material**
- **Multiple output options for a wide range of use-cases**
- **Ignore Repeats setting**
- **Choice of audible and visual feedback, both, or none.**
- **Rechargeable lithium battery with supplied charger cable**
- **Selectable power-down options**
- **Threaded mounting holes.**



Preparing your ToFFEE switch for use

First of all, choose the colour you would like **ToFFEE** to be and attach the self-adhesive decal to the top surface, positioning it carefully to ensure good alignment with the recess in the mouldings.

Make sure your **ToFFEE** switch is fully charged using the cable provided. Simply insert the USB-C plug into the corresponding socket [4] and plug the other end into a computer or charger socket. Once charging begins, the charging LED [8] lights green. When this LED goes out, charging is complete.

Note that if you should lose your charger cable, replacements can be purchased either from a Pretorian reseller or any electronics or on-line retailer. You should request a 'USB-A to USB-C cable'; (or USB-C to USB-C if your charger also uses USB-C).

Once charged, you may now make the required settings to the unit so that it behaves as you need it to. Please refer to the following sections for instructions on how to configure each of the settings.

Range Setting

Range is the farthest distance from the cover glass that the unit can detect an object. In all cases, the unit will detect objects from zero (i.e. in contact with the unit) up to and including the range setting.

To see the current Range, press the Range/Learn button [6] briefly to bring on the display. The corresponding Range settings are given in Table 1. If you wish to change the setting, press it repeatedly (but briefly) until you see the setting you need, and then wait for the display to be extinguished. The new Range setting will become active immediately and will also be saved in the unit's memory for future use. Note that Range settings are approximate.

Range Setting	Range (millimetres)	Range (inches)
0	0-25 mm	0-1"
1	0-50 mm	0-2"
2	0-75 mm	0-3"
3	0-100 mm	0-4"
4	0-150 mm (default)	0-6" (default)
5	0-200 mm	0-8"
6	0-250 mm	0-10"
7	0-300 mm	0-12"
8	0-400 mm	0-16"
9	0-500 mm	0-20"

Table 1:
Range settings

The Range setting may often need to be changed, so it has been made easily accessible from the keypad. The remaining settings usually need to be changed less often and so are bundled together into the Learn Mode:

Learn Mode

In Learn Mode, you can set the following

- Output settings
- Ignore Repeats time
- Feedback type
- Power settings

To enter Learn Mode, press and hold the Range/Learn button [6] until you hear a warbling beep.

Output Mode

The Output mode is the first setting to appear on the display, the settings being as shown in Table 2:

Which setting is appropriate very much depends on the use-case. For example, using **ToFFEE** to control a lamp via a mains switcher may necessitate the use of Latching mode. Double-Click is sometimes used for computer access, since it can emulate a double mouse click for those users who lack to dexterity to click twice in short succession.

One-shot is useful for users whose movements are laboured and who will tend to linger over the switch for longer than the period for which they wish it to operate. Additionally, it can be used to good effect in preventing multiple operation of **ToFFEE** when an object is introduced to the very edge of the sensor zone and might otherwise cause the switch to ‘chatter’.

Delayed Drag is a useful blend of Direct and Latched. If an object passes through the sensor zone and back out in less than 1.5 seconds, it operates in Direct mode. If the object remains in the beam for more than 1.5 seconds, the switch latches on. If audible feedback is on (see later), the unit will click a second time to indicate that the latch is now on. The output can be de-latched by introducing an object to the sensor zone again, even for a short period.

A	Direct/momentary (default)
B	Latching
C	One-Shot
D	Double click
E	Delayed Drag

Table 2:
Output Mode settings

To make changes in this menu, press the Power/Modify button [7] repeatedly until you see the setting you require on the display. Then, either let the display extinguish or press the Range/Learn button [6] to go to the next Learn Mode menu.

Ignore Repeats time

This is the time for which the switch will ignore objects after it was last released. It may be used to prevent accidental secondary operation of the switch, for example because the user has a tremor. By default, it is set to zero, i.e. the unit will operate again immediately after the switch is released.

