Application Note 001

Best practice for S-Bus installation in harsh EMC[1)] environment

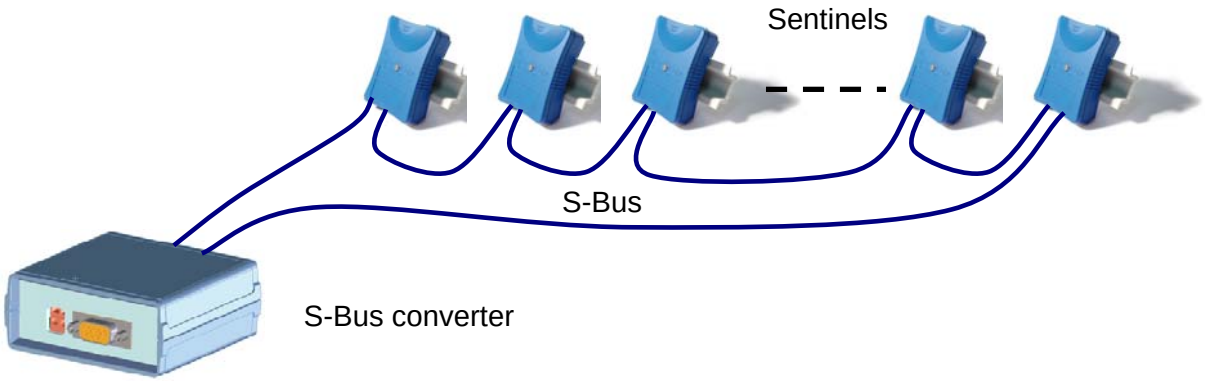
[1)] ElectroMagnetic Compatibility

REVISIONS

REVISION	DATE	MODIFICATIONS	AUTHOR
V1.0	21.12.09	Creation	Ptu

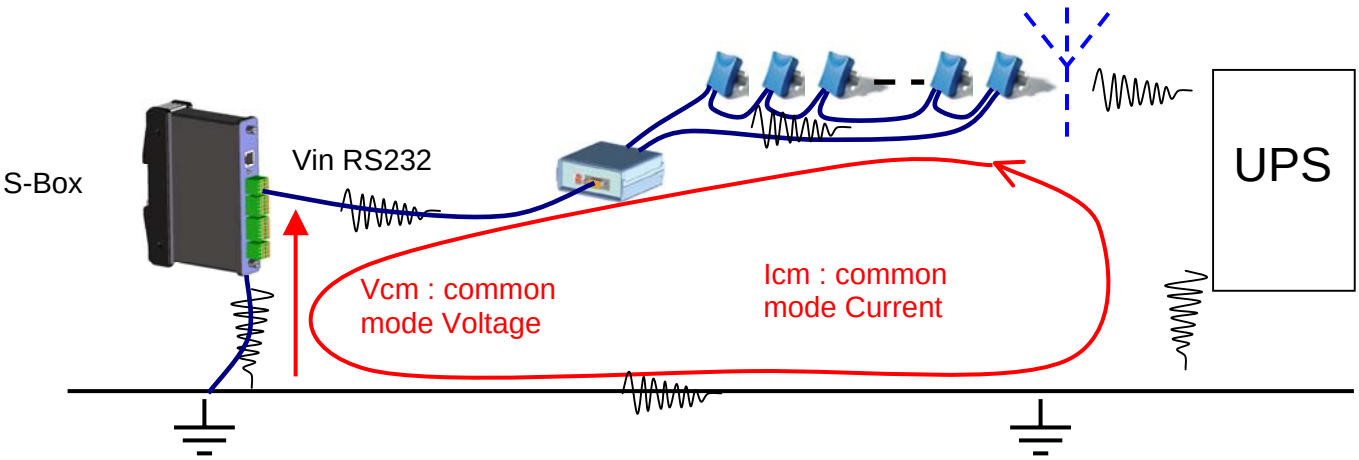
1. *Introduction*

LEM's S-Bus is designed to convert LEM's proprietary Sentinel communication bus to RS-232 for direct communication through PC, S-Box or other Master Units.
The S-Bus consists of a Daisy chain of up to 255 cables (0.4m length) plus end cables of a few meters length:



