

## Introduction

SnP BTIR is a Sip and Puff controller with Bluetooth (BT) and Infrared (IR) interfaces. The BT interface allows one tablet or smartphone to be controlled. The IR interface permits control of multiple audio or video devices. The Mk3 model allows up to forty-five separate actions using just four Sip and Puff (SnP) commands.

SnP commands are given through a mouth-tube or straw. A Sip is a brief suck on the straw while a Puff is a brief blow. The pressure sensitivity of the controller may be adjusted to suit the user. These two basic commands are augmented by longer versions, Long Sip and Long Puff, where the pressure is maintained for a short period. The period is adjustable to suit the user and is typically about one second. There is one optional, special command: An Extended Sip command is like a Long Sip but is held for twice the period – typically two seconds.

To permit forty-five actions to be selected, they are arranged as up to fifteen pages each providing three actions. The user may switch to the next page by using a Long Sip (LS) command. The current page name is displayed on the controller's LCD display along with the three supported actions. These actions may be initiated by using the Short Sip (SS), Short Puff (SP) or Long Puff (LP) commands. When one of the action commands is recognised, a short beep sounds and the corresponding prompt flashes on the display. The page-change command is signified by a longer beep.

If enabled, the Extended Sip (ES) command may be used to return to the previous page to avoid the need to step through all the remaining pages. In practice, the page will first change to the next one as the Long Sip is recognised and then switch back if the Sip is held for the extended period. This results in two long beeps.

The name and order of the pages, and the definition of the three actions, are configured to suit the user. Each page can contain either BT or IR actions but they cannot be mixed. When page-change commands are received (LS or ES), any un-configured pages will be skipped.

BT actions are key-codes which will be sent to the controlled BT device when triggered. The BT device, a tablet or smartphone, must be *paired* with the controller. Once this has been performed, the two devices will connect automatically whenever they are both switched-on and within wireless range – typically 10 meters. While a BT device may be *paired* with a number of controllers, the SnP BTIR can be *paired* with a single device. To allow the device's Apps to be selected and controlled, its *Accessibility* mode must be enabled. This mode is provided by most recent tablets and smartphones but there are variations in how it is implemented. It is usually most efficient to select the options that allow three accessibility actions: *Next*, *Previous* and *Enter*. These three actions allow faster navigation than timed scanning. Some Apps may require additional actions which can be provided on further pages.

IR actions cause the transmission of infrared codes to emulate those of the normal remote control. Most commonly-used remotes can be emulated. The actions are configured by *learning* the IR codes from existing remote controls. Actions for different IR devices (e.g. TV, Sky-box, Sound-system, etc.) can be mixed on the same page if required.

SnP BTIR's configuration parameters are stored in non-volatile memory so will be retained when the controller is turned off.

## The Mouth-tube

There are several ways in which the mouth-tube may be supported. Many users find it most convenient when the tube is attached to a *goose-neck* clamped to an adjacent table or tray. The mouth-tube connects to the controller via a length of silicone tubing. This should be arranged so that any saliva that collects in the mouth-tube does not drain towards the controller. A small filter is usually positioned in the tubing, close to the controller, as additional protection.

## Power Supply

The controller requires a 5 Vdc supply. The connector is a Mini USB Female. Current consumption is about 50mA with brief peaks up to 250mA during IR code transmission. If a mains power supply is used, electricity cost is less than one penny per week. If there is no convenient mains outlet, the controller may also be run from a USB Battery Power Bank (usually used to recharge mobile 'phones). The controller will run for well over 24 hours from a typical 2000mAh unit.

## Configuration

Configuration requires a PC or tablet connected to the Mini USB socket. Connection to a PC requires a USB (A) to Mini USB (B) cable. A tablet can be connected using a USB Micro (B) OTG to USB Mini (B) cable. It is also possible to use an *On the Go* adaptor to connect a USB (A) cable to a tablet. In any case, the USB connection should also provide power to the controller. Some models of smartphone can also be used as configuration terminals if they accept the USB connection. Most recent versions of Windows and Android will load any necessary drivers automatically when the controller is connected to a USB port.

