Home Security Projects for Raspberry Pi

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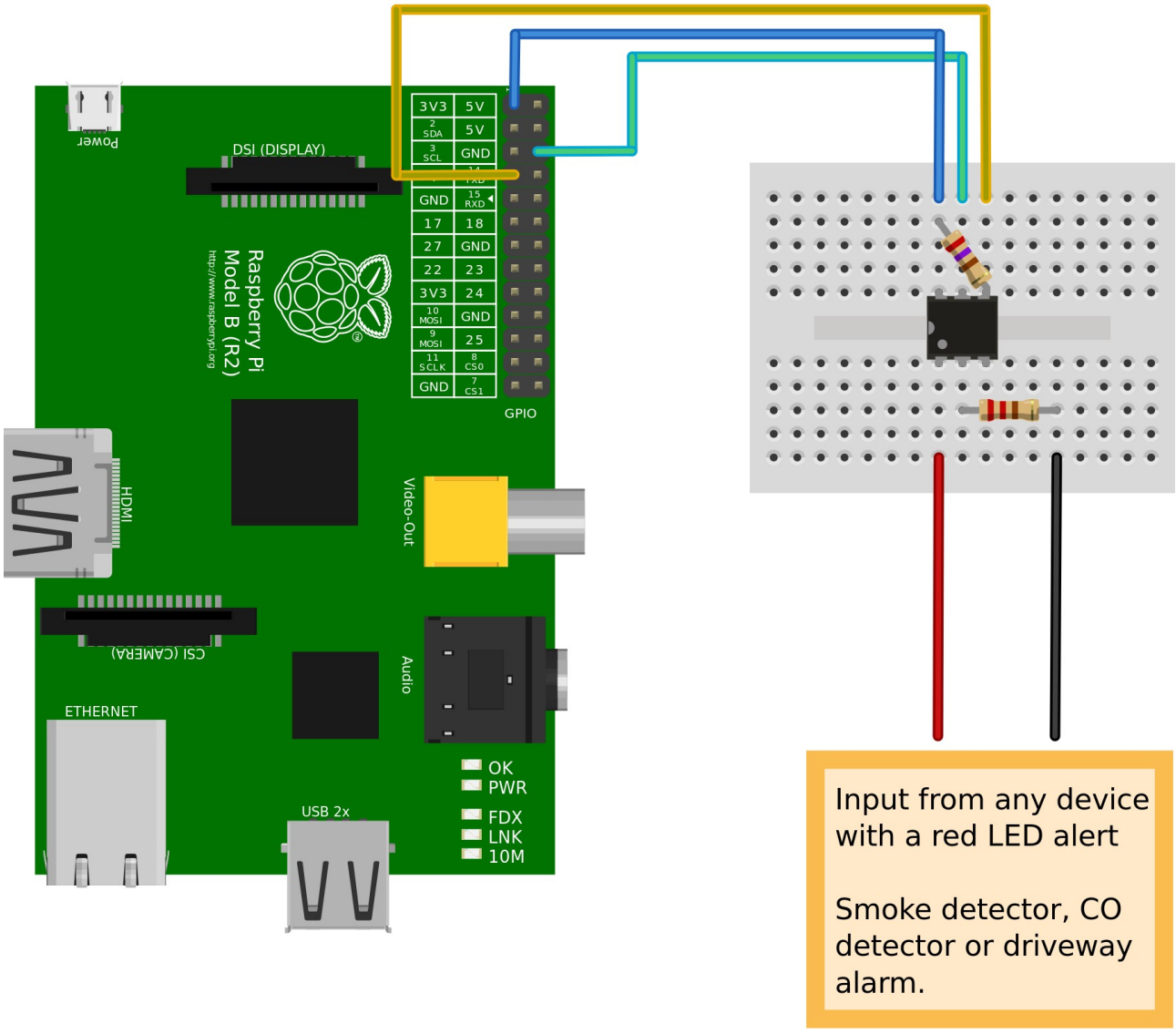
Smoke, CO & Driveway Alarm GPIO connection project.

Components:

- Mini breadboard
- H11L1 opto isolator chip
- Three metres of bell wire
- 270 ohm resistor (red, purple, brown)
- 220 ohm resistor (red, red, brown)

This circuit allows you to safely connect any device with a red warning LED directly to your Raspberry Pi. That can be a smoke alarm, CO alarm or wireless driveway alarm.

By substituting the 220 ohm resistor (red,red, brown) for a higher value, it's possible to connect an input of 5 to 12 volts without fear of damaging your Pi. So you could for instance connect the 12v courtesy light on your car door up to a Pi. We give you examples of each scenario in later pages.



Example 1 – connect a driveway alarm up to a Raspberry Pi.

A wireless driveway alarm has two components. A PIR alarm sensor that you attach to your gatepost has a battery inside it & sends a wireless 433MHz signal to a receiver in the house when it detects alarm.

