

# **Rotary dial phone for your webbrowser**

**(for your MS Windows 7/8/10 computer in combination with Firefox)**

this manual is intended for  
firmware version: V20190623 or higher



***By: Jan Derogee (2019)***

## Introduction

Control your MS Windows 7/8/10 computer's webbrowser or calculator with an ordinary rotary dial phone. Surprise your friends or colleagues with this neat new application for obsolete tech.

Imagine this: You speak with a colleague about a specific website (that you have already bookmarked) and have a discussion about it that requires you both to take a look at it. So you offer to open a webbrowser to take a look, then you do not touch the keyboard or mouse, but reach for the rotary dial phone that was hidden underneath a pile of paperwork. You clear it out, pick up the dial, hear the dialtone and dial a number, bweeeeieieirieirieieip noises come from the receiver and the website shows up on your screen. You act like this is completely normal and continue the discussion about the contents of the site. Then when you are done, you hang up the phone and the webbrowser is closed and you continue like nothing special happened. Leaving your colleague in complete confusion about what he/she just witnessed. Now how fun is that?

You might wonder why somebody would make such a project. Well... just because for the fun of it and to maintain the skills of programming... okay... mostly for the fun of it.

## Table of Contents

1	History.....	4
1.1	What is a rotary phone.....	4
1.2	How to use a rotary dial phone.....	4
2	System setup.....	5
3	Modes of operation.....	5
4	How to use it.....	6
4.1	Dial functions overview.....	6
4.2	Speeddial mode.....	8
4.3	Calculator mode.....	9
4.4	IP-address and number based URL dialing mode.....	10
4.4.1	Dial IP addresses.....	10
4.4.2	Dial number based URL's.....	10
5	Number based URL's and Chinese websites.....	11
5.1	Number based URL's are easy to remember.....	11
5.2	Numbers have meanings in Chinese.....	12
5.3	Examples of Chinese Website Names with Numbers.....	13
5.4	Why don't the Chinese use Mandarin based URL's.....	13
6	Trouble shooting.....	14
7	Easter eggs.....	15
8	Schematic.....	16
9	How it works.....	17

# 1 History

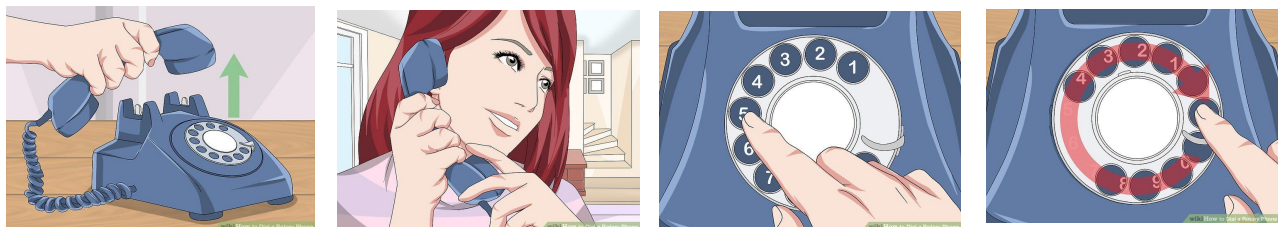
## 1.1 What is a rotary phone

Rotary dial phones are the earliest user controlled phones to be mass produced. Prior to the rotary phone a user would pick up the phone, wait for the operator to answer and then tell the operator who they wanted to be connected with. With the rotary dial (pulse dialing), the user was able to make the connection themselves and therefore was no longer dependent on the speed/skill and presence of the previously used operator. This allowed the user to dial freely and at any time of day, allowing for quicker and more convenient connection to the people they wanted to speak with. This wonder of progress began to exist in 1919 and was to be slowly replaced by push buttons (tone dialing) since 1963.

## 1.2 How to use a rotary dial phone

The rotary dial phone isn't difficult to use, however it may be confusing for some people who never encountered this dialing system. Below is a wonderful set of images from WikiHow that shows you how to use this system.

