

Unusual problems when actuating the “WC box”

Question:

It sometimes happens that when actuating the WC “box”, some users stop functioning and resume functioning when the general pushbutton of the control unit is pressed, in other words when everything is turned off and then turned on again.

Why does this happen? What should I do?

Answer:

First of all, let us try to discover why this happens.

Actuation of the “box”, due to the type of switch and control relay installed, may cause a **strong interference** to the power supply, thus inducing active protection of the Earth or Sky Power Hub to detect anomalies in the system and then remove voltage from the output.

Naturally, distributor output unit to which the box power supply is connected is more sensitive, therefore generally one of the earth distributor outputs. To this end it is recommended to read the descriptive note of the distributor (Power Hub).

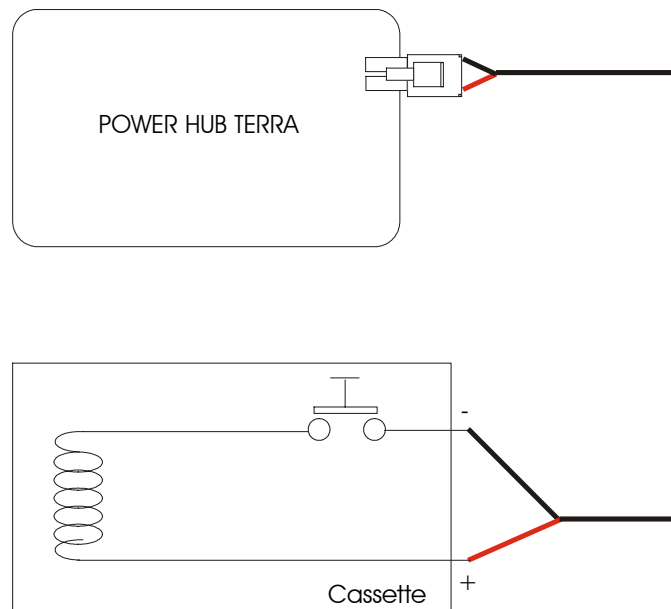


Figure 1 "Box Electrical Circuit Equivalent Diagram"

Figure 2 shows the extra-voltage measured on the input power supply of the box. A signal of the duration of approx. 50 μ sec is noted with peaks of ± 250 Volts.

Figure 3 shows the same signal with a greater time resolution.

Figure 4 shows the signal in the same conditions as those measured on the coil.

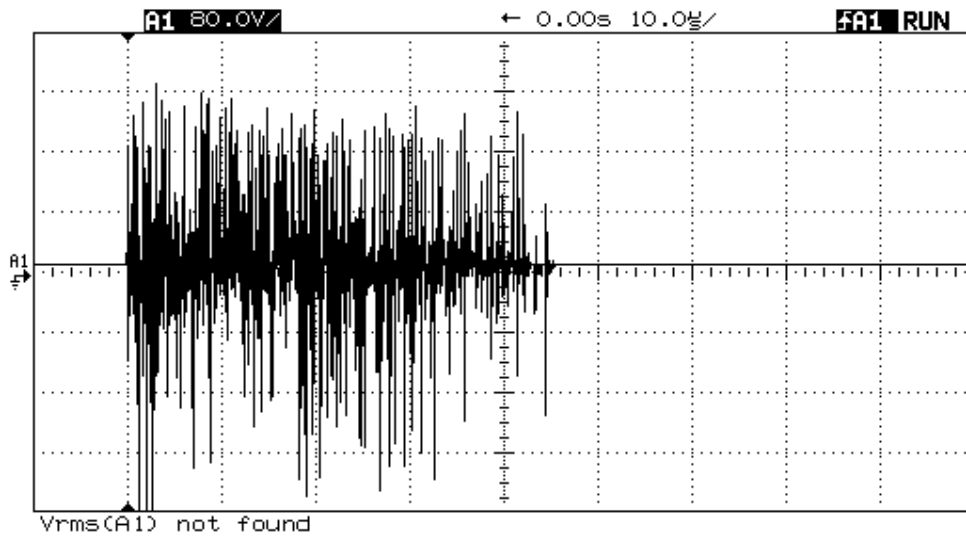


Figure 2 "Extra Voltage measured on the box power supply"