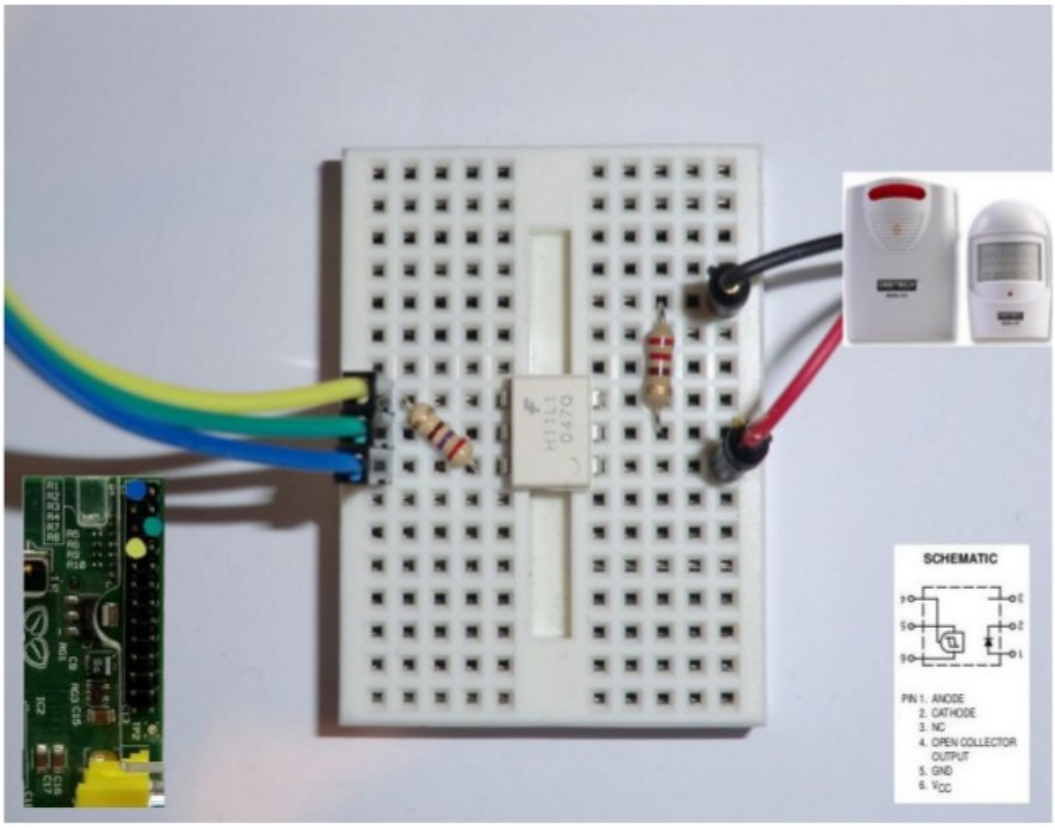
The receiver unit has a sounder and several red LEDs that buzz & flash to alert you of alarm outside. We remove one of the red LEDs and feed the signal into the H11L1 chip.

Pins 1 & 2 of the H11L1 opto isolator chip, on the right-hand side in the photo shown below, are basically an LED light enclosed in a chip package. Pins 4, 5 & 6 of the H11L1 chip, that are on the left-hand side in the photo below are basically a switch that is connected to the Raspberry Pi.

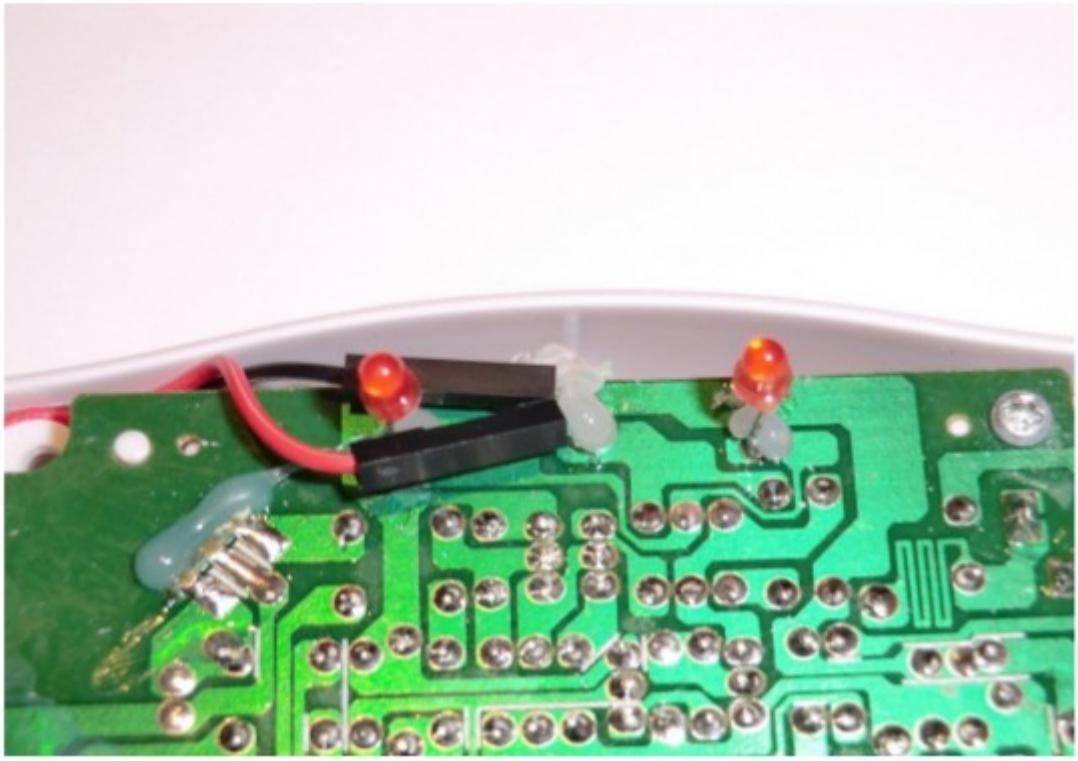
When power is applied to pins 1 & 2, the LED inside the chip is illuminated and the sensor detects this and sends the GPIO pin high. A script running on the Raspberry Pi detects this change.