First pick up the handpiece/receiver, and hold it against your ear, the cord is on the microphone side, which you should hold near your mouth while speaking. Then if the first number of the telephone number you want to call is 5, place your finger in the hole with the number 5 and turn the disc, using your finger clockwise towards the fingerstop.



When your finger hits the fingerstop, pullback your finger from the disc, which will now turn back to its original position making a soft clicking sound. When the disc stops turning dial the other numbers in the same way. When all numbers are dialed the connection is made and you may start your conversation. Hang up the handpiece/receiver on the “hook” when you are finished.



## 2 System setup

No software needs to be installed, no special drivers are required. This device acts like a regular USB keyboard and is designed to operate with the Firefox webbrowser and the standard calculator app. But you do need to do some very simple “configurations” to your systems taskbar in order for this device to work properly:

In order to use the Firefox webbrowser it's icon should be placed onto the windows taskbar as the first item from the left. This allows it to be started using Windows+1 keyboard shortcut. You can achieve this by right clicking on the icon and selecting the option “add to taskbar” from the menu.

In order to use the calculator app it should be placed onto the windows taskbar as the second item from the left. This allows it to be started using the Windows+2 keyboard shortcut. You can achieve this by right clicking on the icon and selecting the option “add to taskbar” from the menu.

Below is an image that shows you how your taskbar could look like when this is done



## 3 Modes of operation

Now what this rotary phone to USB device does is using the phone not as a phone but as a device to control your webbrowser or calculator, by generating the keyboard codes that correspond to the functions coupled to the dial positions of the phones rotary dial.

There are 3 modes of operation, these modes of operation are described in the section “how to use” of this manual.

### **speeddial mode**

open a webbrowser and use max. 8 different bookmarks from the bookmark menu

### **calculator mode**

do some basic calculations using the calculator application

### **IP-address and number based URL dialing mode**

Dial an IP address for instance 123.1.2.3 or dial a number based URL like 126.com

## 4 How to use it

The phone has a hook, a dial and a white button on the front panel. When taking the hook of the phone you can directly speed-dial a bookmark, or start the calculator app or start a browser and dial the IP address or number based URL. Pickup the handpiece/receiver, you will hear a dialtone, dial 0..9 to use a specific function:

- 1..8 = speeddial mode
- 9 = calculator mode
- 0 = IP / URL dial mode

The button is intended to put the dial into shifted mode.

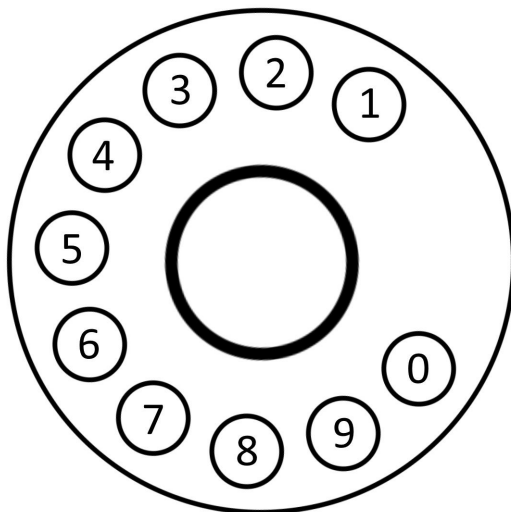
### 4.1 Dial functions overview

The dial normally allows the user to enter a number from 0..9. However this is not enough for dialing IP-adresses or URL's. So in order to allow the user to enter different things than number alone, the small white button on the bottom-right corner of the phone is to be used to select different dial functions.

