



Application Note

Wiring Harness Emulation using Intepro's PSI 9000 Series DC Power Supply

Overview

When testing products to ensure they meet the specifications and performance demanded by their customers, engineers are tasked with simulating real world environments that are sometimes overwhelming and too impractical to implement. Consider the case of the automotive engineer – There are a myriad of different wiring harnesses that their products can be used with. Ideally, products should be tested under conditions as close as possible to what they will see while in use but what do we do when those conditions have a multitude of variants? The solution here is ***not*** to go out and purchase each and every single wiring harness that the engineer's product will encounter. **Intepro's PSI 9000 Series** of DC Power Supplies gives you the option of emulating a wiring harness through its programmable output impedance.

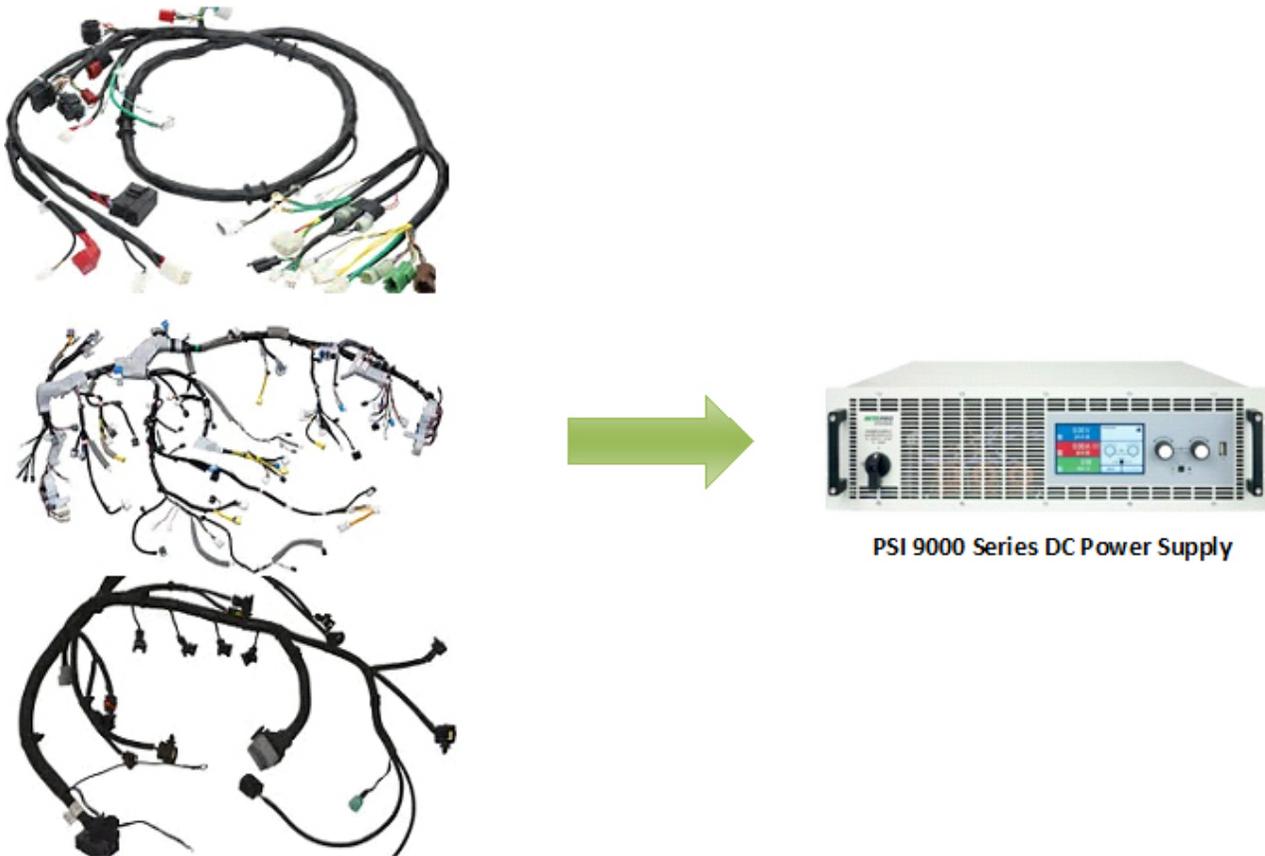


Figure 1: Forego the need for multiple harnesses by using the PSI 9000 Series to test your powered product.



