

INSTRUCTION MANUAL
For
POWER LINE IMPEDANCE STABILIZATION NETWORK

Model LIP-120
5 kHz to 1 MHz



Table of Contents

1.0	Introduction	3
2.0	Products Available from Com-Power.....	4
3.0	Product Safety Information	5
3.1	Product Hazard Symbols Definitions	5
3.2	Incoming Inspection	6
3.3	Package Inventory	6
3.4	General Safety Instructions.....	6
4.0	Product Specifications	9
5.0	Product Description.....	10
5.1	Overview.....	10
5.2	Product Setup	10
5.3	Front & Rear Panel Marking	11
6.0	LISN Theory	13
7.0	Typical Performance Data.....	14
8.0	Warranty	16
8.1	Maintenance	16

List of Figures

Figure 1: Single Phase connection with one set of LISN.....	Error!
<small>Bookmark not defined.</small>	
Figure 2: Front Panel.....	11
Figure 3: Rear Panel.....	11
Figure 4: Example of equivalent PLISN circuit.....	13
Figure 5: Typical Impedance compared to TEMPSET requirement.....	14
Figure 6: Typical Isolation compared to TEMPSET requirements	15
Figure 7: Typical Insertion Loss.....	15

1.0 INTRODUCTION

This manual includes descriptions of front and rear panel ports, controls and indicators; product specifications, safety precautions, operational instructions and warranty information and guidelines and instructions for its proper usage.

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2.0 PRODUCTS AVAILABLE FROM COM-POWER



Antennas



Antenna Kits



Absorbing Clamps



Coupling/Decoupling Networks (CDN)



Comb Generators



Current Probes



Emissions Test Systems



Conducted Immunity Test Systems



Impedance Stabilization Networks (ISN)



Line Impedance Stabilization Networks (LISN)



Antenna Masts



Near-Field Probe Sets



Preamplifiers



Power Amplifiers



Spectrum Analyzers



Product Safety Test Equipment



Transient Limiters



Turntables



Antenna Tripods



Telecom Test Systems

www.com-power.com

3.0 PRODUCT SAFETY INFORMATION

3.1 Product Hazard Symbols Definitions

The hazard symbols appearing on the product exterior are defined below.



The yellow triangle with an exclamation mark indicates the presence of important operating and/or maintenance (servicing) instructions in the literature accompanying the product.



The yellow triangle with a lightning bolt indicates an alert to the user that un-insulated dangerous voltages are present within the product enclosure and on output connectors. These voltages may be of sufficient magnitude to constitute a risk of electric shock to persons.



The Ground symbol inside a circle indicates terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.



To indicate on the rating plate that the equipment is suitable for AC current.



To indicate on the rating plate that the equipment is suitable for direct current.

3.2 Incoming Inspection



To avoid possibility of electrical shock, do not apply power to the LISN if there is any evidence of shipping damage. If shipping damage to the product or any of the accessories is suspected, or if the package contents are not complete, contact Com-Power or your Com-Power distributor.

Please check the contents of the shipment against the package inventory in section 3.3 to ensure that you have received all applicable items.

3.3 Package Inventory

Equipment, accessories, and documents supplied with the model LIP-120 PLISN are as follows:

- Calibration data and Certificate traceable to NIST.

Optional items

- ISO-17025 calibration data and certificate.

3.4 General Safety Instructions

The following safety instructions have been included in compliance with safety standard regulations. Please read them carefully.

- **READ AND RETAIN INSTRUCTIONS** - Read all safety and operating instructions before operating the instrument. Retain all instructions for future reference.
- **HEED WARNINGS** - Adhere to all warnings on the instrument and operating instructions.
- **FOLLOW INSTRUCTIONS** - Follow all operating and use instructions.
- **WATER AND MOISTURE** - Do not use the instrument near water.
- **VENTILATION** - The instrument should be used/installed only in locations where the flow of air through the ventilation openings is not impeded.
- **MOUNTING** - The instrument can be used in Horizontal or vertical orientation as long as the ventilation holes are not obstructed, and the protective grounding is not defeated.
- **HEAT** - The instrument should be situated away from heat sources such as heat registers or other instruments which produce heat.
- **POWER SOURCES** - Connect the instrument only to the type of power source described in the operating instructions or as marked on the instrument.





