

## **Pop-up Surveillance Camera On Your TV**

Would you like to automatically see who's at your front door, even before they ring the doorbell? It's easy to do! Just follow the simple steps described below.

### **CAMERA**

First, a camera must be installed. The camera is mounted so that a person standing near the front door can be seen. If the camera will be exposed to the rain, you should use a specially designed outdoor camera. Alternatively, you could mount the camera in a weatherproof enclosure. If the camera is in a well protected area, you can get by with a standard camera. However, you may want to seal all the openings with a clear silicone caulk as a precaution. As long as you can turn on an outside light, you do not have to be concerned about low-light sensitivity when choosing a camera.

A cable is run from the camera video output to a television or a video modulator. I recommend using RG-6 coax, although shielded twisted pair may be sufficient. A second cable is required if the camera has audio output. Low voltage power cable (9 to 12 VDC for most cameras) must be run to the camera's power input.

### **MOTION SENSOR**

A motion sensor is positioned to detect someone approaching the front door. If possible, avoid aiming it at trees or plants, as movement caused by the wind can trigger some sensors.

The motion sensor also requires low voltage power. In most cases, the camera and motion sensor can be run off the same power cable. The motion sensor's output must be routed to the home controller. There are several ways to accomplish this. Wire can be run to connect the motion sensor output directly to a digital input on the home controller. Or, the output of the motion sensor can be connected to an X-10 Powerflash module. This module generates X-10 On and Off signals when the motion sensor contacts open and close.

Of course, the Powerflash module must be connected to the AC power line in order to generate the X-10 signal. If AC power is not available at the motion sensor's location, wire can be run to a convenient location where the Powerflash module can be installed. For instance, in our home we ran wire from the motion sensor to the security system closet where AC power is available, and installed the Powerflash module there.

There is one potential drawback to using the X-10 approach: the Powerflash module continues to output X-10 signals each time motion is detected. If you plan to send other X-10 commands in response to the motion detector (such as turning on a light or sounding a chime), the Powerflash signals may flood the power line, causing a delay in the X-10 light or chime command being received. This has not been a major problem for us, however.

### **TELEVISION**

There are also different options for supplying the camera video to the television. The camera output can be connected directly to an auxiliary input on the TV, or a video modulator can be used to add the camera video on a TV channel. In this case, the camera output is connected to a video modulator. The modulator is then set up to place the camera output on an unused channel and add it to the cable signal. By modulating the camera video, it can also be distributed to other TVs in the house.

In order to control the TV, a home controller with IR capability is needed. Again, there are several ways to configure the IR transmission. The controller's IR output can be routed through an IR connecting block to a mini-emitter, which is attached to the television's IR receive window. Alternatively, the controller IR output can be routed to an IR "blaster" (a transmitter that floods the whole room with IR). The transmitter must be positioned to face the TV. However, some of these devices are no longer available, as the trend is towards mini-emitters. The HomeVision controller has a built-in IR transmitter that can be used if the HomeVision unit is facing the TV. If you want to control TVs throughout your house, you'll also need an IR distribution system. However, that's a topic for another article.

Finally, for effective IR control, the home controller must be able to detect the current state of the TV (on or off). This can be accomplished by using a high frequency probe (such as the CompCo Engineering TV "Sniffer" Probe). The probe is located behind the TV, where it can detect high frequency electromagnetic energy that emanates from the TV when it is on. The probe has a digital output, and also requires 5 VDC and ground. The output is attached to a digital input on the home controller. 5 VDC and ground can be provided from Port C on HomeVision.

### **OUTSIDE LIGHT**

The outside light should be X-10 controlled. The easiest way to do this is to replace the existing switch with an X-10 wall switch.

### **HOME CONTROLLER**

Now that the necessary hardware has been installed, the home controller must be configured for this application. The controller must have X-10, IR, and direct digital I/O capabilities. Suitable controllers include Custom Solution's HomeVision and JDS's TimeCommander Plus with the IR Xpander. For this article, the HomeVision configuration is used as an example. In this example, a Powerflash module is used to transmit the motion detector output, and the camera video is modulated onto channel 72.

### **IR Learning**

The home controller must be able to transmit the following IR signals:

- TV On
- TV Last Channel
- TV Number 7
- TV Number 2

To learn these IR signals, first select "IR Signals" from the HomeVision "Objects/Events" menu, and add as many IR signals as you plan to learn. It is best to give each one a meaningful name. After you have added the IR signals, click on "Done", and then select "IR Learn" from the "Other" menu. Click the "Learn" button and follow the on-screen instructions. When the signal has been learned, select the IR signal number/name where you wish to save the signal and click on the "Save" button. Repeat the process for each signal.