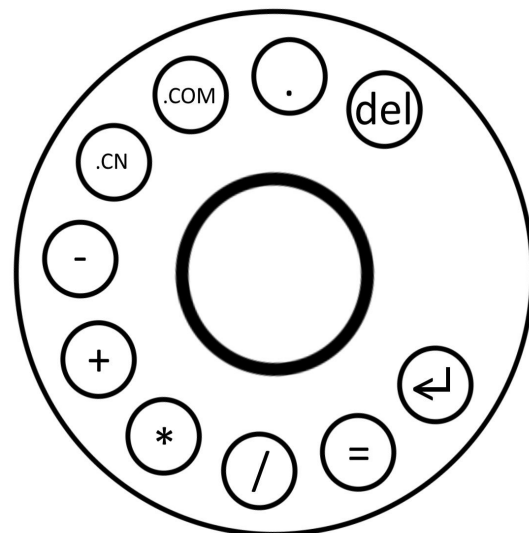
Pressing this button once activates the “shift” function. Then dial the desired “shifted” function on the dial. There is no way to un-shift, so if you didn't really want a shift function and pressed the button by accident, just dial something and then delete it (by pressing the with button once followed by dialing a 1). Below an overview of the functions of the dial in normal and shifted mode.



#### NORMAL



#### SHIFTED



**Note:** some people may ask “Why not use the character functions on the phone?”

That is a completely sensible question, because some phones have next to the numbers alphabetical characters. These characters were intended to make it easier for people to remember a phone number. As the numbers could be substituted by letters. For example: the number 0800-347396757 might be too difficult, especially when mentioned in a 10 second commercial. Therefore the number 0800-FIREWORKS would be much easier.

However, if these characters next to the dial would be used to represent characters from a URL, it would be slightly different, as the device (converting the pulses into numbers) no longer knows exactly what the user meant. When the user dialed a 5, he/she could have meant 5, J, K or L. Which is rather difficult to determine. So perhaps a scheme could be setup to dial a 5 one time for a 5, dial it 2 times for a J, 3 times for a K and 4 times for a L. Not impossible but it becomes confusing when the user wants to dial a 5 followed by a J, then you have 3 times a 5, which may be accepted as the input for a K, which is wrong. So perhaps a longer pause could be required between the numbers, but that would instantly conflict with user who want to dial quickly OR with user who dial too slowly. Anyway, you can see where this is going. And honestly, how many times would you be using it, as it complicates things even further. Also the characters shown are not the complete alphabet and do not have special symbols like the '.' or the '/'. Certainly, technically everything is possible, but there is a limit to what is practically acceptable.



This project is intended as a gadget, a gag, a joke but certainly not as a full featured or serious input device. Simply because dialing by itself is rather slow and not the preferred method of choice for transferring text strings. The function of the speed dialing is perhaps the only function that makes this device slightly useable, but that's about it. Therefore during the development of this device no efforts were made to accommodate the input of raw alphabetical characters.



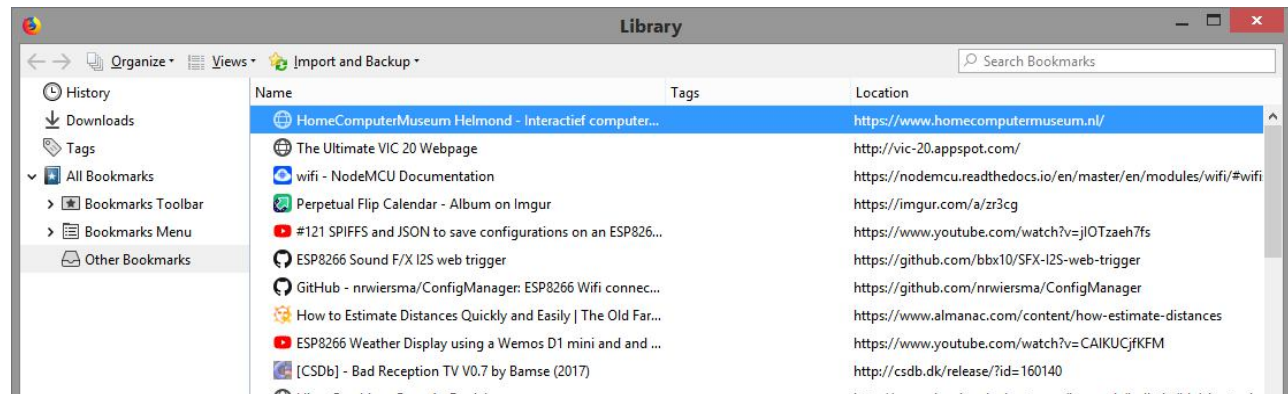
## 4.2 Speeddial mode

The speeddial mode, will open a webbrowser and goes to the x-th item on your list of bookmarks. So assume you have a list of 25 bookmarks, then you can only access the top 8 using the speeddial function.

