

The Next Step

Noise on power lines is harmful to sensitive equipment and components and needs to be controlled. There are several methodologies to accomplish noise reduction, among them identifying most polluting noise sources in your environment and isolating them; rearranging power and grounding branches, and using EMI filters, the latter being most effective both for noise reduction and cost since filtering of noise does not involve rewiring your facility. Please visit www.onfilter.com for more technical information on the subject.

OnFILTER manufactures a line of advanced EMI filters for suppression of noise on power lines and ground in actual installations. Please consider OnFILTER' CleanSweep® power line and ground line EMI filters to manage EMI in your facility.

Customer and Technical Support

For customer service and technical support contact factory at +1-831-824-4052 or at info@onfilter.com or your local authorized OnFILTER representative -- see distributor's section at www.onfilter.com

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Hand-Held Power Line EMI Adapter MSN15



User's Guide



Overview

Thank you for buying EMI Power Line Adapter! MSN15 will help you to observe and measure high frequency signals and noise on power lines and ground with the help of your spectrum analyzer or an oscilloscope, providing valuable diagnostics means, as well as a measure of success in managing electromagnetic interference in your facility. If your interests are in power line communication (PLC), you will be able to observe signals from most types of PLC with ease.

MCN15 EMI Power Line Adapter galvanically isolates its output from 50/60Hz input voltage on the mains while passing through high-frequency signals on power line, allowing connection to conventional instrumentation such as oscilloscopes and spectrum analyzers for analysis.

True balanced input of MSN15 in conjunction with its galvanic separation between input and output eliminates ground loops even if your instrument is plugged into AC outlet.

EMI Adapter has 50 Ohms BNC output, allowing its connection to many instruments. Please read cautionary note further in this document before connecting EMI Adapter to your instrument.

What is included with your EMI Adapter:

- EMI Adapter MSN15
- Test Leads
- BNC-BNC cable, 10' (~3m)
- BNC T-adapter
- BNC 50 Ohms terminator
- This User's Guide



Optional accessories (ordered separately):

- Attenuator **AMS22**
BNC attenuator 20dB for use with spectrum analyzers
- Signal Cable Kit **AMS23**
Spare BNC cable/T-connector/50 Ohms terminator pack



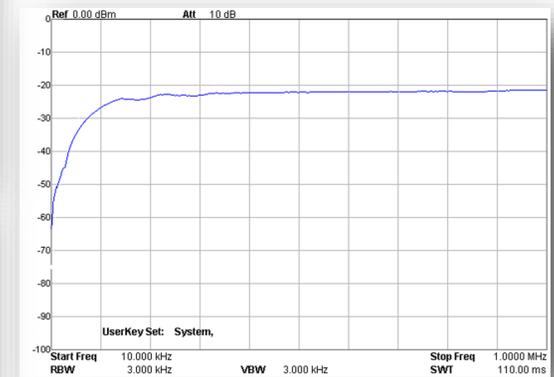
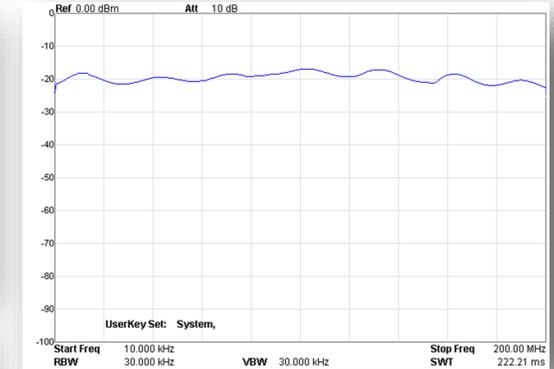
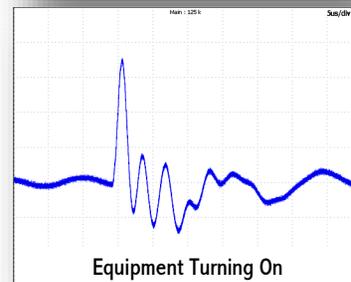
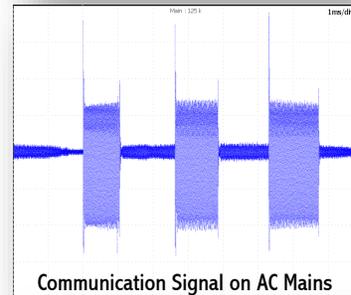
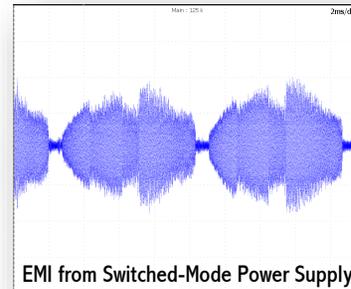
CAUTION! If you are using test leads different from the ones supplied make sure that they:

- have protective banana plugs as shown
- are safety approved as CATIII or better.