• **GROUNDING** - Take precautions to insure that the grounding of the instrument is not defeated. Grounding conductor with adequate cross-section must be connected between a grounding conductor connection for the measurement area and the grounding conductor connection (grounding bolt) on the back/front panel of the PLISN and the PLISN bottom plate, before applying any power to the PLISN. At shutdown or before dismantling the PLISN setup, ensure that the power to PLISN is discontinued before the ground conductor connection is disconnected.



CAUTION:

The LIP-120 is based on the 50Ω/1.37 mH artificial mains network (AMN) circuit and component values (Figure 3) specified in Tempset for frequency range of 5 kHz to 1 MHz

The specified minimum line to ground capacitance (10μF) induces leakage currents in excess of the value permitted under EN 61010-1 standard – safety requirements for electrical equipment for measurement, control and laboratory use.

In addition, the basic insulation required for a category I protection device cannot be assured. Therefore it is imperative to provide additional measures safeguarding against direct or indirect contact by user.

The operator is responsible for ensuring that protection is maintained during work with the line impedance stabilization network (LISN).

Before using the LISN, a secure ground connection must be made to the LISN's grounding bolt and/or the bottom metal plate (The bottom surface of the LISN is left unpainted for effective ground connection). It must not be removed until after the LISN has been disconnected from the mains power supply, in order to avoid electric shock.

The safety notes in the accompanying operating instructions and on the outside of the device must be followed at all times.

- **POWER CORD PROTECTION** - Place power supply cords so that they are not likely to be walked on or pinched by items placed on them or against them.
- **CLEANING** – Clean the instrument outside surfaces of the device with a soft, lint-free cloth. If necessary, a mild detergent may be used.
- **NON-USE PERIODS** - Unplug the power cords of the instrument when it will be left unused for a long period of time.
- **OBJECT AND LIQUID ENTRY** - Take care that objects do not fall into the instruments and that liquids are not spilled into the enclosure through openings.
- **DEFECTS AND ABNORMAL STRESS** - Whenever it is likely that the normal operation has been impaired, make the equipment inoperable and secure it against further operation.
- **SITTING OR CLIMBING** - Do not sit or climb upon the instrument or use it as a step or ladder.

- **ENVIRONMENTAL CONDITIONS** - This equipment is designed for indoor use. Ambient temperature range during operation should be between 5° C to 40° C.

- **STORAGE AND PACKAGING** - The device should only be stored at a temperature between -25 and +70 °C. During extended periods of storage, protect the device from dust accumulation. The original packaging should be used if the device is transported or shipped again. If the original packaging is no longer available, the device should be packed carefully to prevent mechanical damage.

4.0 PRODUCT SPECIFICATIONS

Model: **LIP-120**

Electrical

Frequency range:	5 kHz to 1 MHz
Compliant standards:	TEMPEST
Number of lines:	Two lines
Max current rating:	10 Amp AC, 7 Amp DC
Max Voltage rating:	270 VAC, 50/60 Hz (Line to Ground)/ 380 VDC
Inductor type:	1.37 mH
EUT & Power connector:	Three-pin a.c. receptacle Socket and power cord plug.
RF measurement connector:	50Ω, N type (female)

Mechanical

Dimensions of Each LISN (L x W x H):	11.8 x 8 x 5.1 inches / 30 x 20.5 x 13 cm
Weight of each LISN :	9 lb. /4.050 kg

Environmental

Operating Temperature	5° C to 40° C / 40° F to 104° F
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5.0 PRODUCT DESCRIPTION

5.1 Overview

The LIP-120 Power Line Impedance Stabilization Network is specifically designed to provide necessary measurement platform for any type of TEMPSET test over the 5 kHz

The LIP-120 performs each of the following functions during the measurement:

- provides a defined, stable impedance throughout the measurement frequency range
- isolates the EUT and measurement circuit from the power source, thereby minimizing its influence on the measurements; and,
- It is used to Stabilize the EUT power line impedance during single line conduction and radiation testing over the frequency range of 5 kHz to 1 MHz.