The beauty of this circuit is that it electrically isolates your Raspberry Pi from any potentially dangerous voltage on the other side of the circuit. The most damage you can cause is to the H11L1 chip, which costs less than £1 to replace.

The resistor on the right-hand side of the circuit is there to stop the LED burning out inside the chip. If you substitute the 220 ohm resistor (red, red, brown) for a 100K resistor (black, brown, yellow) you can safely apply 12 volts to pins 1 & 2 of the H11L1, and it will make no difference the the switching on the Pi side.

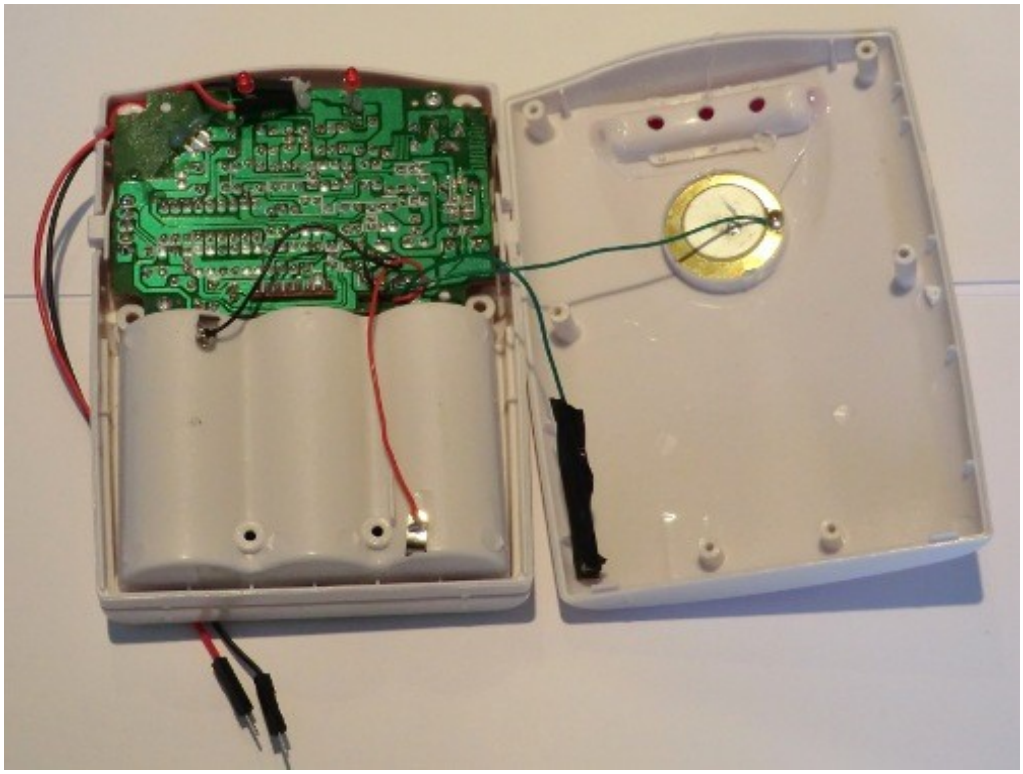


Here's the inside of the Driveway Alarm.



We've removed the cover and cut the head off the centre red LED and attached to IDC cables (included with kit).

The LED has a + & - side, which you can figure out if you have a basic voltage multimeter. If you don't have a multimeter, you can determine the polarity by trial & error when you run the test.sh script on your Pi. When the PIR is activated the GPIO pin on the Pi will read 0, normally it reads 1.



How to make an executable script.

We've assumed you're running the latest version of the Raspbian OS for the Raspberry Pi. (There's an ISO image of it on the DVD and instructions for making a bootable SD card at the end of this document).

When you see us change font to `courier`, we are indicating a command you type into the command line. For example:

```
nano test2.sh
```

Will open a basic text editor & allow you to enter a series of commands, that form the basis of all our scripts. Enter the following text:

```
echo “hello world”
```

Then save the file & exit. To make the command executable type:

```
chmod u+x test2.sh
```

and then to run the script

```
./test2.sh
```

Some scripts will need to be run as root (the highest security level). To do that type:

```
sudo ./test2.sh
```

To see a list of files in the current folder type

```
ls -al
```

If you have any problem running a script, then you've either made a typo, forgotten to make it executable with `chmod`, or need to put a `sudo` in front of it.

If you get bored of entering `sudo` before each command, you can switch to root by entering:

```
sudo su
```

You'll notice the prompt then changes from $ to #. You can exit root by pressing Ctrl-D. While you're in root mode it's a good idea to change the default passwords for root & user pi, like this:

```
passwd
passwd pi
```

Run the test script

Once you have everything connected together correctly, the first step is to run the test script, which scrolls “1”s or “0”s up the display, depending on the state of the input to the H11L1 opto-isolator chip.

```
nano test.sh
```

Then enter the following commands into the nano editor:

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
      trap 'echo "4" > /sys/class/gpio/unexport' 0
      stat=`cat /sys/class/gpio/gpio4/value`
      echo $stat

done
exit 0
```

Save the file & quit the editor. Next, make the script executable:

```
chmod u+x test.sh
```

Now run the script with:

```
sudo ./test.sh
```

You should now see “0”s scroll up the screen when the alarm is triggered and “1”s scroll up the screen the rest of the time.

If it doesn't change, then you probably have the wires connected to pins 1 & 2 of the H11L1 the wrong way around – also check connections on Pi & breadboard.

Download the scripts from our website.

While it's possible for you to manually type in each script, or transfer them from the DVD, you might find it easier to download them from our website. On your Pi, type in the following at the command line:

```
wget http://securipi.co.uk/alarmpi.zip
```

```
unzip alarmpi.zip
```

```
chmod a+x *.sh
```

```
ls -al
```

You should now see various scripts listed. To run the test script type:

```
sudo ./test.sh
```

Send an email when the alarm is triggered.

This script builds on the last one, by adding email & logging ability.

