LINE SURGE PROTECTOR

Models : LSP01-GB-485

: LVP02-GB-024

INSTALLATION MANUAL

impro®

CE

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SURGE PROTECTOR

GENERAL DESCRIPTION

The Surge Protector unit is designed to protect RS485 and single RS422 communication lines [Model LSP01], and 12 V DC power supply lines [Model MSP01] installed between buildings from overvoltages resulting from lightning strikes. The Surge Protectors should also be used on internal lines longer than 50 m. The Surge Protectors have been tested to IEC 801-4, and meet the requirements of this test. The maximum working voltage should be 18 V DC or 13 V AC.

INSTALLATION PROCEDURE

Location

The units should be installed as close to the cable entry point in the building as possible, one at each end of the cable.

Mounting

[1] Remove the unit from the packing, remove the housing cover and remove the plastic bag from the unit.

[2] Use the standard methods, tools and materials suitable for the surface on which the unit is being mounted.

[3] Insert the mounting screws/bolts into the large, diagonally placed holes in the unit housing. Refer to Figure 1.

Connecting

Refer to Figures 1 and 2, and proceed as follows:

[1] Connect the incoming cable with the line to TB2 and the shield to TB1 as shown in the diagram.

[2] Connect the external earth wire between the two flat, brass washers on the earth stud on the outside of the unit housing.

[3] Connect the local internal cable to TB3. **DO NOT CONNECT THE SHIELD**.

[4] Fix nylon cable ties around the cable sheaths immediately inside the housing to prevent the cables being pulled out of the housing.

[5] Fit the housing cover and secure with the four screws in the plastic bag.

CAUTION:

[1] If the unit is to withstand wet weather conditions, seal the openings in the housing with a suitable silicon compound, after the cables have been connected.

[2] The fitting of the Surge Protector unit is not intended to replace any over-voltage protection devices fitted to the equipment being protected, and these should be connected in the normal way.