5.2 Product Setup

Before initiating use of PLISN, ensure that,



- PE conductor is connected to ground.
- The ventilation openings are unobstructed.
- No signal or operating voltages above the permissible limits given in specification.
- The PLISN's power input port is connected to an appropriate power source employing properly rated mains protection, as over current protection is not provided in the LISN.

Failure to comply with any of these points may damage the equipment and/or pose an electrical hazard.

5.2.1 Typical connection diagrams

The LISNs can be used with single phase power sources with one set of LISNs and also three phase power sources (requires two sets of LISNs). Given below are the typical connection setup's for each configuration.

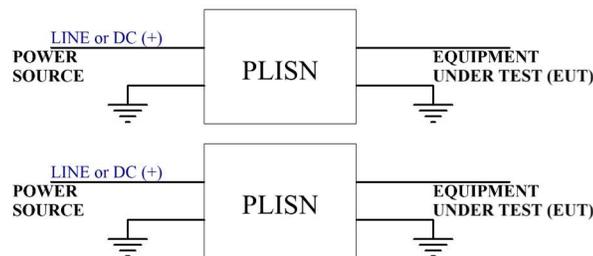


Figure 1: Single phase LISN

5.3 Front & Rear Panel Marking

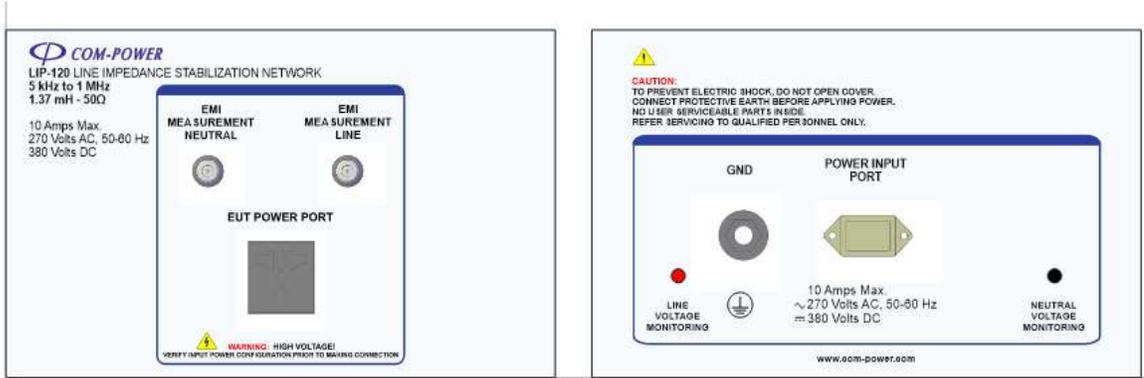


Figure 2: Front panel

Figure 3: Rear Panel

5.3.1 Power input port

The Model LIP-120 has a for connection to an external DC or AC input power source. The PLISN is shipped with two matching shrouded socket plug, for connection to the input power source cables.



CAUTION

Due to the high level of earth leakage current, the device cannot be connected to any power source protected by either a ground fault circuit interrupter (GFCI) circuit breaker or residual current devices (RCDs). The power source must be protected by a circuit breaker with a current rating which is greater than or equal to the rating of the LISN.



5.3.2 Grounding bolt (GND)

The threaded bolt with hex nut marked 'GND' are found on both front and back panel of the LISN. This bolt is used for Protective grounding connections. In addition to this, the un-painted bottom surface of the PLISN should be bonded directly to an earth referenced ground plane for effective RF reference ground. In cases where no ground plane is available, a mains isolating transformer shall be used.

Please refer Safety instructions for more information on importance of grounding. The grounding instructions are to be followed at all times.

5.3.3 EUT power port

The LIP-120 has a standard a.c. receptacle to power the equipment under test.

5.3.4 EMI measurement Port

The LIP-120 provides a 50 Ω N-Type (female) connector to connecting the Spectrum analyzer or EMI receiver for making conducted noise measurements. The shielding connection of the N connector shield is connected to the housing of the PLISN and thus to ground.