When Ignore Repeats is set to a non-zero value, the visual indicator LEDs [3] give a visual indication that objects will be ignored following the last switch operation. Once these LEDs are extinguished, the switch will respond to objects once again. The settings are as follows:

F	None (default)
G	0.5 sec
H	1.0 sec
J	1.5 sec
L	2.0 sec

Table 3:
Ignore Repeats settings

To make changes in this menu, press the Power/Modify button [7] repeatedly until you see the setting you require on the display. Then, either let the display extinguish or press the Range/Learn button [6] again to go to the next Learn Mode menu:

Feedback type

The unit is capable of both visual and audible feedback. Visual feedback is achieved using four green LEDs [2] on the top of the switch. Audible feedback has been designed to sound just like a normal, mechanical switch. Each can be enabled and disabled independently using this menu. The settings are given in Table 4.

N	None
P	Audible only
R	Visual only
S	Audible and Visual (default)

Table 4:
Feedback settings

To make changes to this setting, press the Power/Modify button [7] repeatedly until you see the setting you require on the display. Then, either let the display extinguish or press the Range/Learn button [6] again to go to the next Learn Mode menu:

Power Settings

Three power regimes are available. Which to use depends on how tolerant the user is of the inconvenience of the unit going to sleep. Setting T is perhaps the best compromise of battery life and convenience, but it does require that the Power button be pressed after very long periods of inactivity, and not all users will be able to do so. That situation is likely exacerbated when the unit is mounted, as this will make access to the Power button more difficult.

When set to Power Setting T, the unit goes into Snooze mode after 30 minutes of inactivity. It emits two short beeps to indicate it is doing so, regardless of whether audible feedback is turned on. If there is no further activity for another 2.5 hours, it emits four beeps and then goes to Sleep.

During Snooze, the unit will wake up when a suitable object is introduced at a distance between zero and the Range setting. Power savings are achieved by ‘looking’ for an object less often, so you will need to keep the object in range for longer than usual to make sure it is recognised. As it awakes, the unit beeps twice, regardless of the audible feedback setting.

During Sleep, the unit does not respond to objects at all. The only way to wake the unit is to press the Power/Modify button [7]. Battery life in Sleep mode is many months on a single charge.

Power Setting U allows Snooze to be entered after 30 minutes (just like setting T) but the unit will never go to Sleep. This is a good choice for users who cannot press the Power button due to their disability, or because the unit is mounted. To wake the unit from Snooze, introduce an object at a distance between zero and the Range setting. As with setting T, you may need to keep it in range for slightly longer when waking from Snooze. The unit beeps twice as it awakes. Battery life in Snooze mode is about a week.

Power Setting Y keeps the unit awake indefinitely. It is recommended only when the unit is permanently powered via the USB socket. Battery life when Awake is about 25 hours, or indefinite if plugged into a supply. When in Sleep mode, battery life may be measured in months.

T	Snooze after 30 minutes, Sleep after 3 hours (default)
U	Snooze after 30 minutes. Never Sleeps.
Y	Permanently Awake (recommended only when powered via cable)

Table 5: Power settings

To make changes to this setting, press the Power/Modify button [7] repeatedly until you see the setting you require on the display. Then, either let the display extinguish or press the Range/Learn button [6] again. This is the last of the Learn Mode menus, so a further press will circle back to the Output Mode setting.

Battery Life and Battery Charging

A fully charged battery gives approximately 25 hours of operation, depending on the amount of use. When the battery is getting low, the red LEDs [3] begin to blink red. This is an indication that you should charge the battery soon. Plug the charging cable into the charging socket [4] and then into a charger or computer*.

While charging, the charging LED [8] will be illuminated green. Once charging is complete (a matter of a around 2-3 hours if fully discharged) the charging LED will be extinguished. You can then unplug the cable.

Note that you can continue using **ToFFEE** while it is charging.

* **ToFFEE** plugs into a computer USB port for charging purposes only - it does not give a functional connection this way.

Mounting

ToFFEE may be mounted where necessary using the two threaded mounting holes on the underside of the unit. The distance between them is 31.75mm (1.25"), which is frequently referred to by mounting manufacturers as the 'Buddy button' system.

Please note that the threaded holes require 3mm metric screws. Maximum length inside the unit is 8mm. In North America, please refer to a Pretorian reseller for availability of suitable metric screws.

Cleaning

The cover glass [1] must be kept clean to ensure correct functionality. Cleaning may be achieved with a slightly dampened soft cloth. Do not use any detergents, cleaning chemicals or solvents, the use of which will void the warranty.