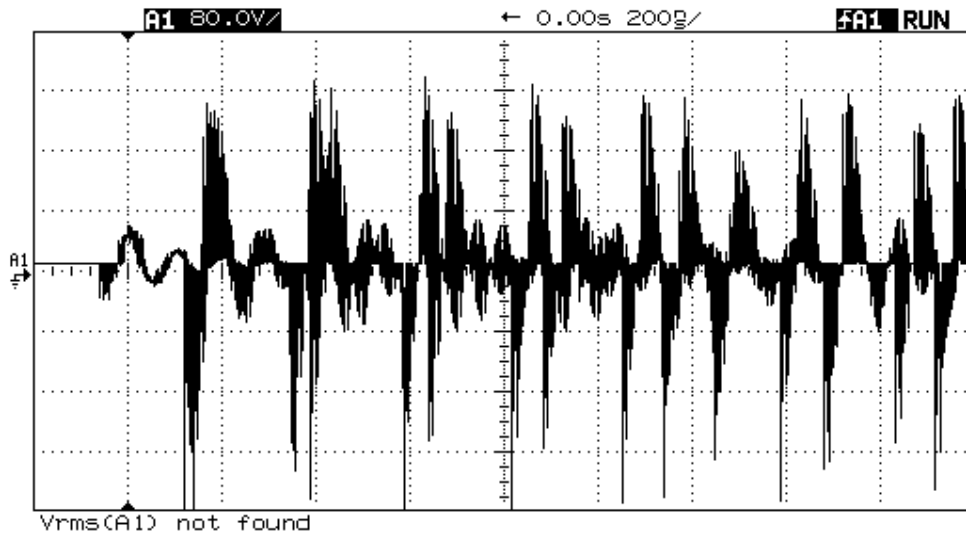


Figure 3 "Extra Voltage measured on the box power supply on another scale "

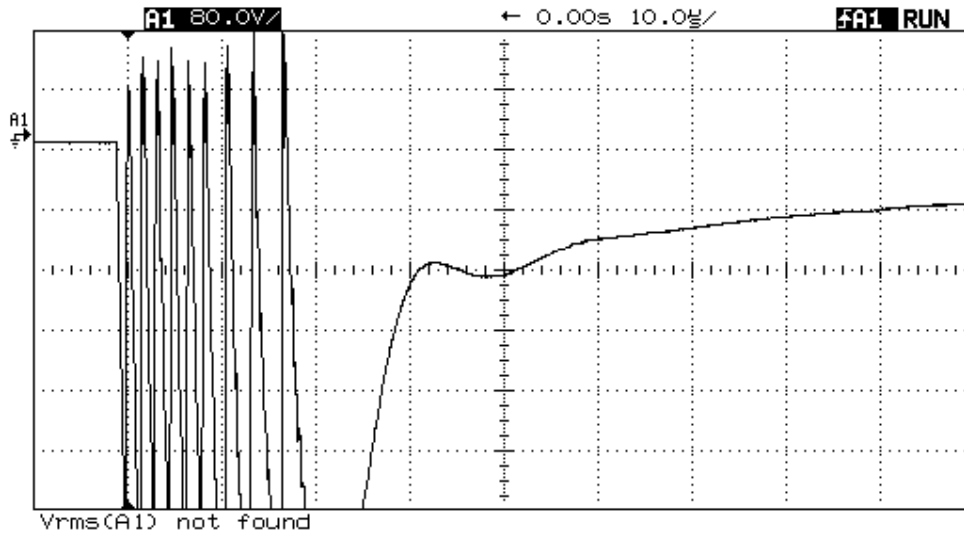


Figure 4 "Extra Voltage measured in parallel to the coil"

Solutions

The solutions to the problem might be:

- To replace the system distributors (Sky and Earth Power Hub) with those produced with an immunity to this interference¹ (from serial no. 472 for Power Hub Earth and from serial no. 473 for Power Hub Earth)
- Install a Zener interference inverter diode (the so-called flywheel diode) in parallel to the relay of the box as in Figure 5;
- Install Zener interference inverter diode in parallel to the power supply as in Figure 7.

¹ The earth distributors with a serial number greater than 472 simply have an electronic fuse intervention time longer than the statistical duration of the box interference.