2. *Harsh EMC environment: immunity issue*

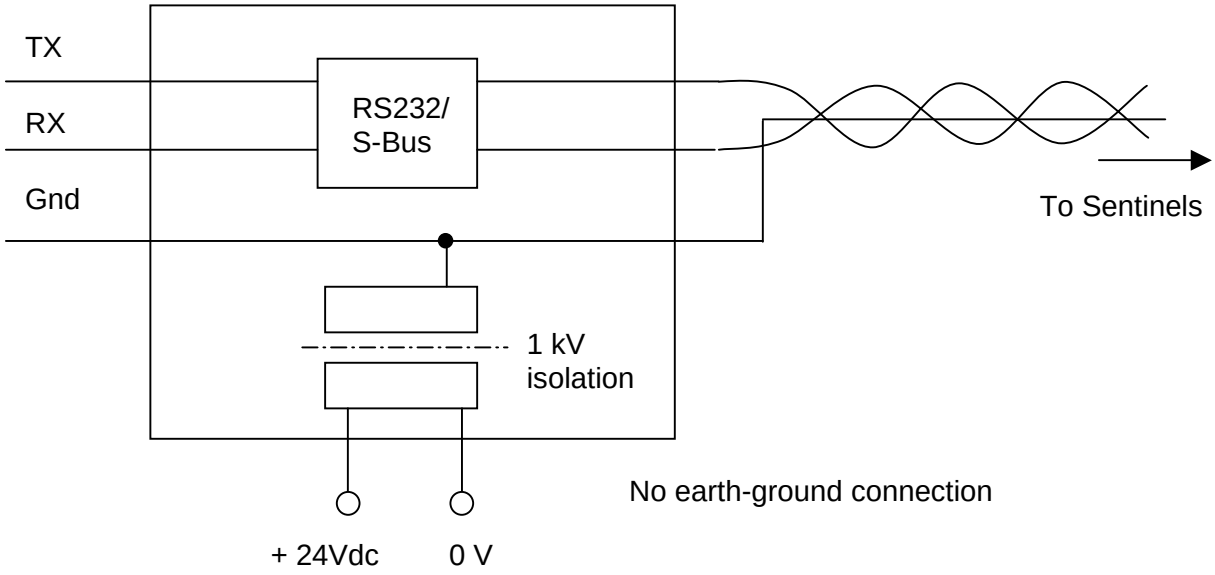
In most of the applications, the S-Bus acts as an antenna and collects the high frequency radiations present in the battery room (mainly from the UPS). The radiations are then converted to conducted disturbance that may arrived up to Master Unit as High Frequency Common Mode Voltage with a high disturbing capability.
This Common Mode Voltage may affect seriously the functioning of the Master Unit such as communication errors, unexpected resets or even general blocking.