Pick up the handpiece/receiver, dial a number 1..8, this opens a webbrowser followed by opening the list of bookmarks. Then the cursor goes down to the selected item (1..8) and opens it.

When you are finished with the webbrowser, you must place the handpiece/reciever back onto the “hook” of the phone and the webbrowser will be closed.

In order for this to work you must setup your list of bookmarks correctly. Press CTRL+SHIFT+B to bring up the bookmarks window. The screenshot below shows how it may look like. By default it brings you to the “other bookmarks” folder and from that list it will select one of the top 8 (speeddial 1..8). If for any reason Firefox brings you to a different folder, then THAT will be the folder you must use. Although that may seems unlikely now, the other bookmarks folder wasn't default some time ago, so there is no knowing what future updates may bring us.



The top line (highlighted with blue) is the bookmark that will be started when speeddial 1 is used, the second line is the one started when speeddial 2 is used, etc. Just drag and drop the bookmarks you want to be under the speeddial in the first 8 locations of this list and that's all you need to do.



### **4.3 Calculator mode**

The calculator mode allows you to do some simple calculations, like adding, subtracting, multiplying and division.

Pick up the handpiece/receiver, dial a 9 to enter the calculator mode. And the calculator app will be opened. Now you can do some basic calculations by dialing the numbers 0..9 and functions . - + \* / =

When you are finished with the calculator, you must place the handpiece/reciever back onto the “hook” of the phone and the calculator app will be closed.

## **4.4 IP-address and number based URL dialing mode**

This mode allows you to dial an IP address (i.e. 123.1.2.3) or a number based URL (i.e. 126.com).

### **4.4.1 Dial IP addresses**

Pick up the handpiece/receiver, dial a 0 (just like you would dial a 0 on a company phone to connect to an outside line) and a browser will be opened.

Now you can dial the numbers of the IP address and for the '.' the 'enter' or the “.com” or any other kind of non numerical character you must use press the shift button then dial the desired character.

Unfortunately, not many websites allow you to directly visit them with an IP-address. Sometimes a warning is shown, something nothing happens at all. That's why the dialing of number based URLs is much more practical/fun.

### **4.4.2 Dial number based URL's**

The Chinese, for various reasons, do use number based URL's. From a western perspective (considering I, the author of this manual, am from Europe) this sound a bit strange at first but there is a perfectly fine explanation for it, in the next chapter is explained why. But first this is how it works in practice:

Pick up handpiece/receiver, dial a 0 (just like you would dial a 0 on a company phone to connect to an outside line) and a browser will be opened.

Now you can dial the numbers of the IP address and for the '.' the 'enter' or the “.com” or any other kind of non numerical character you must use press the shift button then dial the desired character.

## 5 Number based URL's and Chinese websites

Number based URL's aren't entirely non-existing but they are an exception in the western world. A few examples of the well known ones for some:

In the Netherlands, the URL 9292.nl originates from 0900-9292 (a phone number you can call to get public transport travel directions).

In Sweden there's 1177.se a website for health care

In the UK there's 111.nhs.uk an online (non urgent) emergency service. But also 118118.com which is a directory service provider that picked up a lot of popularity before mobile phones became the primary way to search for local businesses. They are still around though, and operate a website that is like a simplistic Yellow Pages / Yelp.

In Australia there's 131500.com.au the URL originates from the public transportation directions phone number of the past.

In Italy there's 187.it for Telecom Italia. Telephone companies customer service had (and still have) short numbers beginning with 1.