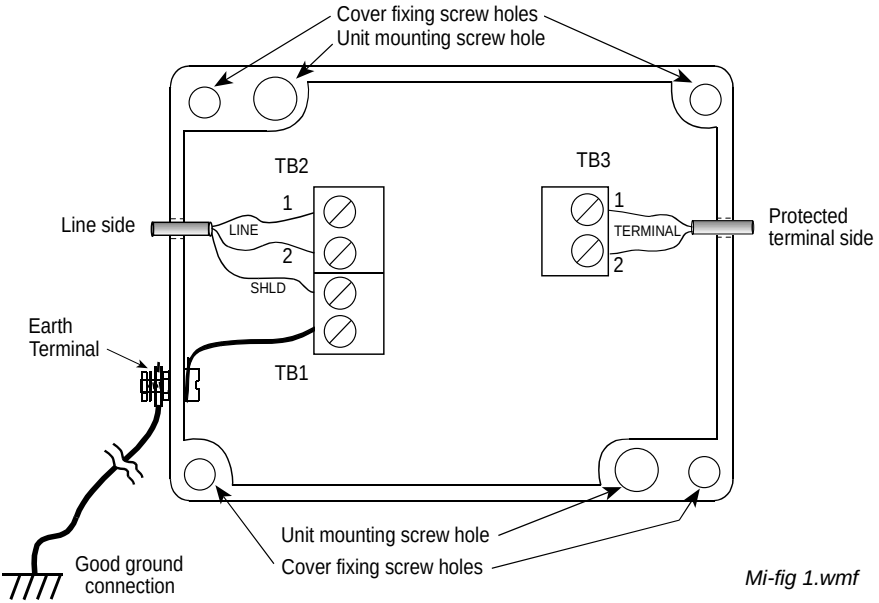

Figure 1 : Installation

See next page

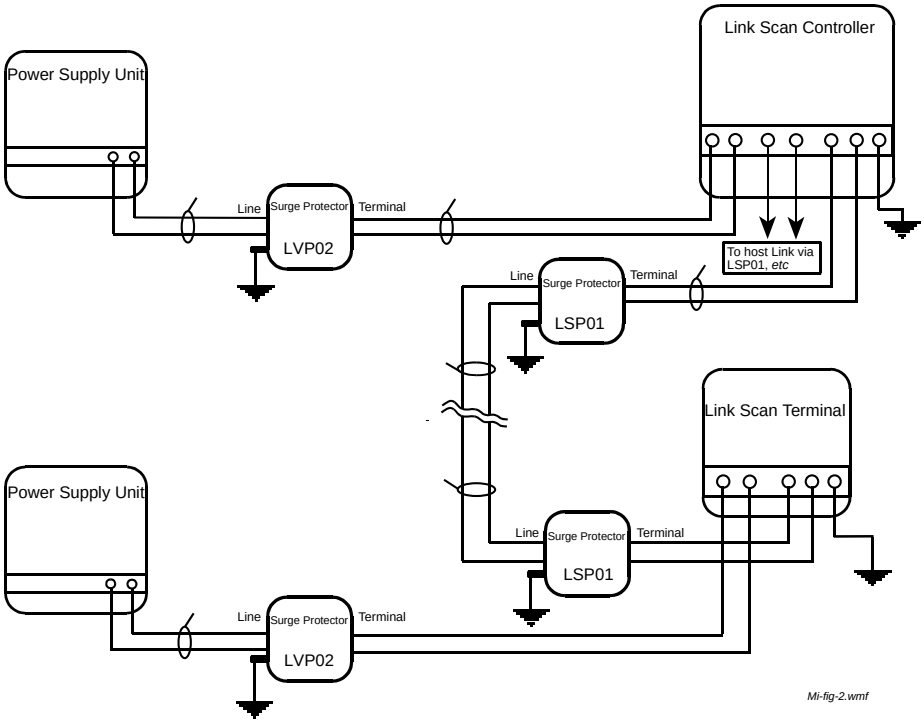

Figure 2 : Schematic Diagram

LIGHTNING PROTECTION AND EARTHING FOR ELECTRONIC EQUIPMENT

INTRODUCTION

An efficient lightning protection and earthing system is essential for the preservation of life, as well as for the protection and proper operation of electrical equipment. The theoretical objectives for the protection of equipment and structures against lightning damage are outlined in the following paragraphs, together with recommendations for achieving these objectives in a practical situation.

LIGHTNING PROTECTION

Lightning discharge current flowing through a circuit produces large potential differences causing the breakdown and sometimes total destruction of electrical components. Furthermore, the heat produced by the discharge current can destroy its own flow path. Thus the primary objective of a good lightning protection system is to prevent these dangerous potential differences from developing. This is achieved by absorbing energy and by providing isolation from high voltages.

Energy is absorbed by components such as lightning arresters, metal oxide varistors [MOVs] and zener diodes, which are able to conduct large strike currents and thus limit the voltage that develops across their terminals. They are used as shunt-type protection across input terminals.
Electrical isolation is provided by components such as chokes, resistors, transformers and opto-couplers which can withstand very high voltages applied across their terminals. They are connected in series with the anticipated lightning path.

Recommendations to minimize the risk of lightning damage are as follows:

[a] Provide a good earth connection to the metal housing of the equipment.
[b] Install system cabling in conduits.
[c] Use fibre-optic cable, or additional filters on inputs and outputs in high lightning risk areas.
[d] Install lightning protection devices.

WARNING : NO LIGHTNING PROTECTION SYSTEM IS ABLE TO GUARANTEE PROTECTION FROM DAMAGE, OR IS ABSOLUTELY SAFE.

EARTHING MODES

The functions of an earthing system are:

[a] to carry fault current into the mass of the earth
[b] to reduce the potential differences between different parts of the installation
[c] to assist the suppression of unwanted electromagnetic radiation.

To meet these requirements, the earthing system should provide a low-resistance path to the mass of the earth. This path must be able to withstand very large strike currents without a significant increase in resistance.

System Earth or Safety Earth

This earth connection provides a common earth conductor, ideally having a resistance of less than 3 ohms, for earthing metal enclosures, racks, shelves, chassis, cable runways and panels.