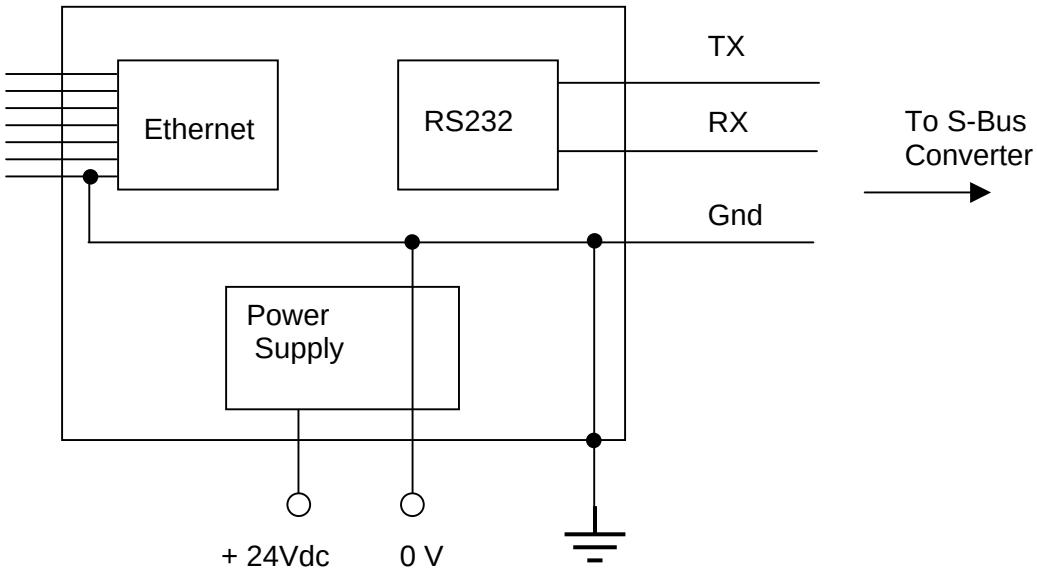
3. Solutions

The solution may vary according to the type of application: computer, S-Box, or others…But what is described hereafter is likely the best trade-off and may be used for every kind of situation.
Before going further on, we need to understand how each part of the system is powered and linked to the earth-ground.

S-Bus converter: S-Bus side and RS 232 side share a common ground but the power supply input is decoupled by an isolated converter:

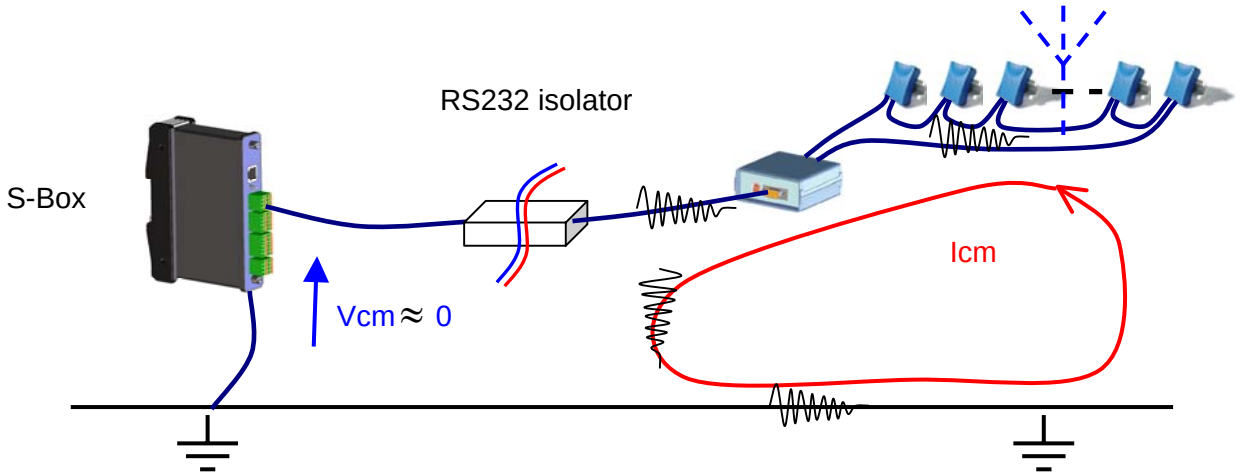


S-Box: all ports including RS232, power supply and earth are all tied together:



Solution:

The most efficient solution to cut high Frequency Common Mode Voltage between to parts of a system, is to insert an isolated barrier on the Communication cable e.g in our case, on the RS 232 link.



Principle:
The isolated barrier does not allow the conducted disturbance to go through it because of the very low coupling capacitance, then the Common Mode loop is reduced and does not affect the Master Unit.

Installation precaution:
Nevertheless, the success of this principle depends also on the installation layout: the installer has to follow strong wiring rules in order not to cancel the beneficial effect of the isolation,

Ideal layout:

RS 232 isolator is Port Powered (does not require external power supply)

