



**INSTRUCTION MANUAL  
For  
LINE IMPEDANCE STABILIZATION NETWORK**

**Model LI-3100  
10 kHz to 400 MHz**





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## **1.0 Introduction**

This manual includes product specifications, safety precautions, product maintenance and warranty information. It also includes some basic guidance on LISN operation.

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## **2.0 Product Description**

### **Overview**

The LI-3100 Line Impedance Stabilization Network was specifically designed for providing standardized line impedance during Electromagnetic Compatibility (EMC) testing in accordance with RTCA DO-160, MIL-STD 461F & CISPR 25 requirements. In addition, it minimizes the noise generated by equipment other than the EUT to be included in the measurement.

The LI-3100 is shipped with two LISN housed in separate enclosures for single phase power applications. For wiring convenience, each LISN has either a black or red shrouded banana for both power and EUT connection. The following items are included with each LI-3100 LISNs.

#### **Standard items included:**

Equipment, accessories, and documents supplied with the LI-3100 LISN are as follows:

- Calibration data and Certificate traceable to NIST.
- Superior Electric shrouded 100A plugs for EUT and power connection.



#### **Optional items**

- ISO-17025 calibration data and certificate.



## **3.0 Product Specifications**

<b>Model:</b>	<b>LI-3100</b>
<b>Electrical</b>	
<b>Frequency Range:</b>	10 kHz to 400 MHz
<b>Compliant Standards:</b>	RTCA DO-160 / MIL-STD 461 / CISPR 25 / CISPR 16-1-2
<b>Number of lines:</b>	Two lines
<b>Max current rating:</b>	100 Amp AC, 70 Amp DC
<b>Max Voltage Rating:</b>	480VAC, 50/60 Hz (Line to Ground) / 676 VDC
<b>Insertion Loss:</b>	<0.65 dB (100 kHz – 108 MHz)
<b>Isolation:</b>	>35 dB (100 kHz – 200 kHz) >40 dB (200 kHz – 108 MHz)
<b>Inductor type:</b>	5 $\mu$ H
<b>EUT &amp; Power Connector:</b>	100 Amps Shrouded Superior Electric sockets
<b>RF measurement connector:</b>	50 $\Omega$ , N type (female)
<b>Cooling:</b>	Forced air
<b>Power Adapter for fan:</b>	Output: 12 VDC, 1 Amp Input: 120 VAC, 60 Hz / 230 VAC, 50 Hz
<b>Fuse:</b>	1 Amp, 250 V (T)
<b>Adapter output connector Diameter:</b>	2.1 x 5.5 mm Center Positive
<b>Operating Temperature:</b>	5° C to 40° C / 40° F to 104° F

### **Mechanical**

<b>Dimensions of each enclosure (L x W x H):</b>	10 x 10 x 21 inches / 25.4 x 25.4 x 53.3 cm
<b>Weight (each network):</b>	13 lb. / 5.9 kg

*This equipment is designed for indoor use only.*

### **3.1 Other items available from Com-Power**

- SPA-series Spectrum Analyzers
- LIN-120A, LISN 150 kHz – 30 MHz, 20 A
- LI-220A, LISN 10 kHz – 30 MHz, 20 A
- LI-125A, LISN 150 kHz – 30 MHz, 25 A
- LI-550A, LISN 150 kHz – 30 MHz, 50 A
- Special order LISNs with higher voltage and / or current
- LIT-153 Transient Limiter
- Cables and connectors



## **4.0 Important Safety Precautions**

The LISN must be securely fastened to the earth ground before making any connections to external power. Proper grounding of the LISN not only ensures correct conducted emissions measurements, it also prevents potential high leakage current from presenting a hazard to test personnel. To help establish proper grounding the bottom surface of the LISN is unpainted. In addition, the bottom plate has holes for securely bolting the LISN to the ground plane.

Only connect power plugs with a protective earth contact into LISN power input port / AE. The protective action must not be negated by the use of a cheater plug or an extension cord without a protective conductor.

### **Caution**

*The LI-3100 LISNs use forced air system to keep the air core inductors cool during the test. Always use the supplied DC adapter to power the internal fan during the test. Do not obstruct the airflow vents. Use the LISNs in a ventilated area. Failure to observe these precautions may result in hazardous conditions for the operator. Overheated LISN may also provide incorrect measurement data or damage the LISN. If the fan stops working discontinue using the LISN and contact Com-Power for further assistance.*

### **Environmental conditions**

This equipment is designed for indoor use to be safe under the following environmental Conditions:

- Temperature: 5° C to 40° C
- Maximum relative humidity: 80%



## **5.0 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 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 seperately 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.