Notes on using ToFFEE

ToFFEE uses invisible laser light to detect the presence of an object. The small black 'cover glass' (actually plastic) [1] on the top of the switch is where the light is emitted from and received back again. The electronics inside the unit measures the time it takes for the light to travel to the object and be reflected back again (its Time of Flight – hence **ToFFEE**).

Although not visible light, it is a laser, and it is important not allow anyone to stare directly into the beam at close range. If the user cannot be so instructed, or prevented from doing so, this constitutes a contra-indication for its use.

Although visible lasers are usually associated with straight beams, the laser in **ToFFEE** does not operate in that fashion. Instead, it propagates as a cone of light with an 18° 'field of view' from the centre of the cover glass, as shown in Figure 1. This means that as the object moves further away from the unit, the breadth of the sensor zone increases. Table 6 gives the breadth of the sensor zone at the maximum distance for each Range setting:

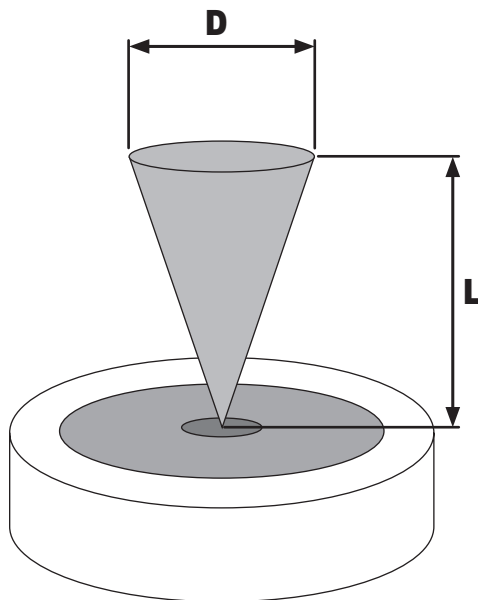


Figure 1 – Sensor zone

Range Setting	Maximum distance (L in Figure 1)	Diameter of sensor zone (D in Figure 1)
0	25 mm	8 mm
1	50 mm	16 mm
2	75 mm	24 mm
3	100 mm	32 mm
4	150 mm	48 mm
5	200 mm	64 mm
6	250 mm	80 mm
7	300 mm	96 mm
8	400 mm	128 mm
9	500 mm	160 mm

Table 6:
Sensor zone
maximum
diameter

You can consider the sensor zone as a cone emanating from the cover glass with a flat top at the Range distance and maximum diameter given in Table 6. An object anywhere in the sensor zone will activate the switch. You can therefore use three generalised methods to operate **ToFFEE**:

- A 'pass-through' where the object (perhaps a hand) is passed horizontally through the beam and out the other side. When using this technique, it is best to make sure the Range is around twice the nominal distance of the object from the cover glass. See Figure 2a.
- A 'wave' in which the object enters the beam and then back out the same side. Again, it's best to make the range approximately twice the nominal distance of the object. See Figure 2b.
- A 'top-down' activation where the object enters the sensor zone from above the flat top of the cone and leaves by backing away from it. Note that as the object enters the sensor zone, the switch activates when the object reaches the flat top of the cone. As the object is removed, the switch de-activates at a greater distance than this to prevent switch chatter. This is known as hysteresis and is shown diagrammatically in Figure 2c and 2d.

Which of these techniques is best very much depends on the user's abilities, but is also affected by the way in which **ToFFEE** is positioned. Of course, the techniques described above can be used interchangeably.

Users who lack fine motor skills or are subject to spasticity may benefit from a larger Range setting, since it will increase the likelihood of a user successfully operating the switch (usually by a pass-through movement). It may help to introduce some Ignore Repeats time in this scenario, since this category of users will sometimes be unable to control the return of their hand to its resting position without making a second (return) pass through the beam.

Conversely, users with conditions such as muscular dystrophy or a motor neurone disease may benefit from a smaller range, allowing tiny movements to be recognised, such as a finger entering the sensor zone by just a few millimetres (a wave movement), or a cheek being puffed out (a top-down movement).

The information provided above represents just a small number of likely use-cases by way of example. Experimentation will lead to the correct position and method(s) of operation for each particular user.