The rules for system earth are as follows:

[1] Arrange the system so that all earthing conductors are as short as possible.
[2] Do not install earthing conductors adjacent or parallel to conductors which carry surge currents.
[3] Make the earth connection using flat copper washers on a metal surface free of paint or other non-conductive coatings.
[4] In certain circumstances, it may not be permissable to connect system earth to mains earth.

Signal Earth or Clean Earth

This earth connection provides an insulated, low-noise common earth conductor having a resistance of less than 1ohm and low impedance at the working frequencies, for earthing electronic equipment. In many systems, signal earth comprises leads which normally carry

only light currents, such as the common negative or zero-volt rail, or the shield of a screened cable.

The rules for signal earth are as follows:

[1] Do not connect signal earth to system earth, or to the earthing system of circuits which carry high power.
[2] Use screened cable for input/output connections longer than 2 m.
[3] Connect the screens together and to earth at one end only, preferably at the equipment terminal block.
[4] Join common earth [negative] leads of input/output signal wires together at one point only, referably at the equipment terminal block.

Earthing Techniques

Various earthing techniques are compared in the following table.

Electrode	Advantages	Characteristics
Vertical rod	Standard hardware, installation easy	High surge impedance
Trench earth	Standard conductors, simple design	High surge impedance decreasing with the number of down conductors
Horizontal mesh	Installation easy during building construction, impractical & costly later	Fluctuating resistance without vertical rods
Earths from water pipes & other services	Cost carried by service provider	Equipment user has no control over quality of earth connection

Table 1: Comparison of earthing techniques

Conductor size and length and the selection of the actual earthing technique, depend on the type of installation and its location.

The rules for the earthing method are as follows:

[1] Comply with the statutory regulations laid down by national and local authorities in the area in which the installation is located.
[2] Ensure that the earthing method selected, and the standard of installation meet the electrical requirements.
[3] Ensure that the construction of the earthing system is mechanically robust and reliable.
[4] Arrange the earthing system so that the earth electrodes are accessible for measurements to be made.
[5] Document the earthing system to ensure that the original design objectives are maintained during alterations or expansions to the system.

WARNING : **SURFACE POTENTIAL GRADIENTS CAUSED BY THE RADIAL SPREAD OF DISCHARGE CURRENT ON THE GROUND SURROUNDING THE EARTH ELECTRODE AFTER A LIGHTNING DISCHARGE, COULD BE INJURIOUS TO HUMAN AND ANIMAL LIFE. VERTICAL RODS MUST BE INSTALLED TO A DEPTH THAT ENSURES ACCEPTABLE SURFACE POTENTIAL LEVELS.**

Vertical rods

Rods are normally of stainless steel, or copper-clad steel, with a diameter of between 16 mm and 25 mm. Multiple vertical rods must be 4 m in length and separated in the ground by a minimum distance equal to the installed length of the rod, and a maximum distance equal to 1,5 times the installed length of the rod.

Horizontal conductors

Horizontal earth conductors should preferably be of circular stranded copper, with a minimum cross-sectional area of 50 mm^2. They must be installed to a minimum depth of 0,5 m, and a minimum of 1 m distant from building foundations.

Optimum Earthing System

The efficiency of an earthing system is affected by many factors including the resistivity of the soil, the type of terrain and climatic conditions, especially the amount of rainfall and temperature extremes.

Ideally the design of the optimum earthing system would take account of the physical characteristics and the ground flash density statistics of the installation site. The final analysis must examine the degree of risk, the cost of the protection system, the replacement cost of the equipment being protected and the consequences of system down-time.

References:

[1] IEC 1024 and VDE 0185 Part 102: Protection of structures against lightning

[2] SABS 03-1985 [as amended in 1986]: Code of Practice for the protection of structures against lightning

ORDERING INFORMATION

The units can be ordered under the following Impro codes:

LPV02-GB-024 - Low Voltage Surge Protector
LSP01-GB-485 - RS485 Line Surge Protector

NOTES

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