The PC or tablet will also require a *Terminal Emulator* program. *Termite* works well on a Windows PC while on an Android device, the *USB Terminal App* may be used. The Terminal Emulator program should be set for 9600 baud, eight data bits, no parity, one stop bit and no handshake. Line termination (CR, LF etc) is not required and will be ignored if present. The program should be set to transmit the whole command line when either the *Send* button is pressed or a New-Line character is entered.

## Configuration Commands

All configuration commands start with a question-mark (?) followed by one or more command characters and parameters. Command characters may be in either upper or lower case. Parameters containing names should be entered in the required case. Spaces between fields are optional and will be excluded before processing. If a space is required in a name field, enter an underscore ( \_ ) instead. Entering a question-mark on its own will cause a list of all commands to be generated. In the following explanations, *italicised* fields indicate parameter values while square brackets ( [ ] ) indicate optional parameters.

The configuration interface must be unlocked by entering **?U *pswd*** before any other commands will be accepted. The password, *pswd*, may be obtained from the author.

There are three types of configuration commands: Reporting; Sensitivity & Options; Pages & Actions.

## **Reporting**

Reporting commands may be used to determine whether any sensitivity adjustments are required to suit a client. When one or more reporting modes are enabled, the results of a client's Sip and Puff commands may be seen.

**?M** – Enable or disable Min/Max reporting. The report displays the minimum pressure difference achieved during a Sip command and the maximum pressure achieved during a Puff command.

**?C** – Enable or disable Command reporting. All recognised SnP commands are logged.

**?R [nn]** – Report pressure differences greater than *nn*. If *nn* is not provided, any pressure change will be reported. The report may be stopped by entering **?R**.

## **Sensitivity & Options**

**?V** – Display a report of current sensitivity and option parameters.

**?A** – Reset the ambient (static) pressure. This happens automatically every 5 minutes.

**?S nn** – Set Sip sensitivity to *nn*. A good starting point is half the minimum value shown by the Min/Max mode. The allowed range is 2-250 and the default value is 20.

**?P nn** – Set Puff sensitivity to *nn*. A good starting point is half the maximum value shown by the Min/Max mode. The allowed range is 2-250 and the default value is 10.

**?D nn** – Set Debounce time to *nn* ms. The allowed range is 5-250 and the default value is 50. This is the minimum duration that a Short Sip or Puff must be maintained in order to be recognised. Adjustment may be required to minimise false or repeated commands.

**?L nn** – Set the time required for a Long Sip or Puff to *nn* ms. The allowed range is 500-5000 and the default value is 1000. This is the minimum time that a Long Sip or Puff must be maintained. An Extended Sip must be maintained for twice this duration.

**?N x** – Set the number of readings that will be averaged to *x*. The value *x* may be 1, 2, 4 or 8. The default is 2. A higher value will reduce noise but will also reduce the response time.

**?W** – Enable or disable the beeper. It is enabled by default.

**?W nn** – Set the beeper frequency to *nn* Hz. Changing the beeper frequency will also vary the volume. The default is 2380 Hz which is the loudest.

**?B** – Enable or disable the Bluetooth interface. It is enabled by default.

**?I** – Enable or disable the Infrared interface. It is enabled by default.

**?E** – Enable or disable the Extended Sip command. It is enabled by default.

**?\*** – Initiate Bluetooth pairing.

**?U x** – Unlock the configuration interface using password *x*. If *x* is absent or invalid, lock interface.

## Pages & Actions

?# - List all pages and actions.

?# *p* – Show all details of page *p*. Allowed values of *p* are 1-15.

?# *p* **B** [*Name*] – Set page *p* as Bluetooth. Optionally set the page name.

?# *p* **I** [*Name*] – Set page *p* as Infrared. Optionally set the page name.