6.0 LISN THEORY

The LIP-120 model power line impedance stabilization network (PLISN) is a Passive electric network that is placed between the Power Line of an Equipment under test (EUT) and the a.c. or d.c. power mains when performing any types of TEMPSET test over 5 kHz to 1 MHz frequency range. The PLISN design to pass the mains power to the EUT power input connector with very little loss while presenting a relatively constant Impedance of 50+/- 10 ohms above 5 kHz to the EUT regardless of local power line impedance variations. This means that the TEMPEST test results for a particular EUT obtained at different locations should be almost identical because the PLISN will have assured that a relatively constant power line impedance over the 5 kHz -1 MHz frequency range was seen by the EUT during the test.

In Addition to stabilizing the EUT power line impedance the LIP-120 couples any EUT-generated spurious power line conducted signals above 5 kHz to a 50-ohm detection system for evaluation and measurement while blocking the 60 Hz power line fundamental frequency from the detection system. Over the test frequency range, the signal coupling circuit has low loss (typically less than 1 dB) to minimize attenuation, and to eliminate the need for any substantial signal level correction. The LIP-120 is also used to stabilize the EUT power line impedance during signal line conduction and radiation testing over 5 kHz to 1 MHz frequency range.

The below figure 5 is example of equivalent circuit for LIP-120 to perform as per TEMPSET standard.