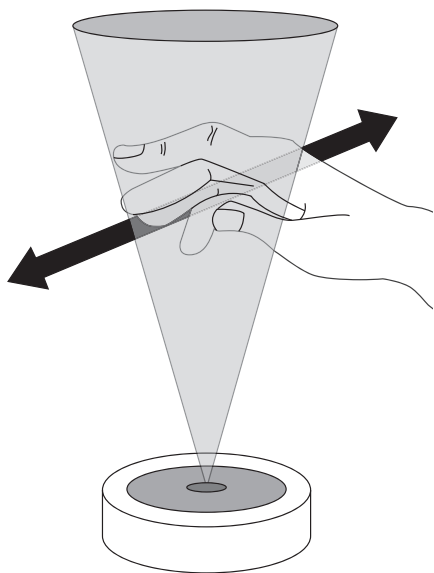


Figure 2a – Pass-through activation

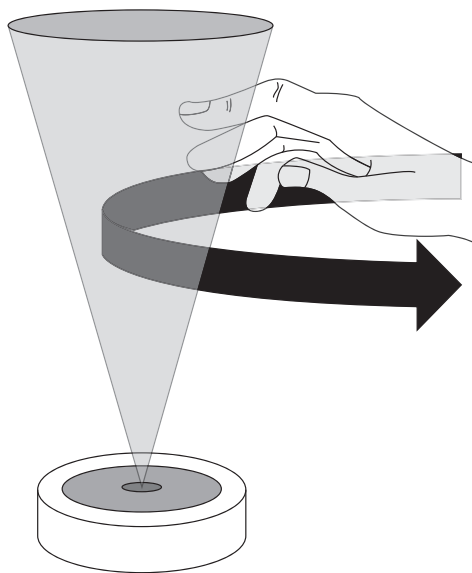


Figure 2b – Wave activation

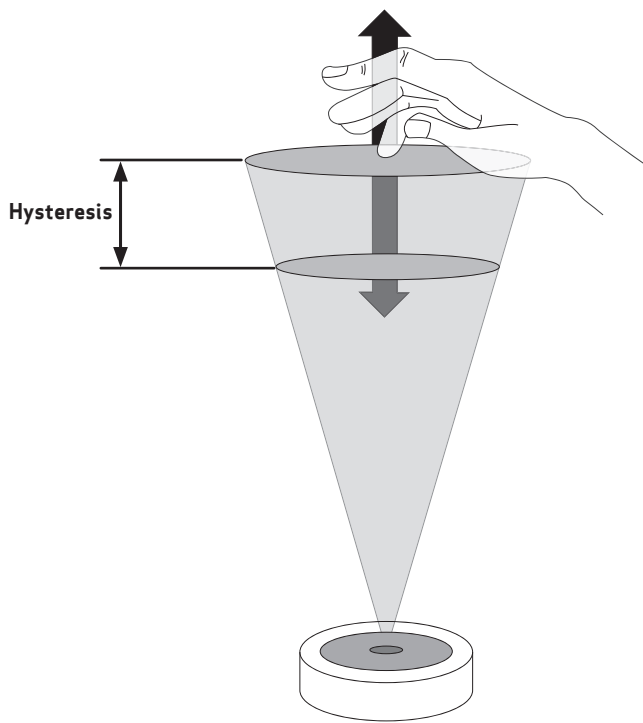


Figure 2c – Top-down activation

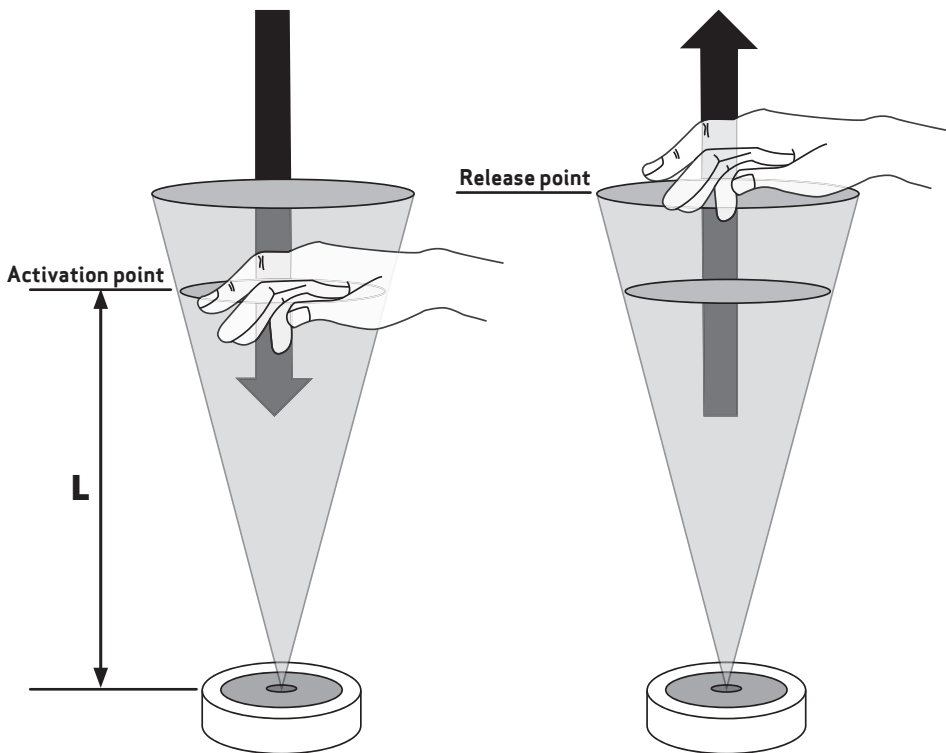


Figure 2d – Activation and Release points

Effect of bright daylight/sunlight

Although the unit uses a very accurately controlled light source, it is not completely impervious to the effects of strong daylight and direct sunlight. The effect is to reduce the achievable range of the unit, and it is therefore more noticeable at larger Range settings. When exposed to very strong light you may find that the point at which the object is first recognised is less than the Range setting implies. For example, if the unit is set to Range 9 (500mm), you could find that the actual operating maximum is reduced to half that when operating in direct sunlight. The effect is much less noticeable at smaller Range settings, so it's best to use large Range settings only when necessary, particularly if the unit is likely to be subject to strong light.

Warranty

TOFFEE Wired Switch is warranted for two years against defects in manufacture or component failure. The unit is designed for use in domestic, educational, health and commercial applications. Use outside these areas is not authorised and will invalidate the warranty. Unauthorised repair or modification, mechanical abuse, immersion in any liquid or connection to incompatible equipment will also invalidate the warranty.

TOFFEE Wired Switch is not authorised for use with safety critical, mission critical or life-sustaining apparatus of any kind.

Maintenance

Your **ToFFEE Switch** has no user serviceable parts. If repair becomes necessary, the unit should be returned to Pretorian Technologies or an authorised supplier.