?# *p* = *Name* – Set page *p* name. Page names are trimmed to seven characters.

?# *p* **C** – Clear page *p*. All parameters of page *p*, including actions, are cleared.

?# *p* **U** – Move page *p* up. Page *p* is exchanged with page *p*-1 if *p* is greater than 1.

?# *p* **D** – Move page *p* down. Page *p* is exchanged with page *p*+1 if *p* is less than 15.

?# *p* **G** – Make page *p* the current page. Page *p* will be shown on the LCD display.

?@ *p a* – Show action *a* of page *p*. *p* must be 1-15, *a* must be 1-3.

?@ *p a* = *Name* – Set the name of action *a* on page *p*. The name is trimmed to four characters.

?@ *p a* **K** *nn* – Set the key-code of action *a* on page *p* to *nn*. *nn* may be decimal or *0xnn* if hex.

?@ *p a* **L** – Learn the IR code for action *a* on page *p*.

?@ *p a* **T** – Test the IR code for action *a* on page *p*.

?@ *p a* **R** *nn* – Set the repeat count of IR action *a* on page *p* to *nn* (1-10).

?@ *p a* **G** *nn* – Set the repeat gap of IR action *a* on page *p* to *nn* ms (10-200).

?@ *p a* **C** – Clear action *a* on page *p*.

?! – Clear all pages.

?X *cc* – Execute SnP command *cc* (LS, SS, LP or SP) on current page.

## Notes

Default values of the repeat count and gap for IR codes are set automatically according to the code type during the *learn* process. It should not be necessary to change these values in most circumstances. When the repeat count is 1, the IR code will be transmitted once. If the repeat count is larger than 1, the IR code will be transmitted that many times with the defined gap time between transmissions.

A key-code may only be set for an action on a Bluetooth page. An IR code may only be learned, and repeat and gap parameters entered, for an action on an IR page.

Typical key-codes are: 2 (Home), 3 (Page-Up), 5 (End), 6 (Page Down), 7 (Right),  
10 (Enter), 11 (Left), 12 (Down), 13 (Enter), 14 (Up), 27 (Esc).

Also key-codes 15 to 26 represent Function keys F1 to F12.

## **Bluetooth Pairing**

The pairing process will vary according to the type and software version of the target device. Consult the device documentation for more information. Although the details may vary, the basic process will be similar. The following description is for devices using the Android operating system version 5.1.

Using the Terminal Emulator program on a connected PC or terminal, enter the `?*` command to initiate pairing. Open the *Settings* page on the Android device and click on *Bluetooth* (usually under *Wireless & networks*). Look under *Available devices* for an entry like *Adafruit EZ-Key xxxx* (xxxx will vary). Click on this line. When pairing is complete, the *Adafruit* entry should appear under *Paired devices* and the *pair* LED on the Bluetooth module should flash slowly.

## **Learning IR Codes**

When you enter an IR Learn command (see `?@p a L` above), SnP BTIR will enter IR Learning mode. It will stay in this mode for about twenty seconds or until it receives a valid IR code. While it is ready to receive a code, it will print a series of dots or error codes on the Terminal Emulator.

To learn a code from a remote control, briefly press the required key while the remote is pointed at the red window on the controller. It is not necessary for the remote to be close the controller and it is often possible to bounce the IR from a nearby wall. When the IR code is received correctly, the Terminal Emulator will display the code type, length and value. If *Timeout* is displayed, a valid code was not received during the learning period. Try again. If *NEC Rpt!* is displayed, the button was held down too long.

If an invalid IR code is received, an error code will be displayed instead of a dot but the learning process will continue. It is always worth trying again with the remote nearer to, or further from, the controller. Also make sure that you only press the button briefly.

The codes and meanings are:

X – The code was not recognised.

0 – The code was zero length.

L – The code was too long to capture. Unusual with a TV or audio remote.

n – Where n is a number. The code was recognised but is not supported.