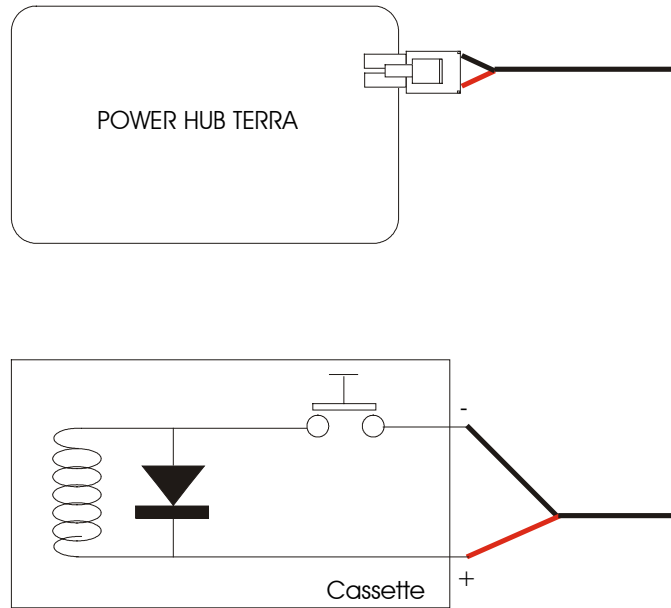


Figure 5 "Solution 1
Installation of "flywheel" diode to eliminate interference of box control"

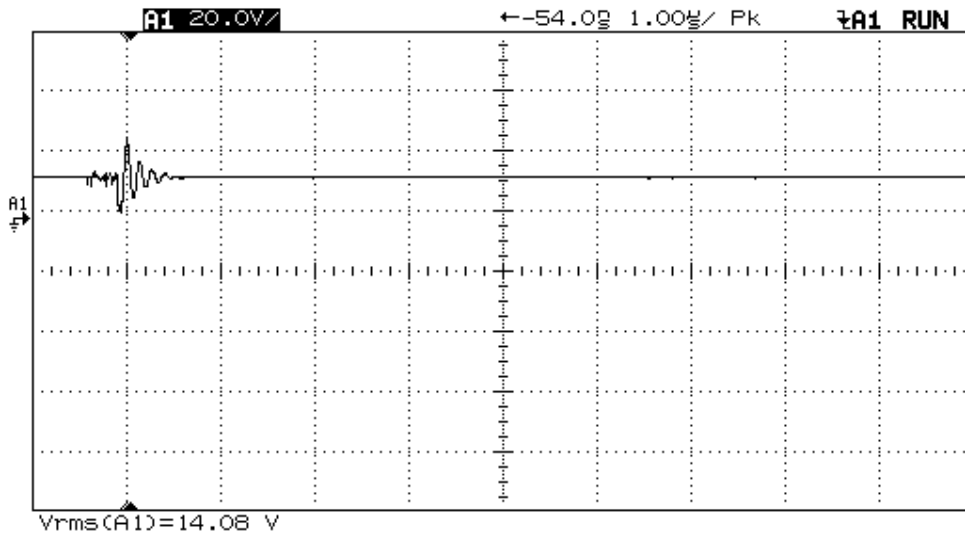


Figure 6 "Extra Voltage measured in parallel to the coil after introduction as in Figure 5"

After this modification, the voltage measured on the box relay coil is that shown in Figure 6. –As you can see, the effect is considerably damped.

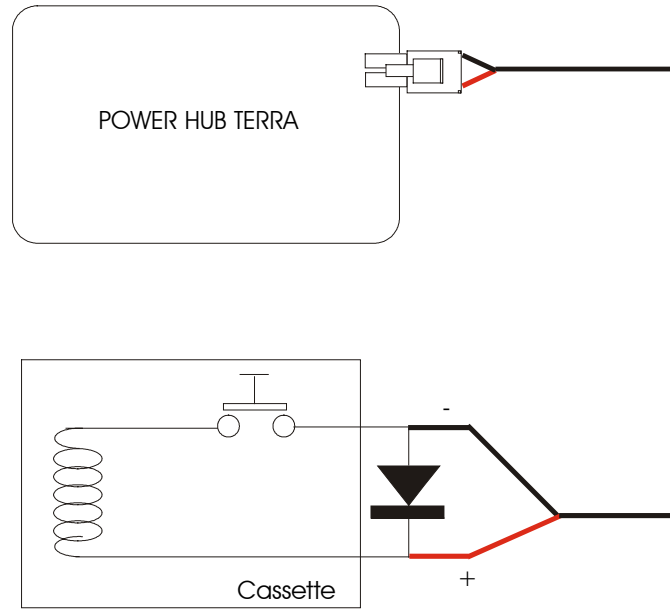


Figure 7 "Solution 2
Installation of diode to diminish interference in power supply.

After this modification, the voltage measured on the box power supply is that of Figure 8. As you can see, the effect is considerably damped.