```
nano alarmpi.sh
```

Then enter the following commands into the nano editor:

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
       trap 'echo "4" > /sys/class/gpio/unexport' 0
       stat=`cat /sys/class/gpio/gpio4/value`
       while [ $stat = "0" ]
       do
              d=`date +%d%m%y`
              t=`date +%T`
              echo "Alarm $t $d" | mail -s "Alarm Detected" youremailaddress@gmail.com
              echo "Alarm $t $d"
              echo "Alarm $t" >> log$d.txt
              stat='1'
       done
done
exit 0
```

Save the file & exit.

Once again, make the script executable with

```
chmod u+x alarmpi.sh
```

Before we can run the script we need to install & configure several mail applications from the internet. You also need to have made a Gmail account (using your PC) for just the Pi to use.

```
sudo apt-get install ssmtp mailutils mpack
```

Setup default settings for SSMTP.

```
sudo nano /etc/ssmtp/ssmtp.conf
```

```
AuthUser=your-pi-gmail-account@gmail.com
AuthPass=your-user-password
FromLineOverride=YES
mailhub=smtp.gmail.com:587
UseSTARTTLS=YES
```

save file & exit.

Send a test email with this command, substituting the email address below with your own.

```
echo “testing 1 2 3” | mail -s “Subject” you@yourdomain.co.uk
```

Assuming that worked okay, you can now run the alarmpi.sh script.

```
sudo ./alarmpi.sh
```

When you move in front of the PIR you should see “Alarm Detected” appear on the display, a record will also be added to the date stamped text file. Now check your emails & you should have a record of the PIR being triggered. You can quit the alarmpi.sh script with Ctrl-C.

You can check the contents of a time stamped log file with:

```
cat log060613.txt
```

You can see a list of all your log files with:

```
ls -al log*.txt
```

If you have lots of entries in your log file, you can pause the display with:

```
cat log060613.txt | more
```

or you can open the file in the editor with:

```
nano log060613.txt
```

If you notice the time & date aren't set correctly, you can run:

```
sudo dpkg-reconfigure tzdata
```

Setup the Raspberry Pi camera module.

Install latest version of Raspbian to an SD card.

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

```
raspi-config
```

Enable camera support in raspi-config & reboot.

Check the camera is working with these two test commands:

```
raspistill -o image.jpg
```

```
raspivid -o video.h264 -t 10000
```

Install software needed to send emails and attachments. (First, setup a spare account @ gmail.com just for the Pi to use, and log into it using your PC at least once a month to keep it active.)

```
sudo apt-get install ssmtp
sudo apt-get install mailutils
sudo apt-get install mpack
```

Setup default settings SSMTP.

```
sudo nano /etc/ssmtp/ssmtp.conf
```

Enter this into the editor:

```
AuthUser=your-gmail-account-just-for-the-Pi-to-use@gmail.com
AuthPass=your-user-password-just-for-the-Pi-to-use
FromLineOverride=YES
mailhub=smtp.gmail.com:587
UseSTARTTLS=YES
```

save file & exit.

Send a test text email and then an attachment, to the regular email account on your phone or PC .

```
echo “testing 1 2 3” | mail -s “Subject” you@yourdomain.co.uk
```

```
mpack -s “alarm photo” /home/pi/image.jpg you@yourdomain.co.uk
```

The standard photo resolution was too big to view on our mobile phone screen, so in the script below we've reduced the size to something easier to view on a small screen. The video that gets recorded to your SD card is still HD.

The video files captured by the script are typically too large to send as email attachments. If you want to view them remotely, it's best to login to the Pi using Filezilla on a PC in SFTP mode.

```
nano alarmpi-rpicam.sh
```

Enter the script:

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
      trap 'echo "4" > /sys/class/gpio/unexport' 0
      stat=`cat /sys/class/gpio/gpio4/value`
      while [ $stat = "0" ]
      do
            d=`date +%d%m%y`
            t=`date +%T`
            raspistill -o $t$d.jpg -w 1024 -h 768 -q 30 -hf
            echo "Alarm Detected $t $d" | mail -s "Alarm Detected" you@gmail.com
            echo "Alarm Detected $t $d"
            echo "Alarm Detected $t" >> log$d.txt
            raspivid -o $t$d.h264 -t 10000
            mpack -s "Alarm Detected photo" $t$d.jpg you@gmail.com

            stat=”1”
            sleep 20


      done
done
exit 0
```

Save the file (Ctrl-O) & exit (Ctrl-X).

