

## Question: What are the fundamentals of analogue TV channels and what are the problems with cross-modulation?

**Answer:** If your CCTV modulator is causing problems with normal TV channels, there are usually two possible causes. This guide will show you spot problems and how to best tune your analogue CCTV devices.

If your CCTV modulator is causing problems with normal TV channels, there are usually two possible causes...

1. Not connected in the the TV AERIAL distribution system correctly
2. The modulators output channel is interfering with a normal TV channel causing “cross-modulation”

This article refers to CROSS-MODULATION. For details on how to connect in to a TV aerial system see “CCTV in the Home”

### UNDERSTANDING THE FUNDAMENTALS OF TV AND VIDEO CHANNELS

Throughout the UK, TV transmitters transmit on channel numbers. These numbers are arranged into different groups that are used throughout the UK.

GROUP	A	B	C/D	E	W
CHANNEL	21-34	39-53	48-68	39-68	21-68
COLOUR	RED	YELLOW	GREEN	BROWN	BLACK

The colour simply denotes what type of aerial should be used depending upon which group the local transmitter is in. Each TV station has its own allocated channel number that varies from area to area to prevent cross interference.

For example in a particular area:

BUTTON ON TV	STATION	CHANNEL
1	 BBC1	may be on CH 40
2	 BBC2	may be on CH 46
3	 ITV	may be on CH 50
4	 Channel 4	may be on CH 53

The channel separation is carefully planned by the DTI and BBC to prevent interference.

When you tune a TV into a station such as BBC1, you are in fact programming that button to BBC’s channel allocation. Therefore when you press Button 1 on your remote control you may be seeing CH40 for example. The important lesson here is that **Button 1 is not CH1; it is whatever is programmed to it.**

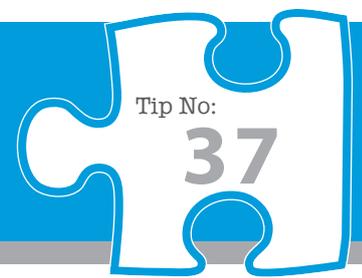
When channels are close to each other or a set distance apart, interference can happen...

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# How to FIT CCTV



A domestic video recorder, a satellite decoder all contain a device called a modulator. A modulator simply allows the output of the VCR, Satellite receiver or camera to be viewed on the TV by matching the signal to the TV channel. The television regards the output of a modulator, VCR or satellite TV as another transmitting TV station. To view the picture from any of the devices you need to tune the TV into the appropriate channel.

If for example, the video recorder has its modulator tuned to CH55, then you cannot put your modulator on CH55, as they will both fight for the same slot on the TV and cause interference. **Therefore when installing a MODULATOR you must separate channels carefully.**

## Channels need to be separated using the following rules:

- Always avoid the same channel as another device. *ie: if the VCR uses CH55*
- Always leave at least 2 channels from the nearest used channel. *ie: if the VCR is on CH50, the modulator could be on CH52 or 48 if nothing else is using them.*
- There are sometimes slight but noticeable interference caused by equipment if either 5 or 9 channels separate the channels. *ie: if the VCR is on CH36 avoid  $36+5 = 41$  and  $36+9 = 45$ . Therefore channel 41 and 45 if used for the control unit could cause interference if the video channel is 36.*

## HOW TO SPOT THE CHANNEL PROBLEM.

### Devices on the same channel

Symptom - the picture has horizontal lines or bars, this is often known as a venetian blind effect.



The "venetian blind effect"

### Devices tuned 1 channel apart

If the channel tuned in is "n", adjacent channel interference will occur if another device such as the control unit is tuned to "n+1". Symptom - sloping pattern of bars, the slope depending upon the frequency difference.

### Devices tuned 5 channels apart

If devices such as VCR, Satellite TV receivers and the control unit are tuned 5 channels from each other slight patterning may occur on the TV picture. Symptom - slight wavy vertical lines on the picture.



Wavy lines in picture

### Devices tuned 9 channels apart

Occasionally the TV picture may suffer because two devices such as a VCR and the control unit are nine channels apart. *ie: "n+9".* Symptom - a wavy S or Z type of pattern.

The cure for all these problems is to correctly separate all the channels so that they are a suitable distance apart.

If for example a VCR or TV Station is on channel *n* you can use any of the remaining channels for the control unit except *n-1* or *n+1* as these will cause "Cross modulation" interference on the picture.

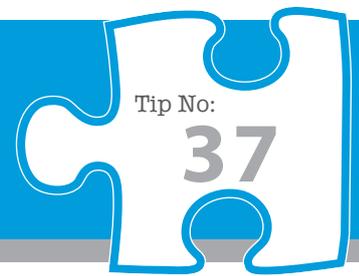
Channels *n-9*, *n-5*, *n+5* and *n+9* may causes a slight interference but this may not be noticeable. If you can avoid them it would make sense to do so. All the remaining channels may be used and should give a clear picture. (*n = channel number*)

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n-9	n-5	n-1	n	n+1	n+5	n+9
31	35	39	40	41	45	49
32	36	40	41	42	46	50
33	37	41	42	43	47	51
34	38	42	43	44	48	52
35	39	43	44	45	49	53
36	40	44	45	46	50	54
37	41	45	46	47	51	55
38	42	46	47	48	52	56
39	43	47	48	49	53	57
40	44	48	49	50	54	58
41	45	49	50	51	55	59
42	46	50	51	52	56	60
43	47	51	52	53	57	61
44	48	52	53	54	58	62
45	49	53	54	55	59	63
46	50	54	55	56	60	64
47	51	55	56	57	61	65

This table shows the relationship between the modulator output channels and those that may cause interference.

If a VCR or TV Station is on channel **n** you can use any of the remaining channels for the control unit except **n-1** or **n+1** as these will cause "Cross modulation" interference on the picture.

Channels **n-9**, **n-5**, **n+5** and **n+9** may cause a slight interference but this may not be noticeable. If you can avoid them it would make sense to do so. All the remaining channels may be used and should give a clear picture.

**(n = channel number)**

**NOTE:** Cross-modulation is a problem with any device that contains a modulator such as a VCR, SATELLITE RECEIVER etc. It is overcome by careful tuning.

## Using a portable TV as a Tuning aid.

If you have a old portable TV, this can be used as a tuning aid. The best type is the old fashioned manual type where you can simply read off the channel that you are tuned into. If you have interference problems that you suspect are caused by cross modulation you can use the portable TV to solve them.

With nothing else connected, connect a portable TV to the devices that may be causing interference as below.

1. Connect the portable TV to the RF output of the video recorder and find out what channel it is transmitting on, then write this down.
2. Connect the portable TV to the modulators output and see what channel it is transmitting on.
3. Connect the portable TV to the RF output of the Satellite receiver if one is installed.
4. Connect the portable TV to the aerial lead and write down the channel numbers of any TV stations in the band 40-55.

Now you have all the channel numbers of devices that are transmitting in the band 30 - 65. The next step is to move any modulated channels to a different channel position if they are causing problems as indicated in table 1 above. You can adjust the various channel positions by using the channel adjust screw on the back of the various devices (as per manufacturers instructions).

## TRIAL AND ERROR

You can solve cross modulation problems by trial and error. This is done by moving the channel adjust on the modulator of a CHANNEL at a time until the picture clears. If by using this method the picture is nearly there but still has some interference take the following steps.

1. Get the best picture you can by adjusting the modulator ONE CHANNEL AT A TIME.
2. Now adjust the channel adjust on another device A FRACTION AT A TIME such as the VCR or Satellite. Do this until the picture clears. If you still do not get a clear picture now, go back to step 1 and so on.

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