Fig 1: Simplified wiring schematic with S-Box

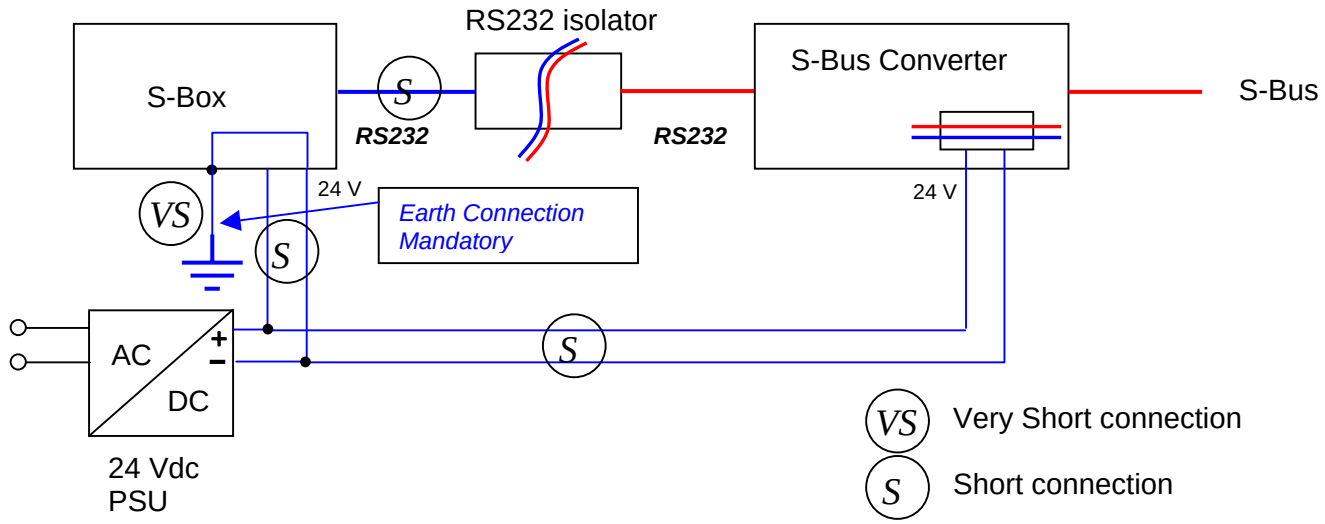
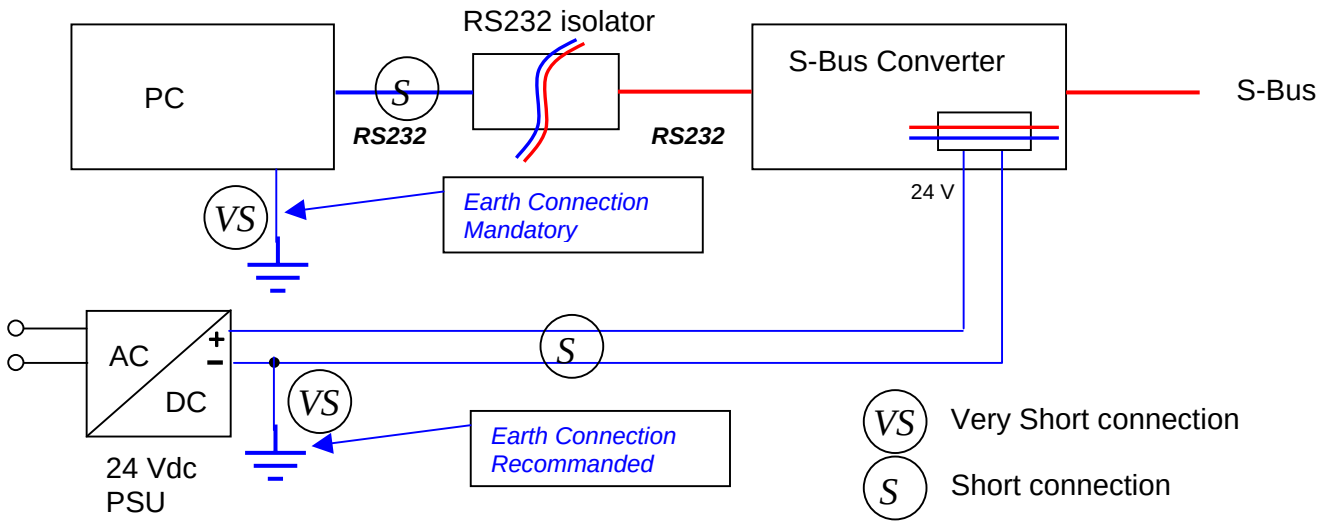