But the above number based URL's are merely to be considered as exceptions, we may state that most western websites have a text based URL. And having an URL or website that consists of a number may therefore be associated (by westerners) as cheap or may let them think that it really means that the most desirable version of a specific URL was already taken.

In China, though, that's usually not the case. In fact it is the complete opposite to what most western people are accustomed to. Because if you are seriously looking at Chinese companies online, you may notice that it's quite common for Chinese website names to include digits or even consist of numbers entirely. This is much less common with the names of English-language websites. There are a couple of reasons for this. Firstly, numbers are often easier for Chinese people to remember than Latin letters as these are not their native used symbols. Secondly, numbers often have extra meanings in Chinese. So you may now consider the fact that dialing a URL mainly consisting of numbers, using an old rotary dial phone like this project does, now becomes much less "strange" or awkward. You may even tend to believe that it could be practical to visit website using a rotary dial phone, but that would merely be a matter of personal taste.

### 5.1 Number based URL's are easy to remember

The numerals 0123456789 are used in China much as they are elsewhere in the world, and people learn them from a young age. This means they are very familiar to Chinese people and not seen as something foreign. But Latin letters, on the other hand, are generally much less familiar to many Chinese people. This may be less true for younger generations who study the Latin alphabet (thanks to Pinyin) from an early age, but in general Chinese people have less reason to use Latin letters day-to-day than they do with Arabic numerals.

The upshot of this is that Chinese website domains consisting of numbers can be much easier for Chinese people to remember than domains consisting of only Latin letters. This is often true even for domain names in pinyin – many Chinese people are not familiar with pinyin.

## 5.2 Numbers have meanings in Chinese

The second reason number domain names are popular in China has to do with the huge number of homophones in the Chinese language. That is, the large amount of words that sound alike. Because there's quite a limited amount of syllables in Chinese languages, many words end up sounding similar or identical. Numbers are no exception.

Because all numbers in Chinese sound similar to other words, it's difficult to avoid certain associations growing between numbers and the words they sound like. This can also be put to use by intentionally choosing numbers to mimic the sounds of other words.

Here are some common associations between numbers and similar-sounding words in Chinese:

1 (一) can sound similar to 'want' or 'is going to' (要).

2 (二) can sound similar to 'love' (爱), but also means 'stupid'!

3 (三) can sound similar to 'life' or 'birth' (生).

4 (四) is generally bad as it sounds like 'death' (死).

5 (五) is quite versatile, as it can sound similar to many different words. Most commonly it is used as 'I / me' (我 and 吾), and 'not have' (无).

6 (六) can sound like 'flow / stream' (流), 'stay' (留) and 'fortune' (禄).

7 (七) can sound like 'arise' (起).

8 (八) can sound like 'prosper' (发 in 发财), and two eights side-by-side (88) can look like the character for 'double happiness' (囍).

9 (九) can sound like 'long lasting' or 'eternal' (久).

Because of this, certain combinations of numbers can be quite significant. 14, for example, can sound like 'will die', and is thus quite undesirable. Similarly, 18 can sound like 'will prosper' and is quite desirable.

Digits are even more convenient when you consider that the words for numbers are homophones for other words. The URL for the massive e-commerce site Alibaba, for example, is 1688.com, which sounds when pronounced something like "yow-leeyoh-ba-ba", not perfect perhaps, but very understandable and a good reminder.

But it isn't always about the way it sounds and the digits in a domain name usually aren't random either. For example the Internet company NetEase uses the web address 163.com. This is a throwback to the days of dial-up internet when Chinese Internet users had to enter 163 to get online. And the phone companies China Telecom and China Unicom simply reappropriated their well-known customer service numbers as domain names, 10086.cn and 10010.cn, respectively.