In the case of repair or complaint, Please visit our website [www.com-power.com](http://www.com-power.com) and fill out RMA form (<http://com-power.com/repairservicereq.asp>). Our techincal assistance personnel will contact you with RMA number. Please ensure to have the RMA number stated on shipping documents.

## **5.1 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.



## **6.0 Front and rear panel marking**

### **6.1 Power input port**

The Model LI-3100 has a 100 Amps Superior Electric pin receptacle on the back panel for connection to external DC or AC power source. The matching shrouded banana socket plug is included with the LISN. See specification table on page 5 of this manual for the voltage and current ratings.

### **6.2 EUT power port**

The LI-3100 uses a 100 Amps Superior Electric Shrouded banana socket receptacle as the EUT power port. The matching color coded plug is included for making the connection to the EUT.

### **6.3 EMI measurement Port**

The 50 Ω Type 'N' connector located to the right of the EUT Power Port for connecting the Spectrum analyzer or EMI receiver for making conducted noise measurements.

### **6.4 Grounding bolt (GND)**

The bolt marked 'GND' are found on both front and back panel of the LISN. This bolt is used for PE grounding with a braid or short wire. This is in addition to mounting the LISN on the RF ground plane using conductive bottom surface.

### **6.5 Input 12V<sub>DC</sub>, 1 A**

The 12V<sub>DC</sub> input is a standard 5.5mm x 2.1 mm dc power jack to connect power adapter for the Fan.

### **6.6 Fuse, 1 Amp**

The fuse is for the Fan operation, it is a 20 x 5mm 1A, 250V (T) fuse. For continued protection against risk of fire, replace only with fuse of the specified type, current and voltage ratings

### **6.7 Power switch**

This switch controls the Fan operation. Always turn the fan ON before powering the EUT via LISN.



## 7.0 LISN Theory

### 7.1 Overview

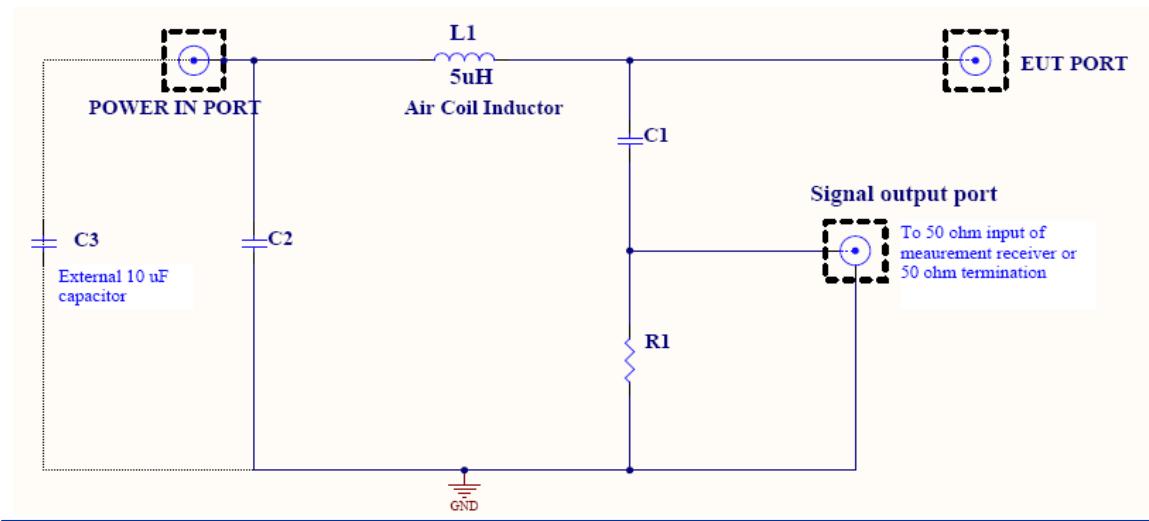
Line Impedance Stabilization Networks used supply standardized line impedance to the EUT during conducted emissions testing which is independent of the external power line impedance. The standardized impedance enables consistent readings for RF noise measurements on the power line. The model LI-3100 consists of two separate LISN networks housed in separate enclosure for testing EUTs with single phase power requirements.

In addition to providing standardized impedance, the LISN also acts as a low pass filter for the power to equipment under test. The LISN blocks RF noise from the power line from reaching the equipment under test, however, the power to the equipment passes through the LISN with minimal effect. This filter comprises of single stage low pass LC filter. Therefore, it has capacitor and an inductor for the filter. The inductor used in the LI-3100 is air core type to eliminate the possibility of saturation and to provide stability.

The LISN also provides a low impedance path for the RF noise from the EUT to the measuring equipment, thereby facilitating the measurement of the RF noise. The insertion loss of the measured noise may be significant especially at low frequencies. Therefore, at frequencies below 400 kHz, the insertion loss correction factor must be compensated for highest accuracy noise measurement.