```
chmod u+x alarmpi-rpicam.sh
```

```
sudo ./alarmpi-rpicam.sh
```

The script takes a photo & video when the PIR is triggered & sends the photo as an attachment to the Gmail account specified in the script. It then records 10 seconds of HD quality video to the memory card. The time of the event is also recorded to a date-stamped log file.

Here's an analysis of what happens on the raspistill command line:

```
raspistill -o $t$d.jpg -w 1024 -h 768 -q 30 -hf
```

Output a still photo to a file whose name is the current time+date.jpg. Make the photo measure 1024 pixels wide (-w) by 768 pixels high (-h). Set the quality (-q) to 30, which is quite low but reduces the size of file we then send by email. Finally, horizontal flip the picture (-hf) because our test picture was the wrong way around. If the camera was mounted upside down we could include the vertical flip (-vf) switch to correct for that with both the raspistill & raspivid commands.

Text on photo.

How to overlay text on a photo from the Raspberry Pi Camera module.

You might want to overlay text on a photo to provide a time & date stamp, before emailing the photo to your phone.

Firstly, we need to install the Imagemagick library:

```
sudo apt-get install imagemagick
```

Next, we need to take a test photo & then use the `convert` command to overlay the text.

```
raspistill -o 1.jpg -w 1024 -h 768 -q 30
```

```
d=`date +%d%m%y`
```

```
t=`date +%T`
```

```
convert -pointsize 20 -fill yellow -draw 'text  850,30 “'$t'
     '$d'”' 1.jpg 2.jpg
```

The top-left of the photo is co-ordinate 0,0 and the bottom-right would be 1024,768. We positioned the time & date at co-ordinate 850,30. The file 2.jpg is now time & date stamped.

If you notice the time & date aren't set correctly, you can run:

```
sudo dpkg-reconfigure tzdata
```

The script below will email you a time & date stamped photo:

```
nano alarmpi-rpicamtd.sh
```

Enter the script:

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
       trap 'echo "4" > /sys/class/gpio/unexport' 0
       stat=`cat /sys/class/gpio/gpio4/value`
while [ $stat = "0" ]
       do
       d=`date +%d%m%y`
       t=`date +%T`
       raspistill -o 1.jpg -w 1024 -h 768 -q 30
       raspivid -o $d$t.h264 -t 10000
       convert -pointsize 20 -fill yellow -draw 'text 850,30 "'$t' '$d'"' 1.jpg $d$t.jpg
       mpack -s "alarm photo" /home/pi/$d$t.jpg you@youremailaddress.co.uk
       stat='1'
       done
done
exit 0
```

Save the file (Ctrl-O) & exit (Ctrl-X).

```
chmod u+x alarmpi-rpicamtd.sh
```

```
sudo ./alarmpi-rpicamtd.sh
```

You'll also find the script on our DVD.

Using a Sony PS2 or PS3 Eye Toy USB webcam to take photos.

Install software needed to send emails and attachments. (Setup a spare account @ gmail.com and log into it using the web browser on your PC at least once a month, to keep it active.)

```
sudo apt-get install ssmtp
sudo apt-get install mailutils
sudo apt-get install mpack
```

Setup default settings SSMTP.

```
sudo nano /etc/ssmtp/ssmtp.conf
```

Enter this into the editor:

```
AuthUser=your-gmail-account@gmail.com
AuthPass=your-user-password
FromLineOverride=YES
mailhub=smtp.gmail.com:587
UseSTARTTLS=YES
```

save file & exit.

Send a test text email and then an attachment.

```
echo “testing 1 2 3” | mail -s “Subject” you@yourdomain.co.uk
```

```
sudo apt-get install fswebcam
```

```
sudo fswebcam -d /dev/video0 -r 320x240 test1.jpg
```

```
sudo fswebcam -d /dev/video0 -r 640x480 test2.jpg
```

```
mpack -s “alarm photo” test1.jpg youremailaddress@gmail.com
```

Script to grab photo from webcam when PIR is triggered.

```
nano alarmpi-webcam.sh
```

Then enter:

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
       trap 'echo "4" > /sys/class/gpio/unexport' 0
       stat=`cat /sys/class/gpio/gpio4/value`
       while [ $stat = "0" ]
       do
                    d=`date +%d%m%y`
                    t=`date +%T`
                    fswebcam -d /dev/video0 -r 640x480 $t$d.jpg
                    echo "alarm Detected $t $d" | mail -s "alarm Detect" you@gmail.com
                    echo "alarm Detected $t $d"
                    echo "alarm Detected $t" >> log$d.txt
                    mpack -s "alarm Detected photo" $t$d.jpg you@gmail.com
                    stat='1'
       done
done
exit 0
```

Save & exit.

```
chmod u+x alarmpi-webcam.sh
```

```
sudo ./alarmpi-webcam.sh
```

Script to capture photos from Easycap USB video grabber.

When the PIR detects alarm, the script below will capture a series of photos from a Syntek 1160 chipset USB video grabber and save the results to the SD card. It then works out which are failed captures (under 20k in size) & deletes them. You need to use the very latest version of Raspbian to capture any good frames from the USB video grabber at all. On average, only half of the six captures will be good (increase the line `counter=6` to suit).

We still consider support for USB video grabbers on Raspberry Pi to be experimental only.
This script emails the last successful capture.

Script to grab photo from Easycap USB video grabber STK1160 chipset when PIR is triggered.