And finally, there's the wide, wild world of Chinese internet slang which may have originated by the fact of people dodging censors (or just nosy parents) and using homophonic numerals are perfect for such a task. So 748 is telling someone to go to hell, 555 basically means a crying emoji, 233 means you're laughing, and 520 is 'I love you'. And if you wanted to really kick it up a few notches, there's 2010000, which means 'I love you for 10,000 years'. How's that for your Valentine's Day Instagram hashtag?

### 5.3 Examples of Chinese Website Names with Numbers

The effects described above would have been used when the below Chinese website names were created:

126.com and 163.com are owned by Netease, which is a general Internet services website, similar to Yahoo. Many people in China use 126.com for their email. 126 read in Chinese sounds very roughly like “I love you” in English.

88.com	online gaming and general Internet services website.
51.com	online gaming site. The name sounds like “I want”.
51job.com	job search website. The name sounds like “I want a job”.
56.com	video-streaming website. The name sounds like “I stream”.
3.cn	a shortcut to Jingdong Mall (is at jd.com)
4399.com	China’s first and largest online gaming website
92.com	buying and selling used cars
12306.cn	a place to order your train tickets
4008-517-517.com	McDonalds’ delivery online, “517” sounds a bit like “I want to eat.”

Note that official Chinese company names are always written in Chinese characters even though these aren't always included on their website. It's important to realize that the English names of Chinese companies aren't the true companies name, but just a way to name them in the west.

### 5.4 Why don't the Chinese use Mandarin based URL's

You may ask yourself, “why don't Chinese web addresses just use Mandarin characters?” well that's because that's a pain, too. The Internet Corporation for Assigned Names and Numbers (ICANN), which sets the rules for web addresses globally, has periodically hyped the expansion of domain names to include non-Latinate scripts, but Chinese web sites have yet to take full advantage.

Keep also in mind that it is difficult to type Chinese characters on an alphabet-based keyboard.

Some devices require a special plug-in to type in Chinese URLs, and even then it takes longer to type or write out characters than to input a few digits. Plus, for web sites that want to expand internationally but don't want to alienate foreign audiences with unfamiliar characters, numbers are a decent compromise.

## 6 Trouble shooting

In some cases when you try to use the phone, it doesn't work as expected. Things may happen and things may fail. The way the system works, is by generating keyboard codes, so it works just a like a user pressing buttons on his/her keyboard. Sometimes it takes a while for an application to start, firefox may take quite a few seconds to start when your computer has just been switched on, this is quite normal. But because it takes so long to start, the keyboard codes that have been sent, are missed by the Firefox web-browser, since it wasn't ready for it yet.

Just close firefox and you'll notice that the second time you'll open it, it will be much quicker to start, the system allows for a startup time of max. 1.5 seconds and then starts sending the keyboard codes.

Now there is now way for the device to know when the application that is opened is fully started, it effectively is typing blind on the keyboard and hopes for the best. There are 2 methods that can be used to implement its operation. 1: the device opens the application and waits for 10 seconds or a minute or whatever, but it does so every time you use it and then send the keyboard codes, meaning that it responds all very very slow but always works. 2: the device opens the application and waits for 1.5 second then starts sending the keyboard codes. Now this may fail the first time it is used, but after that it works and it works quite quickly. Therefore, for practical reasons, you now understand why method 2 is implemented in this device as it is no big deal if it fails the first time (unless you've opened a Firefox webbrowser manually just before) but it becomes annoying quite quickly if it responds painstakingly slow...

## 7 Easter eggs

Easter eggs are little jokes put into a device by the programmer during development of the product. Sometimes an easter egg is a way of putting a name tag into the code, allowing the programmer to claim the software to be his/hers in a later stage. Sometimes an easter egg allows for additional functionality in the form of a small game. Sometimes an easter egg is just an homage to something historical or sentimental. But in all cases an easter egg is supposed to be a harmless little joke created by using the otherwise unused space in a programs memory.

Normally, easter eggs are to be hidden and not shown in a manual, perhaps a small hint but never directly as printed here. The reason why it is printed here is simple... nobody would notice this functionality otherwise. And what is the fun in a joke if notices it?

