How to FIT CCTV

Tip No: 344

Question: How can I prevent ground loop interference with my CCTV installation?

Answer: A ground loop occurs when there is more than one "ground" or "earth" between two pieces of equipment. By carefully using good CCTV power supplies you will minimise ground loops but if they still exist then a device that blocks the current flowing down the earth connection is an option.

CCTV Camera picture where a ground loop isolator has been used to remove the ground loop problem.

CCTV Camera picture where a ground loop problem exists.

A common problem many installers face with CCTV installations is earth or ground loop problems. Many CCTV installers have seen the classic symptoms of the rolling humbar or the tearing picture but don't understand the cause of the problem and the solutions to cure it. They may have even seen a small spark or felt a slight tingle when they disconnect interlinking cables from video recorders and other equipment; these are all signs of ground loop problems. (Please note - a tearing picture can also be caused by a weak signal and a humbar by over-voltage or an unregulated power supply used with a 12V camera such as a 13.8V alarm PSU)

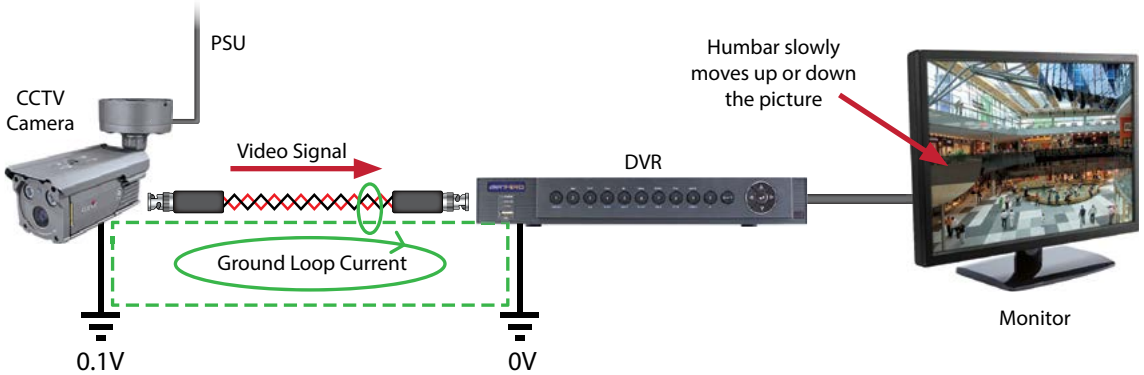
BAL250 - 1ch Passive Balun with built-in ground loop isolator.

So, What Is A Ground Loop?

A ground loop occurs when there is more than one "ground" or "earth" between two pieces of equipment. Because the two pieces of equipment have multiple ground paths, loops (circuits) are formed in which current can flow. The current flowing through this unwanted circuit in the CCTV system can have a devastating effect on the system's performance. The current flows through the cable and it actually picks this interference up (in its ground loop antenna!) and carries it to the sensitive inputs of CCTV equipment such as DVRs, Quads and Switchers. The DVR, quad or switcher simply interprets this "interference hum" as part of the intended video signal entering the equipment and displays it on the monitor as a rolling "hum" bar.

Diagram illustrating a system with a ground loop problem...

The small voltage difference in the two grounds sets up a ground loop current. This current picks up interference as the circuit created by the ground loop acts as an antenna. The 50Hz Mains interference picked up is displayed on the monitor as a humbar.



Ground established via the camera's input current or fixing ect.

Ground through the DVR's Mains input

This CCTV installation tip is aimed at helping you to install CCTV equipment. If you are looking for answers on "how to fit CCTV" or perhaps "how to network a DVR or NVR" or even "how to get CCTV on your mobile phone" why not check out our full range of CCTV installation tips at: **www.systemq.com**

How to guides aim to answer commonly asked questions in a concise and informative manner. They are for advice & guidance only and do not replace any of the manuals or other literature supplied with our products.