Concept

A wiring harness can be modeled as a lumped resistance, usually provided as Ohms per unit of length. To derive the resistance of the harness, we need to know the material, length and gauge. Once we have these values, the resistance is given as -

$$R = (\rho * L) / A$$

Where ρ = Resistivity of Material, L = Length of Wire, A = Cross-Sectional Area of Wire

To determine the cross-sectional area of the wire, we can use the following –

$$A_n = 0.012668 \text{ mm}^2 \times 92^{36-n/19.5}$$

Where n = the wire gauge from AWG (American Wire Gauge)

Implementation

Using internal resistance control, the power supply simulates a virtual internal resistor which is in series to the voltage source output and thus also in series with the load. This feature can be set up via the power supply's front panel or via remote control.

We take the resistance calculated for the wiring harness and use the following formula to determine our set points –

$$U_{\text{actual}} = U_0 - (I_{\text{actual}} \times R_i)$$

Where U_{actual} = Actual Output Voltage, U_0 = Output Voltage Setting, I_{actual} = Actual Output Current, R_i = Internal Resistance Setting (calculated lumped impedance from wiring harness)

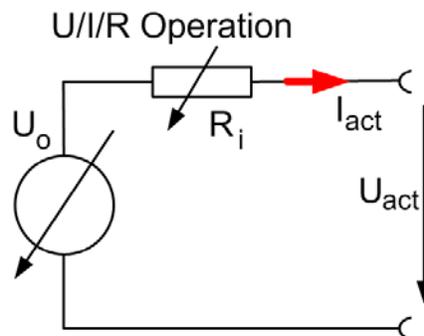


Figure 2: Depiction of internal resistance.



As an example, if your product is powered by 12 VDC @ 5 Amps you would need to set your output voltage to 22 VDC to simulate being connected to a wiring harness having 2 Ohms of resistance.

In general, the adjustable resistance range is defined as the following equation for any given model number -

$$R = 0 - 30 \times (V_{\text{nominal}} / I_{\text{nominal}})$$

For a PSI 9080-120 (80 VDC Nominal, 120 Amps Nominal), the resistance range is 0 – 20 Ohms.

Summary

Today's power test products are evolving along with the changing demands of the market place. These tools are designed to make testing your products easier while ensuring they will provide the quality and performance your customers demand. The ability to simulate a variety of resistive loading effects saves your company both time and money. What else can Intepro help you with?

For more information or to request a quotation, please contact Intepro Systems!

sales@inteproate.com

InteproATE.com

Contact Us

United States

Intepro Systems America, LP.
14712 Franklin Ave
Tustin, CA 92780 USA
Tel: +1 714.953.2686
Fax: +1 714.673.6567
sales@inteproATE.com

China

Intepro Power Electronics (Shenzhen) Co., Ltd
No. 828, Block 7, Fourth Industrial Area
Nanyou, Nanshan District
Shenzhen, China 518052
Tel: 0086 755 86500020

United Kingdom

Intepro UK Ltd.
9 Lakeside Business Park
Swan Lane, Sandhurst Berkshire
GU47 9DN / UK
Tel: 44 012 5287 5600

Ireland

Intepro Systems Ireland Limited
Lonsdale Road
National Technology Park
Limerick / Ireland
T +353 61 33 22 33
F +353 61 33 25 84
sales@InteproATE.com
support@InteproATE.com