Specification

Max. AC Voltage	250VAC RMS
Max. DC Voltage	250V DC
Measurement Category	CAT III 250V
Frequency Response	30kHz...200MHz AC Mains frequencies are fully blocked
Output Impedance	50 Ohms
Connector	BNC
Internal Signal Limiter, Typ.	15V peak either polarity (typ.)
Approvals	Certified for compliance with IEC/EN 61010-1:2010, Third Edition, AMD1:2016; 61010-2-030:2011



All specifications are subject to change without notice.

Making Measurements

Connecting it all together

- Connect MSN15 to your instrument as shown on the previous page 5.
- Plug banana plugs of the test leads into MSN15. While the test leads and the banana jacks of MSN15 are color-coded, input of MSN15 is balanced and isolated—there is no difference whether red and black leads plug into matched colored jacks or not. Hold MSN15 firmly as you are doing it. The same applies when you disconnect test leads. It helps if you use supplied alligator clips with the test leads to free up one hand since you will need a hand to hold MSN15 itself

Power Lines

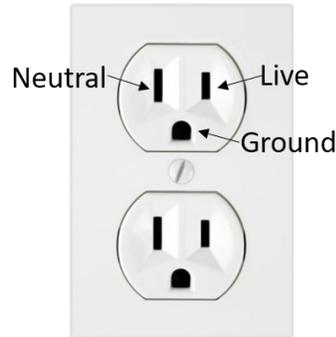


WARNING: When measuring signals on live power lines do not touch tip of the test lead—it may have exposed high voltage if another test lead is connected to a circuit under voltage.

Noise on power lines can be common-mode and differential (also called “normal”) mode. The high-frequency signals may be different for each mode.

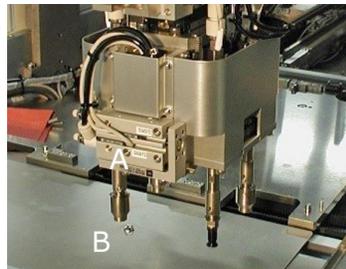
Differential signal exists between wires carrying power, such as Live and Neutral. Mains voltage of 50/60Hz itself is a differential signal. Communication over power lines also utilizes largely differential mode signals. As seen, signal of differential mode can be either “good” or “bad.”

Common mode signals are never good news. This type of signal is often result of parasitic “leakage” of current from Live or Neutral to Ground.

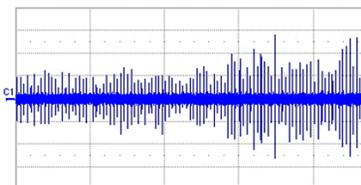


Ground

Why measure EMI on ground? Different grounded circuits, such as metal parts in equipment, or equipment functionally connected to each other may have low DC resistance, but for high frequencies impedance of mutual ground connections can be quite high and with inevitable current leakage to ground there are usually noticeable high-frequency voltage difference leading to equipment and process errors, tool lock-ups and electrical overstress (EOS). MSN15 allows easy and accurate measurements of such signals.



Figures to the right show measurement points between two grounded points A and B in a semiconductor equipment and the actual signal measured between them which is significantly higher than specified in such Standards as SEMI E176.



Measure value status	P1.max(C1)	P2.min(C1)	P3.pkpk(C1)
	3.79 V	-2.98 V	6.76 V
	✓	✓	✓

Link to inCompliance Magazine article about SEMI E176

Brief Tour of your MSN15 EMI Adapter

Please refer to the rest of this User’s Guide for a detailed explanation of each connection. EMI Adapter MSN15 has no battery. There are no serviceable or replaceable parts inside.



Supplied test leads

BNC output connector

Banana jacks

Safety

MSN15 was designed to meet or exceed requirements of IEC61010-031:2015; UL61010-031 Edition 2; and CAN/CSA-C22.2 No. 61010-031-07 Equipment for Measurement, Control and Laboratory Use - Part 031: Safety Requirements for Hand-Held Probe, Pollution Degree 2 (as defined in IEC/UL 61010-1). Note: Rated for indoor use only.