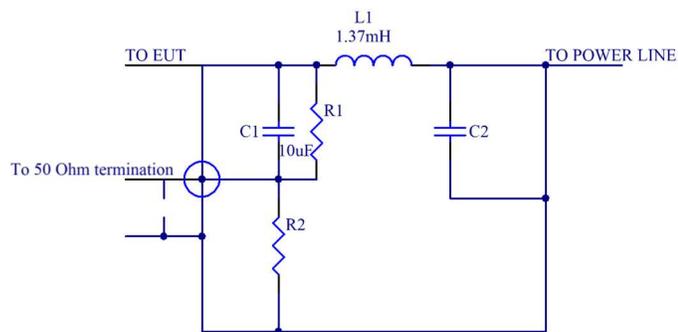


Figure 4: Example of equivalent LISN circuit

7.0 TYPICAL PERFORMANCE DATA

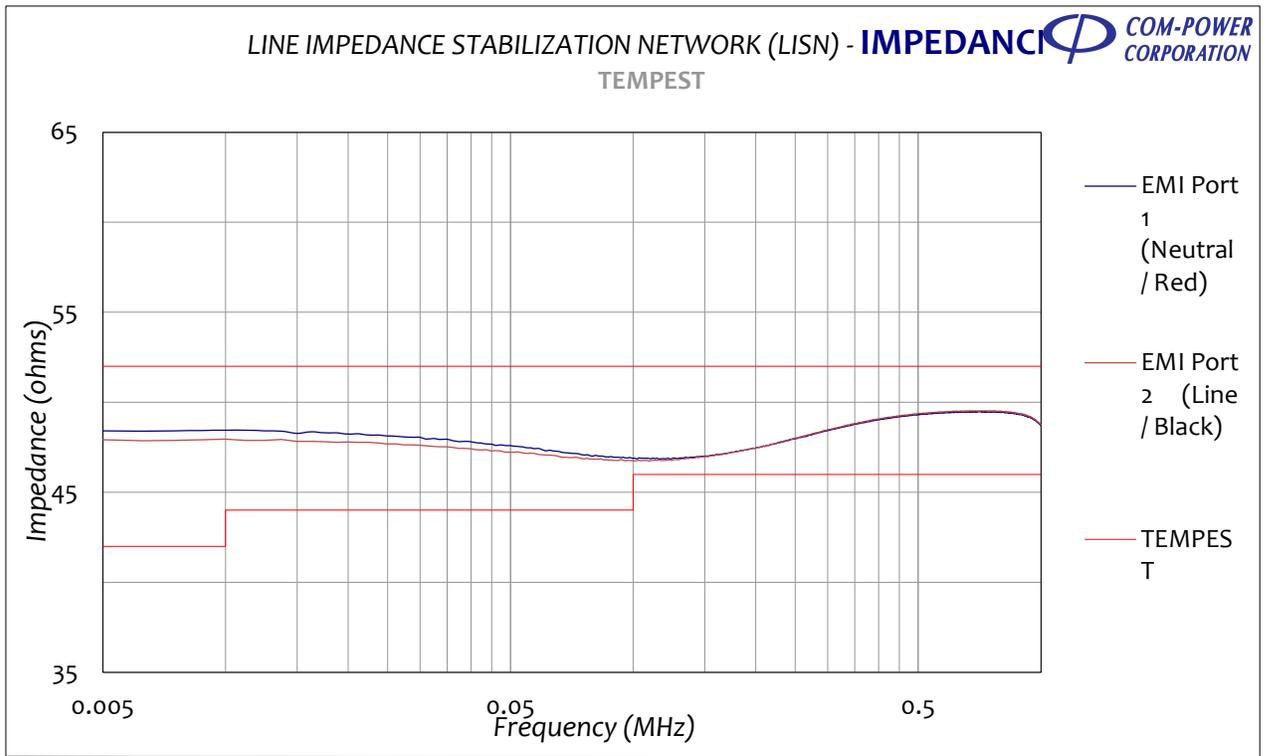


Figure 1: Typical Impedance compared to TEMPESET requirements.