ToFFEE Switch contains a rechargeable lithium-ion battery that isn't user replaceable. Although the unit uses the very latest battery and charging technology, it may eventually need to be replaced, in which case it should be returned to Pretorian Technologies or an authorised supplier.

Disposal of batteries is often subject to local laws. Please consult your local authorities for information relating to your locale. Never dispose of a battery in fire.

Technical Specification

Maximum working voltage at switch terminals: 60V peak

Switch output voltage type: dc or ac¹.

Voltage orientation when using dc: Either orientation.

Maximum working current at switch terminals: 500mA

On-state resistance: 0.6Ω typical, 2Ω maximum.

Ingress rating: IP30

Mounting holes: 3mm threaded, 31.75mm pitch, 15mm maximum length

¹When using ac, pay heed to the maximum peak voltage above and make sure the rms voltage takes this into account.

Troubleshooting Guide

Symptom	Possible Cause	Remedy
No power to switch	• Battery is flat • Unit is in Sleep mode	• Charge the unit • Wake unit up by pressing Power button [7]
Switch activates multiple times	• Operating on edge of sensor zone • Operating at the farthest point of the sensor zone	• Move hand further into the centre of the beam • Move hand closer or increase the Range setting • If the above measures don't help, consider using One-Shot mode, including some Ignore Repeats time, or both.
Switch operates randomly with no target in the sensitive zone	• Cover glass [1] is dirty	• Clean cover glass [1] with a soft, slightly damp cloth and polish.

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Firmware revision is 161.0 onwards.

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