### **Timer**

A timer is needed because the motion detector continues to send signals as long as something is moving. We don't want to keep executing the actions over and over when it is still the same person at the door. In our example, the timer is set for one minute, so that after one minute goes by with no motion detected, the camera video display is shut off.

To create the timer, select "Timers" from the "Objects/Events" Menu. Select a timer for use or add a new one by clicking the "Add" button. Enter a name for the timer in the name field. We used timer number 1 and named it "Motion Sensor". For this application, timer actions do not need to be defined and enabled. Click the "Done" button to exit.

### **Flag**

A flag is used to remember the initial state of the TV so it can be returned to that state when the event is over. The flag is set up by selecting "Flags" from the "Objects/Events" menu. Select or add a flag and name it. Click "Done" to exit.

### **Digital Input for the TV Probe**

The digital input for the TV probe must also be configured by opening the "Input Port" window and selecting, naming and enabling the correct port.

### **X-10 Actions**

From the "Objects/Events" menu select "X-10 Modules". Select the Powerflash module's house and unit code. Establish actions for the Powerflash module's X-10 Off signal by double-clicking on the "Off Actions Defined" field in the "X-10 Modules" screen. The code used to define the appropriate actions is shown in the box accompanying this article. When you have finished entering the action code, make sure the "Module Enabled" and "Off Actions Enabled" fields are checked in the X-10 Modules screen.

Note several features of this setup:

- It turns the TV on if its not already on. After motion stops, it returns the TV to its previous state.
- It turns the outside light on if it's dark, then turns if off after 1 minute with no motion being detected.
- It sounds a chime module the FIRST time motion is detected

### **CONCLUSION**

We hope you will enjoy using this home automation application. Of course, there are numerous modifications that can be made to customize this idea for your particular situation. For instance, a similar function could be implemented using a driveway sensor. Have fun!

#### **Example Parts List**

Camera Motion Sensor Powerflash module HomeVision controller IR connecting block Mini-emitter TV sniffer probe X-10 chime module X-10 wall switch
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## Sample HomeVision Schedule Code

**NOTE: This code is located in the Powerflash module's "Off Signal" actions and is performed each time the corresponding X-10 Off signal is received.**

```
;The front door outside motion sensor just detected motion.
If
  Timer #1 (Motion Sensor) is not running
  ;This timer will be running if we previously detected motion and are
  waiting for it to time out before turning the light back off and
  returning the TV to its previous state.
Then
  ;This must be the first detected motion.
  ;Turn the TV to channel 72 to view the front door camera.
  If
    Input Port C-1 (TV On/Off Probe) is low
    ;The port is low if the TV is currently on.
  Then
    Set flag #1 (TV On/Off State)
  Else
    ;The TV is off, so turn it on.
    Clear flag #1 (TV On/Off State)
    Transmit IR signal #10 (TV Power) once
  End If
  Transmit IR signal #7 (TV 7) once
  Transmit IR signal #2 (TV 2) once
  If
    Time is dark (after sunset & before sunrise)
  Then
    ;It's dark outside, so turn the porch light on.
    X-10:A 1 (Outside Entry Light) FORCE ON
    ;Wait 1 second then try turning light on again. (In case motion
    sensor is flooding the power line with X-10 signals)
    Delay for 1.000 seconds
    X-10:A 1 (Outside Entry Light) FORCE ON
  End If
  ;Sound chime module to alert us to the visitor.
  X-10:A 2 (Chime Module) FORCE ON
End If
;
;Load timer to time out after 1 minute without motion.
;Note that this command resets the timer each time motion is detected.
Wait 0:01:00.00 with timer #1 (Motion Sensor), Then:
  ;These actions are only performed after 1 minute without motion:
  If
    Flag #1 (TV On/Off State) is cleared
  Then
    ;Turn TV back off (its original state).
    Transmit IR signal #10 (TV Power) once
  Else
    ;Return TV to previous channel which the viewer was watching.
```

```
        Transmit IR signal #11 (TV Channel Return) once
End If
If
    Time is dark (after sunset & before sunrise)
Then
    X-10:A 1 (Outside Entry Light) FORCE OFF
End If
End Wait
```