System Q Ltd. McGregor's Way, Turnoaks Business Park, Hasland, Chesterfield, S40 2WB
Telephone: **01246 200 000** Website: **www.systemq.com** Email: **support@systemq.com**

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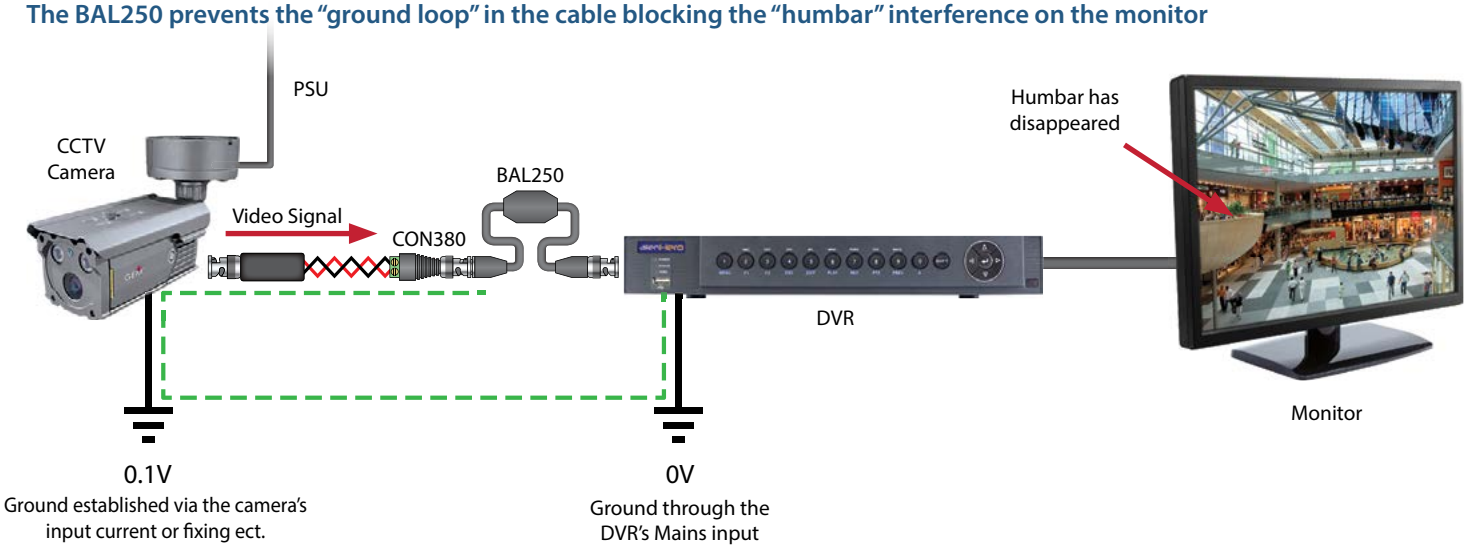
So How Can You Prevent Ground Loops?

In practice this is hard to do as each CCTV system is pretty much bespoke so you can't apply general rules. Some equipment tends to be inherently free from ground loop problems. This is usually when using one power source which powers all the cameras and the cameras don't have different ground potentials so there are no ground loops.

In systems that have different types of CCTV cameras installed with different types of power supplies, there is a greatly increased chance that some of the cameras and other pieces of equipment may have different ground potentials. Two pieces of equipment only need a "ground voltage" difference of 0.1V (which is tiny) and to be interconnected with an earth cable of 0.1 ohms resistance to form a **ground loop current of 1A!!** Well designed 12V CCTV power supplies are often "double-insulated" and the 0V output is in effect floating. This has the benefit that it can "float up or float down" to the ground potential of other equipment minimising ground loop problems. Some other power supplies such as "alarm-power supplies" may clamp the 0V output to an electrical earth causing ground loop problems with CCTV equipment. **YOU SHOULD NEVER** remove the electrical safety earth of mains equipment in an attempt to remove a ground loop as it can endanger lives.

By carefully using good CCTV power supplies you will minimise ground loops but if they still exist then a device that blocks the current flowing down the earth connection is an option. The **BAL250 1ch channel passive balun** has a built in ground loop isolator. It simply terminates ground loop currents in a cable and blocks the hum and interference carried in the ground loop. To use the BAL250 with CAT5 you will need to use a **CON380 terminal strip to BNC connector**.

The BAL250 prevents the "ground loop" in the cable blocking the "humbar" interference on the monitor



How Many BAL250 Isolators Do I Need To Cure A Problem?

The BAL250 should be fitted between the camera and the input of CCTV equipment such as a DVR that it is connected to, generally speaking the BAL250 would be fitted at the rear of the DVR to its "video input(s)". For example in a 4 camera system it is possible that only one camera has an earth loop problem and that one BAL250 may cure it. In reality though if you experience ground-loop problems in a CCTV system it is often best to fit one BAL250 to every input as earth loops may sometimes not be sufficiently strong to show up as humbars but they may still cause erratic operation of equipment due to the unwanted currents flowing through the earths. The motto here being better to be safe than sorry.

BAL250

CON380

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