WARNING: Observe proper safety precautions when working with voltages over 60 VDC or 30 VACRMS. These voltages pose shock hazard. Use only test leads supplied with the product or safety approved test leads with shrouded banana plugs.



WARNING! Do not touch test probe tip when other probe is in contact with live power—high voltage may be present.



WARNING: To avoid electrical shock or fire, make sure that the test leads are in good condition. Contact OnFILTER for repair or replacement.



WARNING: To avoid electric shock or fire, keep MSN15 body and its output cable away from the circuits being measured. The MSN15 body and output cable are not intended to be in contact with the circuits being measured.



CAUTION: High-frequency and transient signals on power lines can reach significant magnitude. MSN15 adapter limits peak amplitude of such signals typically to no more than 15V. This may exceed maximum allowed signal amplitude for 50 Ohms input in some instruments. In order to avoid damage to your instruments by such signals see proper connection techniques on page 5 of this User's Guide.



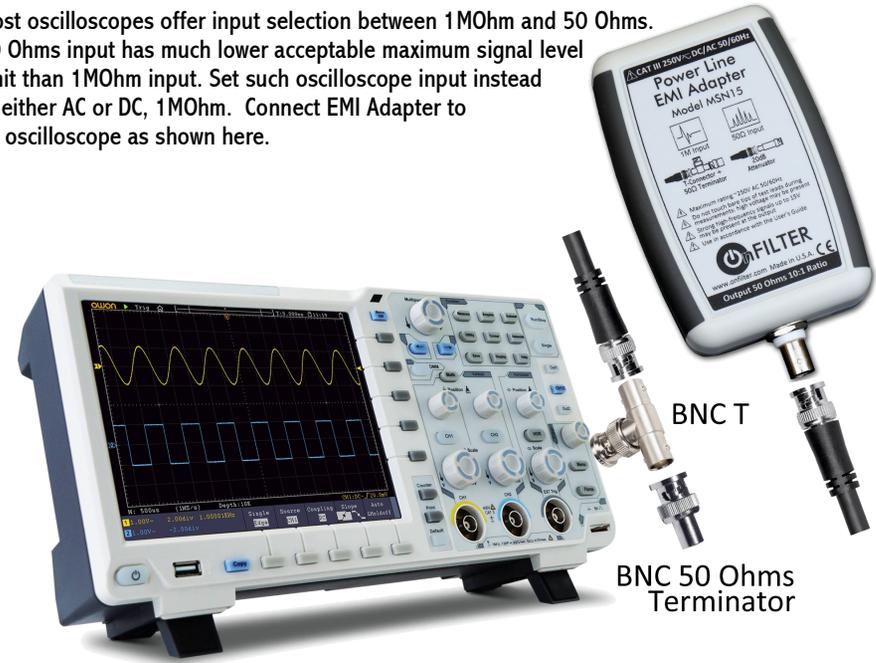
CAUTION: Always read instructions to your instruments
 For instruments that allow either 50 Ohms or 1 MOhm input selection, always choose 1 MOhm input and use supplied adapters as shown in this User's Guide to maintain 50 Ohms impedance
 For instruments that have only 50 Ohms input always use optional attenuator (20dB is recommended) in line with the 50 Ohms input.

Observe caution when working with high voltage:

- Avoid working alone.
- Do not use the EMI Adapter if it is damaged, or if its safety is impaired.
- Inspect the test leads for damaged insulation or exposed metal. Check test lead continuity.
- Damaged leads should be replaced.
- Use only the accessories provided or approved by the manufacturer.
- Disconnect the live test lead before disconnecting the common test lead.
- Follow all safety procedures for equipment being tested.

Connecting to an Oscilloscope with 1MOhm Input

Most oscilloscopes offer input selection between 1MOhm and 50 Ohms. 50 Ohms input has much lower acceptable maximum signal level limit than 1MOhm input. Set such oscilloscope input instead to either AC or DC, 1MOhm. Connect EMI Adapter to an oscilloscope as shown here.



Connecting to an Oscilloscope or a Spectrum Analyzer with 50 Ohms Input

Spectrum analyzers typically have only 50 Ohms input. Some high-speed oscilloscopes also use only 50 Ohms input as well. Unless your 50 Ohms instrument can safely withstand 15V peak signals, we recommend to use optional in-line BNC attenuator as shown below. This way the maximum signal will not exceed 1.5V (typ.).