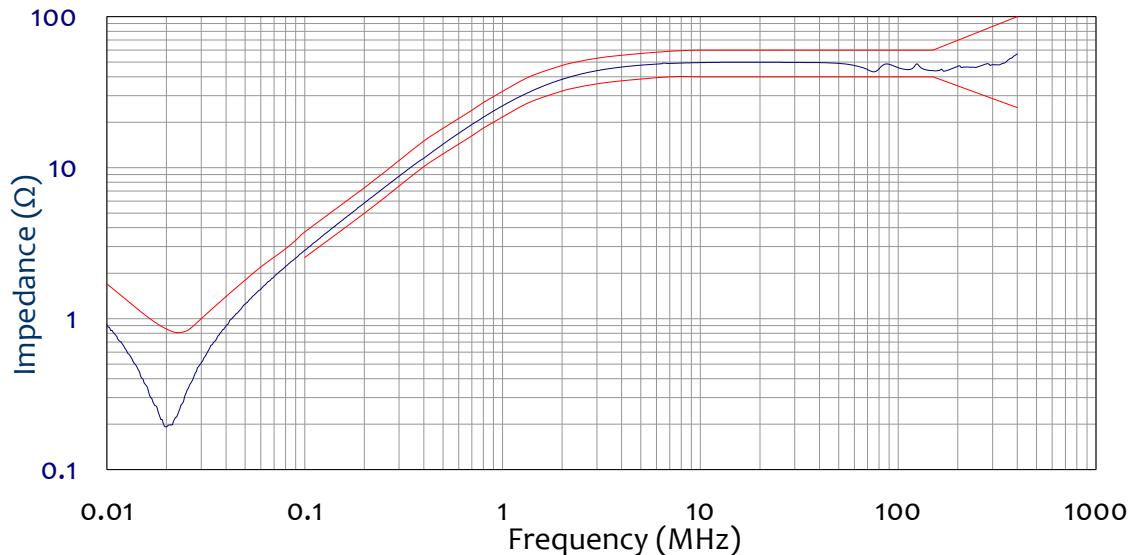
The figure below is a typical schematic of a 5  $\mu$ H LISN as specified in the CISPR-16-1-2, MIL-Std 461 standard. The LISN does not incorporate any internal 10  $\mu$ F capacitor, so the requirement specified in DO-160 for the 10  $\mu$ F capacitor is to be fulfilled externally.