```
nano alarmpi-easycap.sh
```

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
      trap 'echo "4" > /sys/class/gpio/unexport' 0
      stat=`cat /sys/class/gpio/gpio4/value`
      while [ $stat = "0" ]
      do
                  d=`date +%d%m%y`
                  t=`date +%T`

      # start code for usb video grabber
      counter=6
      while [ $counter -gt 1 ]
      do

                  d=`date +%d%m%y`
                  t=`date +%T`
                  fswebcam -d /dev/video0 -i 0 -r 720x576 $d$t.jpg
                  sleep 1
                  counter=$(( $counter - 1 ))
                  echo $counter

            done
      ls -l *.jpg | awk '{if ($5 < 20000) print $9}' | tee -a deletelog | xargs rm
      rm deletelog
      # end code for USB video grabber

                  echo "alarm Detected $t $d" | mail -s "alarm Detect" you@gmail.com
                  echo "alarm Detected $t $d"
                  echo "alarm Detected $t" >> log$d.txt
                  p=`ls *.jpg -Art | tail -n 1`
                  mpack -s "alarm Detected photo" $p you@gmail.com
                  stat='1'
      done
done
exit 0
```

Save the file (Ctrl-O) & exit (Ctrl-X).

```
chmod u+x alarmpi-easycap.sh
sudo ./alarmpi-easycap.sh
```

Bluetooth scanning.

The Bluetooth adapter we used is just a cheap thumbsize unit with a CSR chip inside. To install the Bluetooth stack for Raspbian on the Pi, at the Terminal prompt type:

```
sudo apt-get install bluetooth bluez-utils blueman
```

insert the Bluetooth adapter & scan for devices by typing

```
hcitool scan
```

if it doesn't work, then use

```
hciconfig hci0 up
```

to bring the interface up & then scan again.

The script below will scan for Bluetooth devices when the GPIO4 pin reads 1 (it normally reads 0, until someone trips the PIR).

Here's the shell script:

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
       trap 'echo "4" > /sys/class/gpio/unexport' 0
       stat=`cat /sys/class/gpio/gpio4/value`
while [ $stat = "0" ]
       do


                      x=`hcitool scan --flush`
                      y=${x#*Scanning *...}
                      d=`date +%d%m%y`
                      t=`date +%T`


              echo $d,$t,$y | tr " " "\n"
              echo "--------------------"
              echo $d,$t$y | tr " " "," >> aa$d.txt
              y=''
              stat='1'
       done
done
exit 0
```

Set up Wifi Sniffing on Raspbian build.

```
sudo apt-get install iw tshark
sudo apt-get install subversion
sudo apt-get install libssl-dev
svn co http://svn.aircrack-ng.org/trunk aircrack-ng
cd aircrack-ng
```

```
make
sudo make install
```

```
sudo airmon-ng start wlan0
sudo tshark -i mon0 subtype probereq
```

Some other commands to try:

```
sudo tshark -i mon0 subtype probereq -w /tmp/rpi-cap.pcap
```

```
sudo airodump-ng mon0
```

Scan for WiFi Probe Requests.

Earlier, we showed you how to scan for Bluetooth devices when the alarm is tripped. Many more modern phones have Bluetooth disabled by default now, but these newer Android phones often use WiFi to determine their location quickly, in combination with GPS.

The WiFi chip in a phone uses the same unique Mac style address (00:11:22:AB:CD:EF) as a Bluetooth chipset, so it's possible to record a unique phone identifier. You can see the unique Bluetooth & WiFi Mac addresses of your own phone under the 'Settings → About This Phone' menu.

When WiFi is turned enabled on my phone, it sends probe requests every ten seconds. If I've previously associated successfully with other WiFi networks, then this information is also available, and may give you clues to who they are. This project works fine with the £10 WiPi USB wifi adapter available from cpc.co.uk

If you have the USB WiFi dongle connected you can use the `ifconfig` command to show information.

You should expect to see the adapter listed as `wlan0`. We now need to place the WiFi adapter into Monitor mode.

```
sudo airmon-ng stop wlan0
```

followed by the command

```
sudo airmon-ng start wlan0
```

should produce the `mon0` interface, you can do

```
sudo airodump-ng mon0
```

and see WiFi access points near you. CTRL-C to quit.

To see full probe requests from devices with WiFi enabled do

```
sudo tshark -i mon0 subtype probereq
```

This shows you the manufacturer of the device sending the probe, but it's also possible to just have the complete Mac address without the name resolution. This command records for 60 seconds to a log file:

```
sudo tshark -i mon0 subtype probereq -n -a duration:60 > cap.log
```

you can view the contents of the log file with

```
cat cap.log | more
```

We use the Tshark command in our script to grab the probe requests for 60 seconds, when the PIR alarm is triggered. The script also scans for Bluetooth devices. The script then processes the capture from Tshark to remove any duplicates and just leaves the unique Mac addresses spotted in the final text that are sent in the email to our Gmail account.