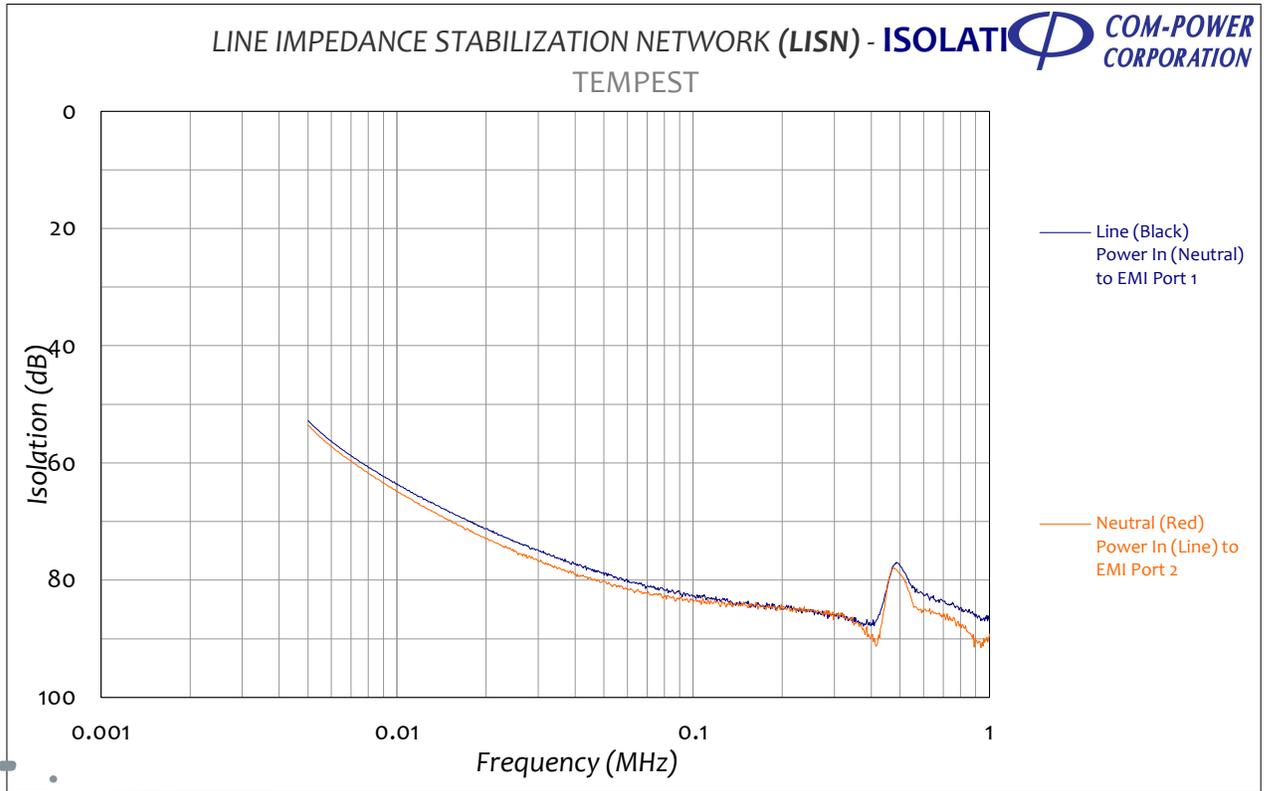


Figure 2: Typical Isolation compared to TEMPEST requirements

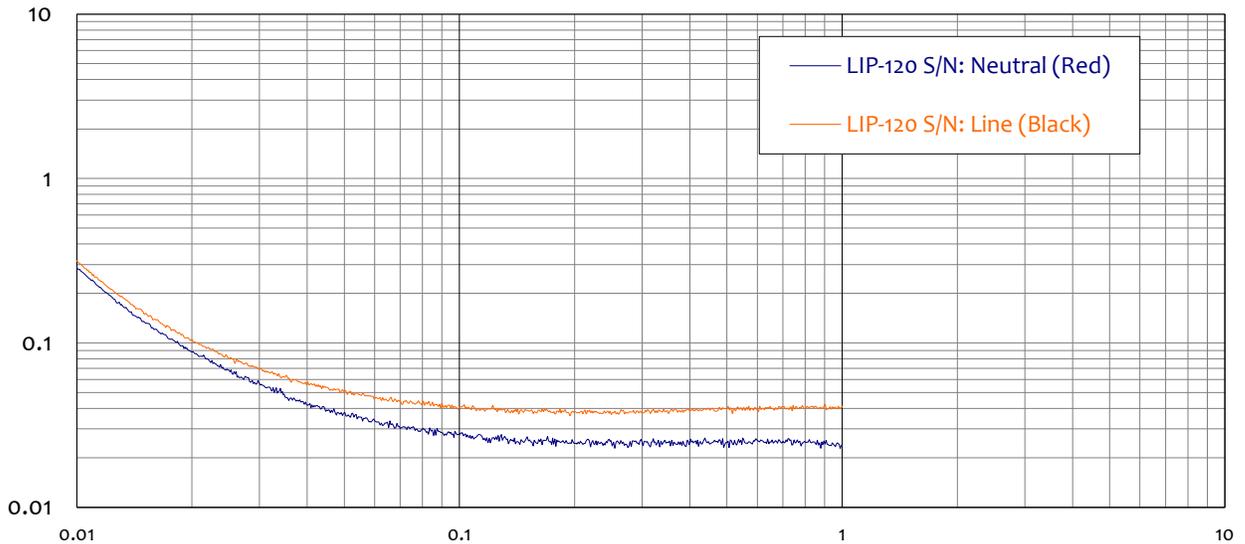


Figure 3: Typical Insertion Loss for TEMPEST

8.0 WARRANTY

Com-Power warrants to its Customers that the products it manufactures will be free from defects in materials and workmanship for a period of three (3) years. This warranty shall not apply to:

- Transport damages during shipment from your plant.
- Damages due to poor packaging.
- Products operated outside their specifications.
- Products Improperly maintained or modified.
- Consumable items such as fuses, power cords, cables, etc.
- Normal wear
- Calibration
- Products shipped outside the United States without the prior knowlege of Com-Power.

In addition, Com-Power shall not be obliged to provide service under this warranty to repair damage resulting from attempts to install, repair, service or modify the instrument by personnel other than Com-Power service representatives.

Under no circumstances does Com-Power recognize or assume liability for any loss, damage or expense arising, either directly or indirectly, from the use or handling of this product, or any inability to use this product separately or in combination with any other equipment.

When requesting warranty services, it is recommended that the original packaging material be used for shipping. Damage due to improper packaging will void warranty.

If you feel that the product is not working as intended, or is malfunctioning, please contact Com-Power for assistance. In the case of repair or complaint, Please visit our website www.com-power.com and fill out RMA form (<http://com-power.com/repairservicereq.asp>). Our customer service personnel The RMA number should be displayed in a prominent location on the packaging and on the product, along with a description of the problem, and your contact information.

8.1 Maintenance

This product contain no user serviceable parts inside. If the unit does not operate or needs calibration, please contact Com-Power Corporation. Any modifications or repairs performed on the unit by someone other than an authorized factory trained technician will void warranty.

The exterior surface may be cleaned with mild detergent and then be wiped with a dry, clean, lint-free cloth. Use care to avoid liquids or other foreign objects entering the chassis.