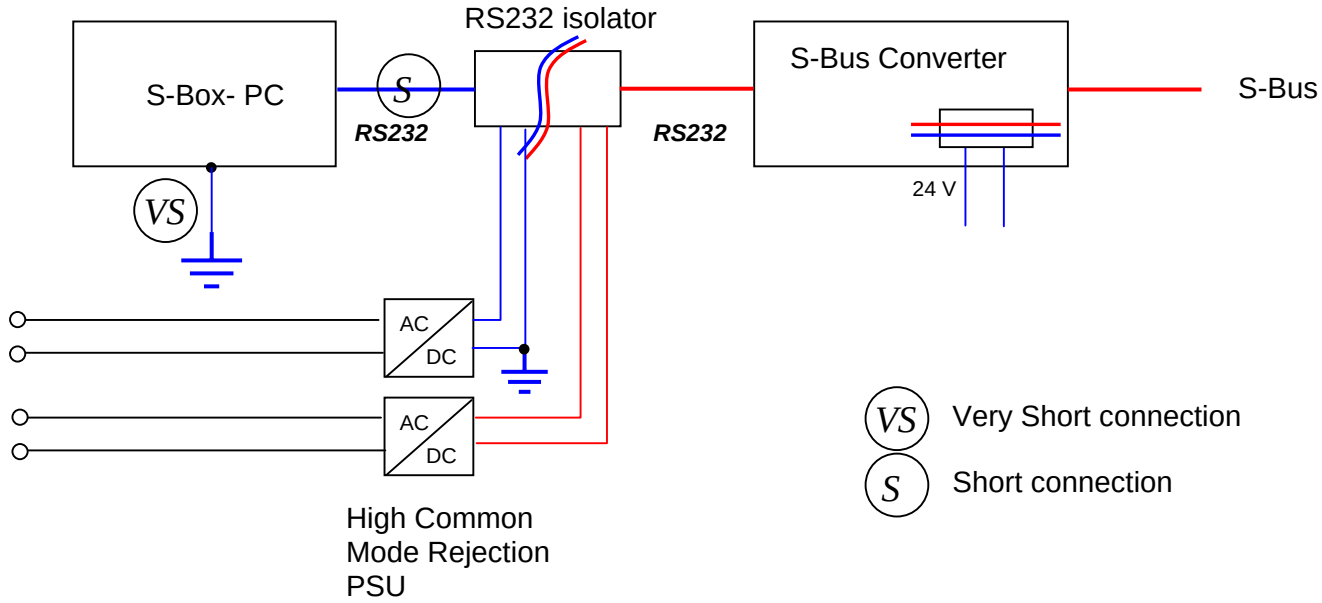
Fig 2: Simplified wiring schematic with PC



Acceptable layout

Use of RS232 isolator needing external power: in this case it is mandatory to use 2 separated external power supplies (one on each side of the isolator), each power supply shall have strong Common mode rejection capability:

Fig 3 : RS232 isolator with external power supplies



Forbidden Layout

Fig 4 : RS232 isolator with only one external power supply

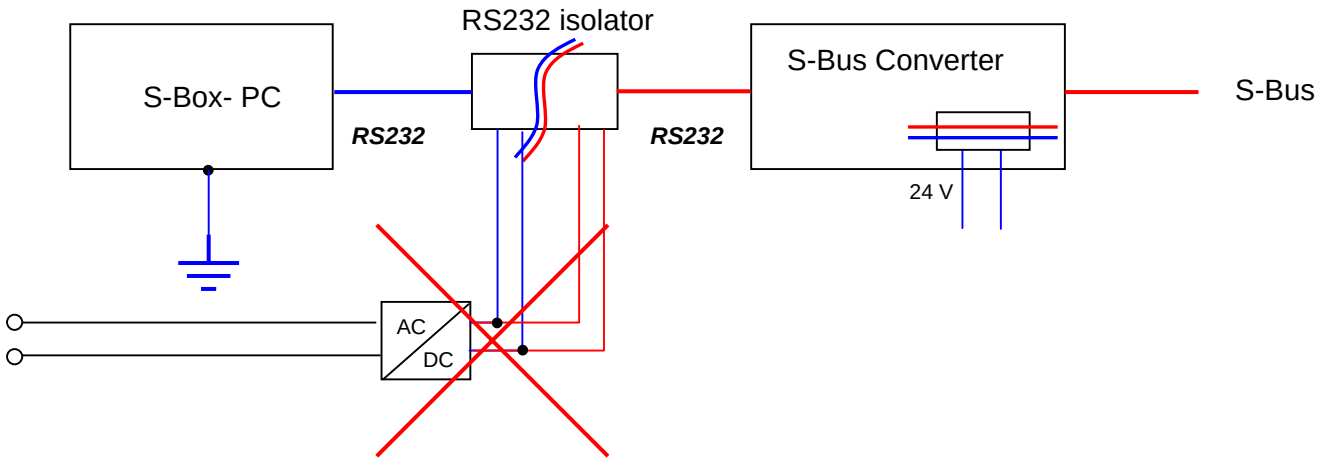


Fig 5 : Earth disconnected

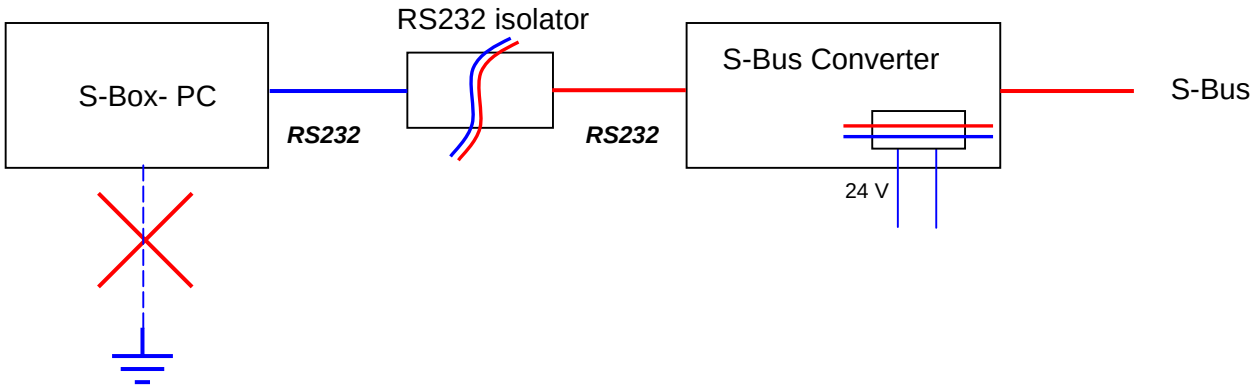
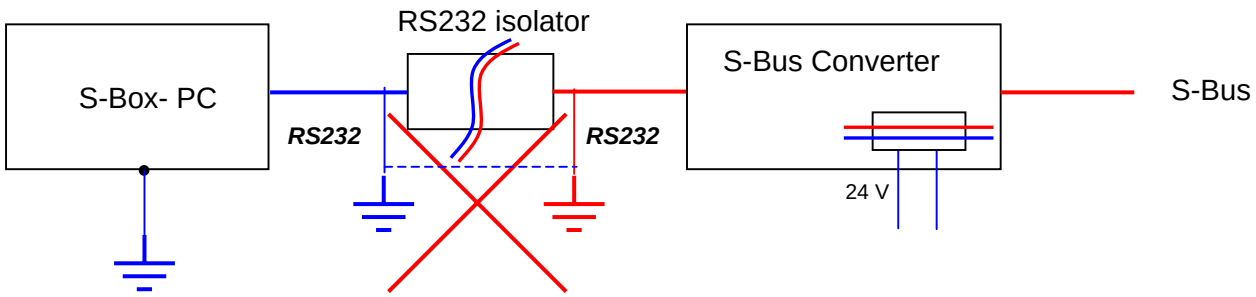


Fig 6 : Do not ty to ground RS232 cable shield: this would bypass the isolator



Appendix 1: S-Box ground connection

- Do not consider DIN rail mounting as ground connection
- Use the Ground screw as indicated below