```
nano alarmpi-wifi.sh
```

```
echo "4" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio4/direction

while true;  do
       trap 'echo "4" > /sys/class/gpio/unexport' 0
       stat=`cat /sys/class/gpio/gpio4/value`
while [ $stat = "0" ]
       do


                      x=`hcitool scan --flush`
                      y=${x#*Scanning *...}
                      tshark -i mon0 subtype probereq -n -a duration:60 > cap.log
                      egrep -o "[a-z0-9]{2}:[a-z0-9]{2}:[a-z0-9]{2}:[a-z0-9]{2}:[a-z0-9]{2}:[a-z0-
9]{2}" cap.log > cap2.txt
                      sed '/ff:ff:ff:ff:ff:ff/d' cap2.txt > cap3.txt
                      sort -u -o cap4.txt cap3.txt
                      z=`cat cap4.txt`
                      d=`date +%d%m%y`
                      t=`date +%T`


              echo $d,$t,$y,$z | tr " " "\n"
              echo "-------------------"
              echo $d,$t,$y,$z | tr " " "," >> aa$d.txt
              echo -e "Subject: Alarm Alert\r\n\r\n ALERT $t,$y,$z" | mail -s "alarm Detect"
you@gmail.com

              y=''
              z=''
              stat='1'
       done
done
exit 0
```

Then make the file executable with

```
chmod ugo+x alarmpi-wifi.sh
```

Run the scanner command with

```
sudo ./alarmpi-wifi.sh
```

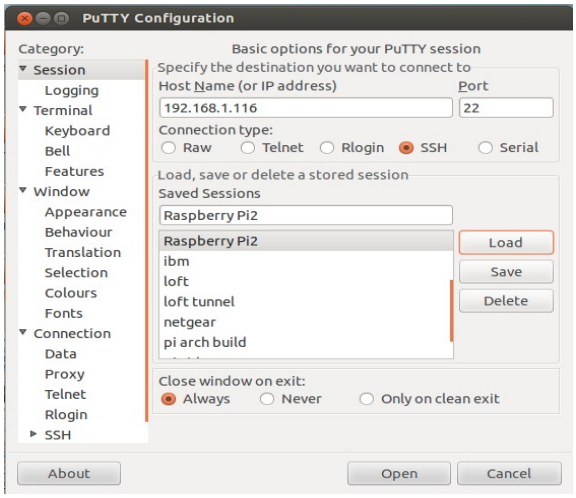
Connect to your Pi remotely from your PC.

It's a pain leaving a keyboard, mouse & monitor connected to your Pi when running the alarm, so we login remotely using the free Putty terminal emulation package. Putty is available for PC, Mac & Linux from http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html
This gives you a remote text terminal window on your PC, where you can issue commands as if you were sat in front of the Pi.

When you first install Raspbian Wheezy onto an SD card & start your Pi, you'll notice the `raspi-config` command will give you the option to turn on SSH – this is the service we use to login remotely. When you boot up the Pi, you'll also see the IP Address allocated to your Pi, above the Login & Password prompt – it will look something like 192.168.1.149 ← *note down the address you see and enter it into the Putty software on your PC.*

If you don't see the ip address you can use the command:

```
sudo ifconfig
```



On the PC running Putty, make sure the IP address is entered, you are set to Port 22 & the SSH radio button is selected, choose Open. Login as *pi* & password *raspberry*. Once logged in use `passwd` to change the easily guessed default to something else. We suggest you also do `sudo su` and `passwd` again, to change the root password, then do CTRL-D to drop back to user Pi.

You can make the scripts you've created run in background on the Pi & then logout from Putty. You do this by adding an ampersand character '&' to the end. To run alarmpi-rpicamtd.sh in background type:

```
sudo ./alarmpi-rpicamtd.sh &
```

Make a note of the process number displayed (say 2501 for example below) & then logout using CTRL-D. You should now receive emails from your Pi every time the alarm is tripped.

When you log back in you can kill the background process by rebooting the Pi, or by doing:

```
sudo kill -9 2501
```

If you forget your process id, you can view a list of jobs running in the background with

```
sudo ps aux | grep bash
```

the job you need to kill will be a bash script running at around 17% of processor cycles.

How to transfer video files from your Pi to PC using Filezilla.

Assuming you're using a wired connection to your Raspberry Pi, type in