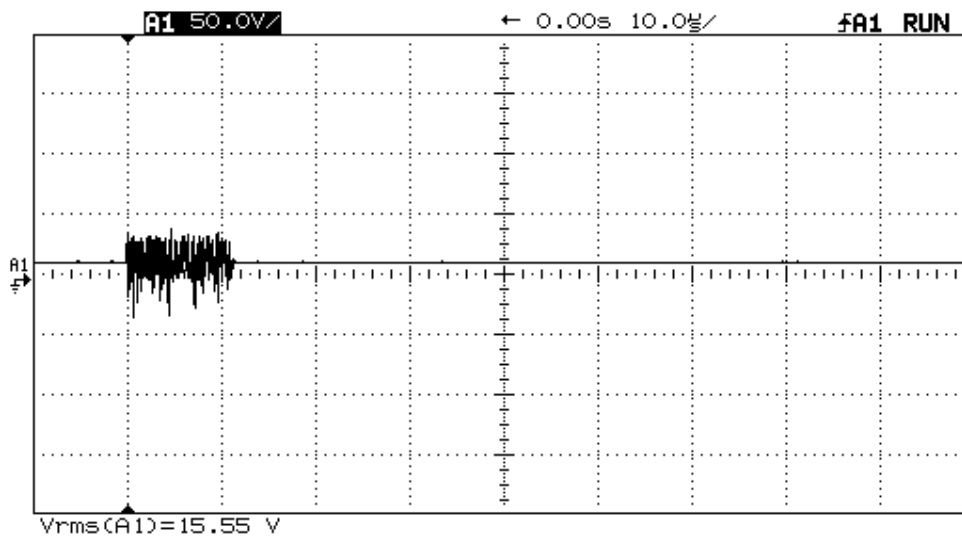


Figure 8 "Extra Voltage measured in power supply after installation of diode"

Considerations about the solutions

The simplest solution to adopt from an operative point of view is the one shown in the diagram in Figure 7.

How do I proceed?

Behind the box is a “mammoth” terminal board, as shown in Figure 9, to which two wires are connected: the positive one (+12, usually red) and the negative one (GND, usually black) of the power supply.

Once the terminal board has been located, you can apply the diode as in Figure 9.

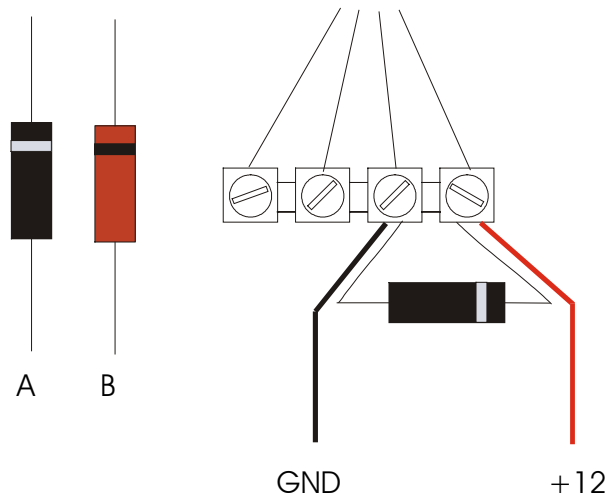


Figure 9 "Where to apply the diode to the box terminal board. The Figure shows a graph of the two possible diodes (A and B) available on the market"

It is advisable to pay attention to the polarity of the diode. The cathode tube, the part of the component (A or B) shown in Figure 9 with the clamp, must be connected to the positive wire (+12V, usually red) and the other to the negative wire (GND, usually black).

Where to find the component

The recommended component which can be bought in any electronic components store² is:

The planar silicium-Zener diode in the DO35 container with a tolerance of $\pm 5\%$ $V_z = 18\text{ V}$; the price is lower than £ 500.



Figure 10 "Picture of a Zener Diode"

You can directly contact our technical service team at the following e-mail address: assistenza.tecnica@ArSilicii.com

² For RS Components customers, the article code is 283-750

Final considerations

Though the least difficult solution seems to be that of replacing the Earth Power Hub with the one which is insensitive to said interference, it is important to note that the effect³ caused by actuation of the box without the flywheel diode installed remains and the interference is clearly affected by all the on-board systems supplied by the service battery when the service battery is in parallel with the engine battery, and by all the systems, including the ECUs of the mechanics, GPS systems, two-way radios, (CB radios) car radios, etc.

³ Extra-voltage in the power supply