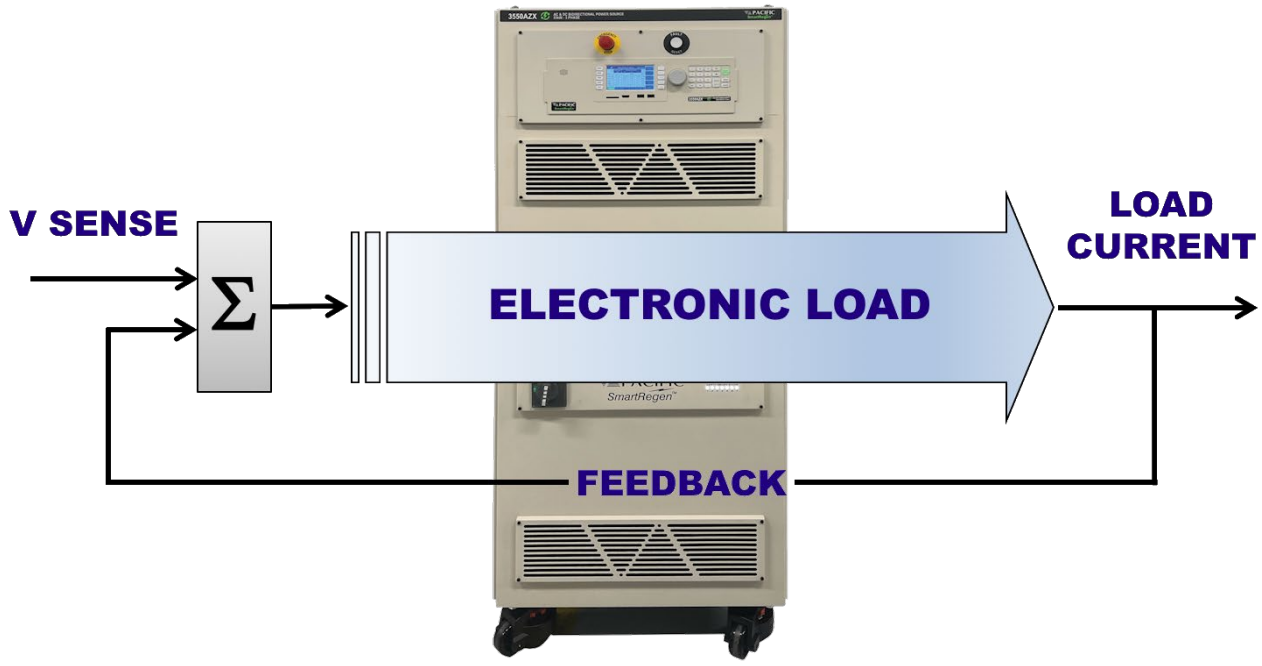
PACIFIC POWER SOURCE
2802 Kelvin Ave, Suite 100, Irvine, CA, 92614 USA

High Impedance Mode for Load Applications

AZX SERIES



1 Abstract

Unlike resistive load banks that have no actual active control loops, programmable electronic loads respond to changes of the sensed input voltage to regulate the programmed load current as part of this closed-loop feedback. This is true in Constant Current, Constant Power as well as Constant Resistance modes.

As such, the voltage at the input of the electronic load follows Ohms law so a sudden increase in impedance at a given load current will result in a corresponding sudden increase in voltage. Thus, if the connection to the unit under test is suddenly disrupted, impedance seen by the electronic load jumps to high value causing the voltage to rise quickly.

Advanced electronic loads like the AZX Series have a high voltage protection feature that will cause the load to trip off. While this protects the load and the unit under test from potential over voltage damage, it may not be desirable occurrence. This condition applies to both dissipative electronic loads as well as regenerative electronic load like the AZX Series with Load (L) option. Refer to application note "AZX Electronic Load Capacitance Control AZX Electronic Load Capacitance Control" for more information on mitigating this condition.

2 Electronic Load High Impedance Mode Operation

To address the condition described in the first paragraph, the AZX features a unique high impedance mode with a programmable voltage threshold setpoint. When this voltage threshold is reached at the AZX Load input terminals, the load transitions to a high impedance mode and regulates its input voltage to zero volts. The AZX load stays in this high impedance condition while sensing the input voltage from the unit under test. Once the load's voltage sense circuits detect a voltage level from the unit under test again, the AZX exits this high impedance mode and starts operating as a regenerative electronic AC or DC load again.

This high impedance mode allows the AZX to stay enabled during periods where the unit under test is in a different state. Also, it allows the AZX load to enable its output and remain connected into a high impedance/open circuit condition. Normally, electronics cannot operate into such high impedance or open circuit conditions and will fault.

Note: This mode is **not** enabled by default because any voltage spike can cause the AZX to enter this mode and exit it quickly. This may be confusing and not desired by the user depending on the application.

Figure 2-1 below shows an example of such a disconnection event on AZX electronic load as captured by its internal digital oscilloscope for all three phases. Note the peaks on the voltage before the AZX enters the high impedance mode. The instance where the unit under test disengages results in these sudden voltage spikes occurring. They are caused by the load current into a high impedance condition. The AZX load detects this event and quickly changes state from load mode to high impedance mode to bring down the voltage to zero. As shown, this response takes less than half a cycle of the UUT operation frequency.