```
ifconfig
```

and make a note of your inet addr of eth0 interface, it will be something like 192.168.1.135

On your PC, Mac or Linux PC download & install Filezilla from
https://filezilla-project.org/download.php

Launch Filezilla & go to File → Site Manager → New Site → name it Raspberry Pi.

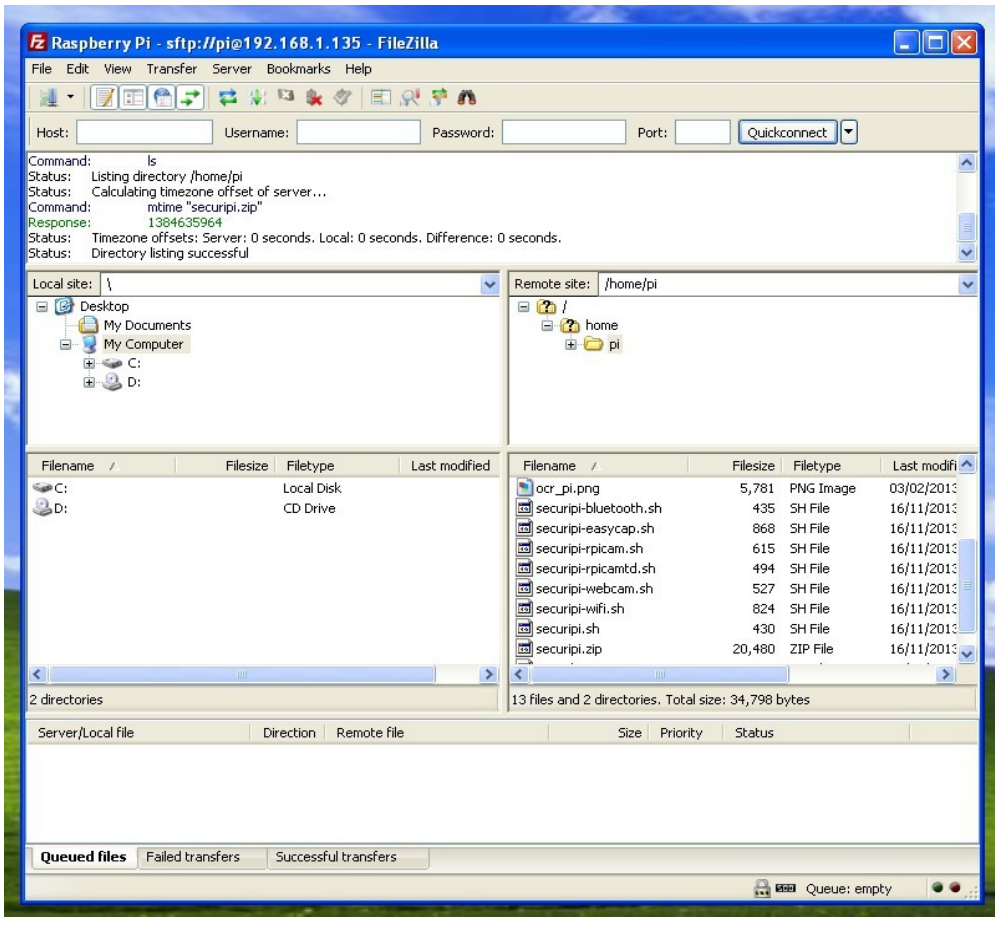
Then enter the following, remembering your Host IP address won't be the same as mine:

Host : 192.168.1.135
Port : 22
Protocol : SFTP
Logon Type : Normal
Login : pi
Password : raspberry

Then click OK.

File → Site Manager → Raspberry Pi → Connect → tick always trust this host tickbox & OK. List of files on the Pi appears in the right hand pane. You can drag videos captured on your Pi onto your PC's Desktop (left hand pane).

Once you have the H.264 video files on your PC, you can play them using the free VLC Media Player. http://www.videolan.org/vlc/index.html



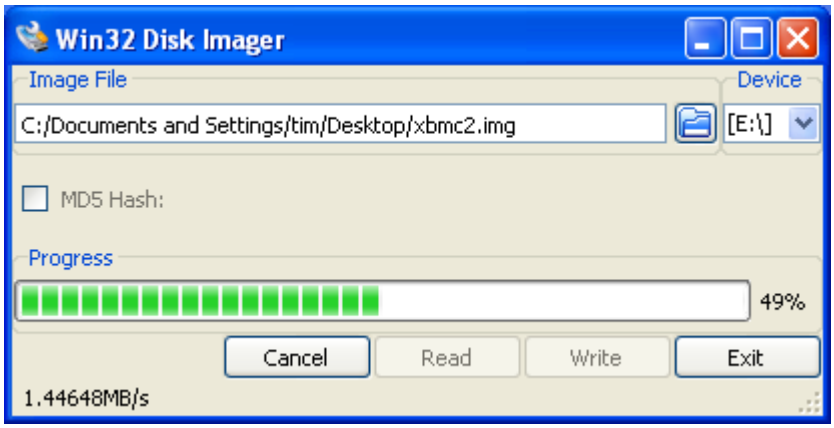
How to load Raspbian OS onto an SD card

The alarm GPIO kit DVD also contains the latest Raspbian OS for the Raspberry Pi. The image needs to be unzip'd & loaded onto a blank SD card in the correct manner, using your Windows or Linux PC. You'll need to use Raspbian version 2014-01-07-wheezy-raspbian.img (or newer) if you have the Raspberry Pi camera module or a USB Video Grabber.

The Raspberry Pi can only boot from an SD card, not a USB stick or external hard drive. We recommend you use a fast Class 10 SD card, although Raspbian will also run fine on an older Class 4 card.

For Windows Users: Insert the SD card into your PC and make a note of the drive letter assigned to it – in our case it was the E: drive. Extract the Win32diskmanager-binary.zip software from the DVD onto your Desktop, and you'll see an icon like the one below appear. Then drag over to your Desktop & Unzip any of the software images you want to use. Run Win32DiskManager, choose the image file (2014-01-07-wheezy-raspbian.img) & upload to SD card, making sure you selected the SD card as the target Device and not your hard drive – this will then make an SD card that the Raspberry Pi can boot from.

We've also included HP's USB/SD card formatter called SP27608-2.1.8.exe which can be useful for blanking pre-used SD cards & USB sticks.



For Linux/Ubuntu Users: drag the image files from the DVD onto your Desktop, extract the images from the zip files. Have target SD card attached to PC. Open a Terminal by holding down keys CTRL-ALT-T together. Then type:

```
sudo apt-get install gparted
sudo gparted
```

Now check in Gparted that your SD card appears as drive letter SDB (top right change SDA to SDB). This is very important, if you have more than one hard drive your SD card could appear as SDC or HDC, in which case amend instruction below to reflect the difference. Assuming your SD card is SDB & you want to upload the Raspbian image, type this into the Terminal:

```
sudo dd if=2014-01-07-wheezy-raspbian.img of=/dev/sdb
```

Hit Enter & wait around 30 minutes while the image is copied to the SD card, you'll know it's finished when the $ prompt re-appears. The Raspbian image gives you an options menu when you first run it in the Raspberry Pi, and you should choose to have Raspbian resize itself to the full capacity of the SD card.

Need more help? http://elinux.org/RPi_Easy_SD_Card_Setup