And this device has an easter egg too. Just 3 small functions that are a reminder to the past. When you dial one of the numbers below you will be send directly to a website related to that number. The numbers are typically Dutch service numbers from the 1980's for time, weather and information. The fun in these is that you can dial them just like back then and get a similar result.

This is how you can trigger the easter eggs, there not really that complicated, it's just like dialing the phone number as you would on a company phone where you would need to dial a 0 to get to the outside line then the 3-digit number to get the desired service.

Pick up phone, dial 0 (this starts the browser), then dial 002 (002 was the number you would dial to get the current time) a website is opened that provides you with similar information.

Pick up phone, dial 0 (this starts the browser), then dial 003 (003 was the number you would dial to get a national weather forecast) a website is opened that provides you with similar information.

Pick up phone, dial 0 (this starts the browser), then dial 008 (008 was the number you would dial to get information about a specific telephone number) a website is opened that provides you with similar information.

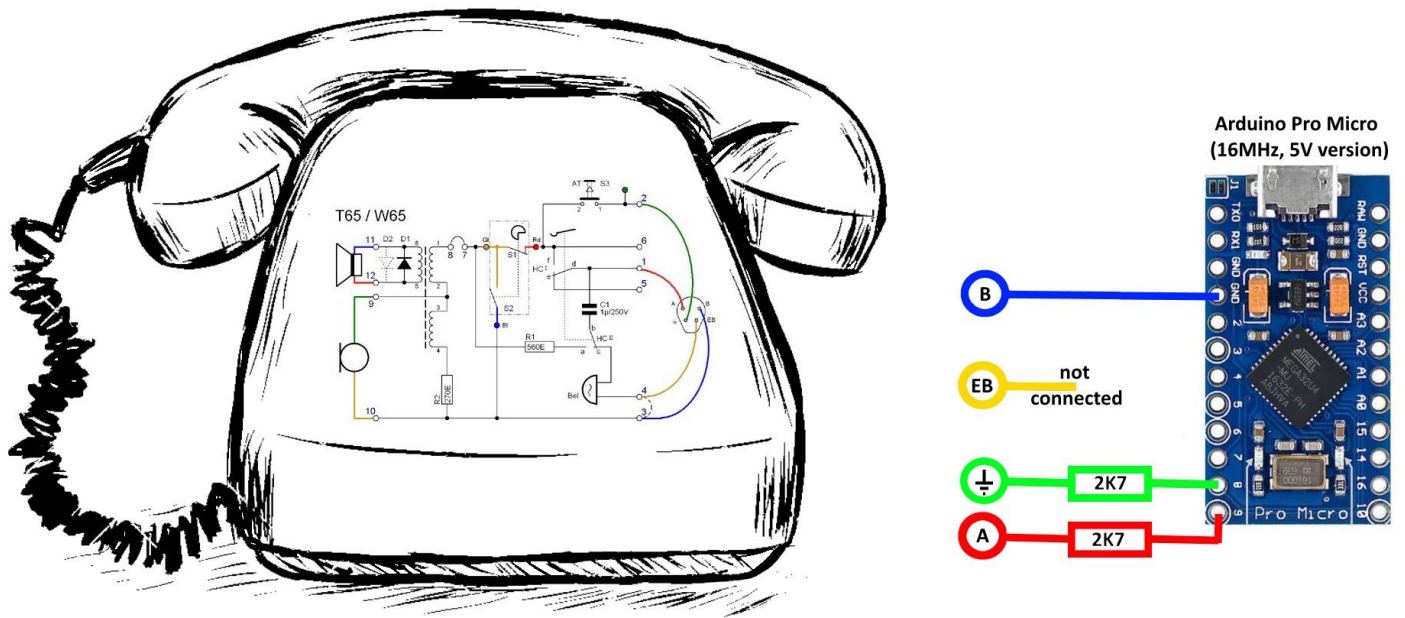
Pick up phone, dial 0 (this starts the browser), then dial 3.14159 (and go to the wikipedia page of the magical number on which our whole society is build).