**Figure 1 – Example of an equivalent LISN circuit**

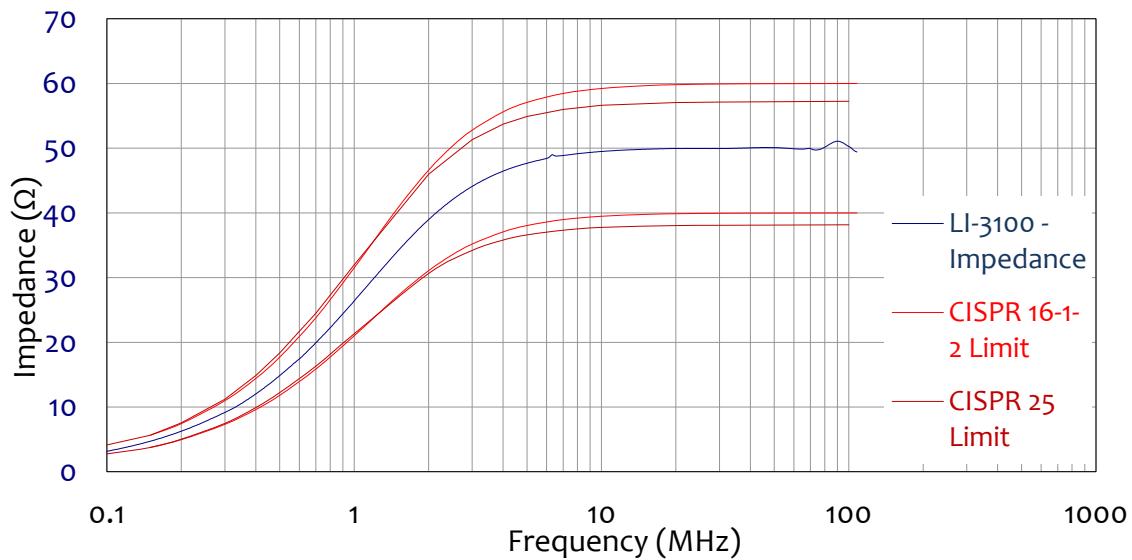




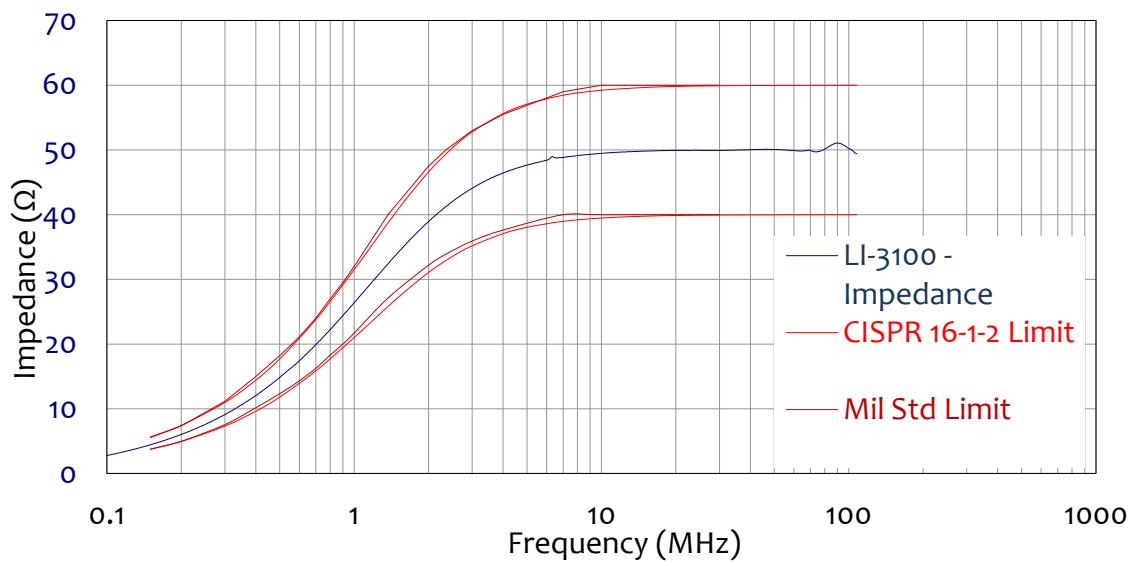
## 8.0 Typical Performance Data



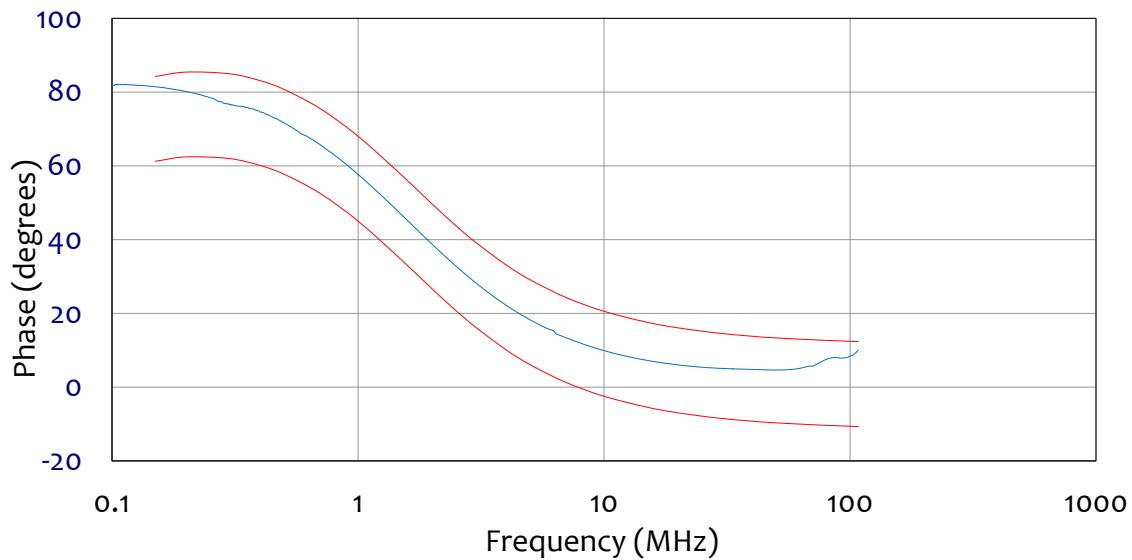
**Figure 2** - Impedance (AE Port: 10  $\mu$ F capacitor to ground ) compared to DO-160 requirements.



**Figure 3** - Impedance (AE Port Short) compared to CISPR 16-1-2 & CISPR 25 requirements.



**Figure 4** - Impedance (AE Port Open) compared to CISPR 16-1-2 & Mil-Std 461 requirements.



**Figure 5** - Phase (AE Port Open/short) compared to CISPR 16-1-2 requirements.