Pick up phone, dial 0 (this starts the browser), then dial 1.1.2.3.5.8.13.21 (and go to the wikipedia page of the Fibonacci\_number)



## 8 Schematic

The schematic of this project is nothing more than an Arduino Pro Micro and 2 resistors, all connected to the phone using 3 wires. Below how to connect it all.



## 9 How it works

The whole project is nothing more than a spiced up keyboard example for the Arduino Pro Micro (or Arduino Leonardo). So despite the tech of an Atmega 32u4 behaving like a keyboard... no other special magic happens.

The main reason to do it like this is simply because it is the easiest as no special drivers are required. Everything works out of the box. This way you can use it on any computer even if you don't have administrator rights for it and therefore aren't allowed to install any kind of software or drivers. Which might be the case if you want to use this device at work.

In order to control your computer through the use of only a keyboard there is a small trick to be pulled, it is the trick of using keyboard shortcuts. Keyboard shortcuts are quite normal keyboard commands for general purposes (OS related shortcuts) or for a specific type of program (program related shortcuts).

Because this device acts like a keyboard, the information is going only in one direction. From keyboard to computer. There is no way the computer can let the keyboard know in which state it's in. This means that you cannot just send a set of keypresses and hope for the best, because then weird things will happen eventually. So the trick here is to force the OS (using OS related shortcuts) into a known state and work your way up to the program from there and then perform the program related shortcuts.

Opening the webbrowser (which is an app expected to be located on the first position of the taskbar) can be started using :

WINDOWSKEY+1 = start 1st item on the taskbar

but this would be problematic when Firefox is already open, as it would mean that we don't know in which state it is and this causes problem especially when closing it later on, because we might be closing something the user doesn't want to be closed. So it would be best to open up a completely independent instance of the webbrowser:

KEY\_LEFT\_GUI + KEY\_LEFT\_SHIFT + 1

Focus to the taskbar and open a new instance of the app on the first position of the taskbar

delay for 2.5 seconds                      Allow some time for the app to start

KEY\_CONTROL+L                      Focus the address bar (and selects all within) so you can begin typing

KEY\_DELETE                      Clear text if there was any

Opening the bookmarks menu and selecting an item could be the following set of key events:

KEY\_LEFT\_ALT, B, KEY\_DOWN\_ARROW, KEY\_DOWN\_ARROW, KEY\_RETURN

But unfortunately... this seems to work on an English version of the OS and therefore an English version of Firefox will be installed. But doesn't work when a Dutch OS is running and a Dutch version of Firefox is installed. Because in the Dutch version the B isn't used for **B**ookmarks but for something completely different. Instead an A (for blAdwijzer) would be required. This makes this

sequence of keypresses almost completely useless if you want to use it on different systems. Therefore a different combination must be used. Fortunately, the use of the combination:

KEY\_CONTROL+SHIFT+B, KEY\_DOWN\_ARROW, KEY\_DOWN\_ARROW, KEY\_RETURN  
does something similar and equally useful. Therefore this combination will be the preferred one for this project.

Finally, when the user decides to hangup the receiver on the hook (terminate the call), the webbrowser must be closed. Closing the webbrowser is something similar:

KEY_LEFT_GUI + T	Focus to or "open" the taskbar
KEY_HOME	Make sure we are at the start (first position)
KEY_UP_ARROW	Arrow up to make a selection from currently opened instances
KEY_END	Choose the last instance of the application (this fails only if the user has opened another instance manually after using the phone BEFORE the receiver was put down
KEY_RETURN	Confirm chosen selection from the (possible) list of items
KEY_LEFT_ALT+KEY_F4	The application close command

So as you can see, it is not impossible to control your computer through the use of blind keyboard presses. But you have to make sure you are using the right key events, otherwise you might be doing things that may be something completely “undesirable” if you are executing these in the wrong application. Therefore as shown above, care has to be taken to prevent this as much as possible. By forcing an extra HOME command and using new instances.