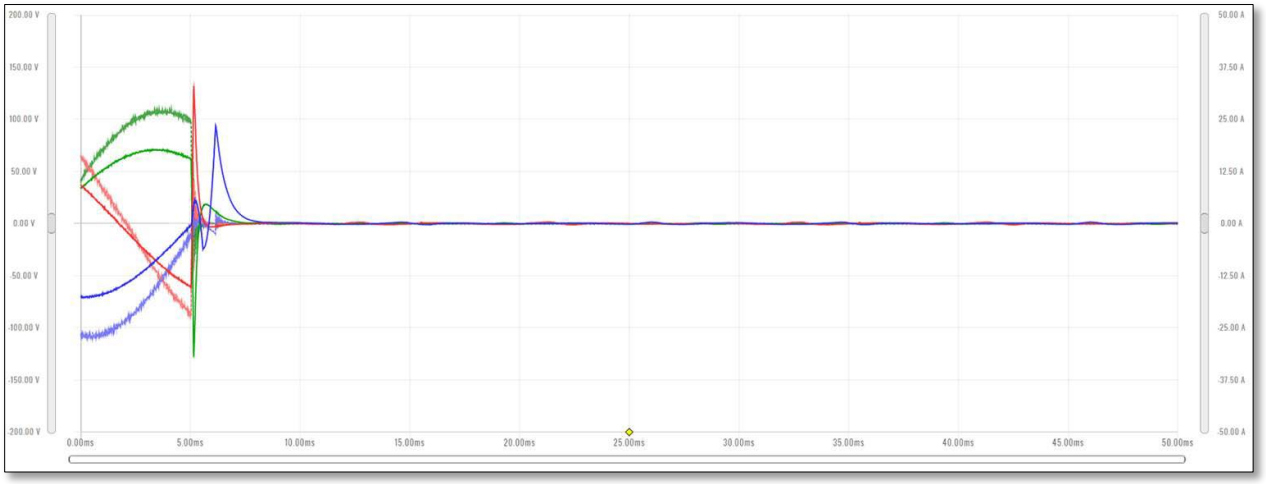


Figure 2-1: AZX Electronic Load Internal Scope Capture of Disconnect Detection

The reverse sequence of events occurs when the unit under test is reconnected or re-engages. Figure 2-2 is an example of such a connection event. Note how fast the AZX Load responds using its fast sync mode. The scope capture shows that the three phase currents resume within half a cycle of the UUT operating frequency.

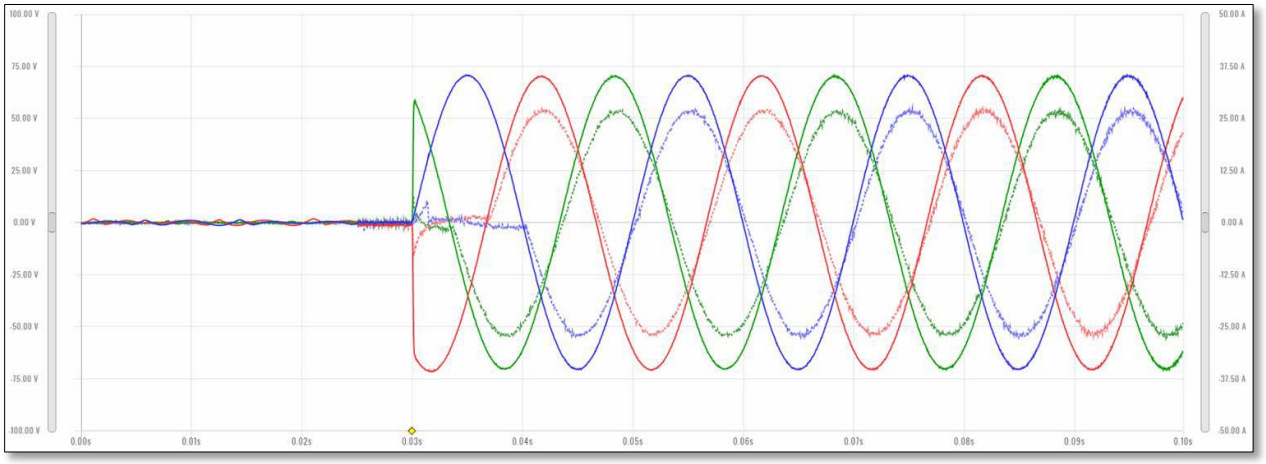


Figure 2-2: AZX Electronic Load Internal Scope Capture of Re-connection

This **High Impedance** mode and the available **Fast Synchronization** mode of operation is one of the many unique capabilities of the advanced regenerative AZX Series products. See application note "**AZX Load Synchronization Modes**" for more information on the Fast Sync mode function.

3 High Impedance Control SCPI Commands for ATE Applications

The high impedance mode can only be controlled via one of the remote-control interfaces of the AZX Series units using the four **HIGHIMPEDance** SCPI commands listed here:

[SOURce:]HIGHIMPEDance[:STATe]#?
0 is OFF and 1 is ON.

[SOURce:]HIGHIMPEDance[:STATe]#?
Query the state.

[SOURce:]HIGHIMPEDance:THREshold:MODE# <0|1>
0 is by level and 1 is by the percentage of the programmed over-voltage protection level.

[SOURce:]HIGHIMPEDance:THREshold:MODE#?
Query the mode.

[SOURce:]HIGHIMPEDance:HYSTeresis:LEVel# <LEVEL>
Set the level.

[SOURce:]HIGHIMPEDance:HYSTeresis:LEVel#?
Query the level.

[SOURce:]HIGHIMPEDance:THREshold:PERcentage# <PERCENTAGE>
Set the percentage.

SOURce:]HIGHIMPEDance:THREshold:PERcentage?
Query the percentage.

Note: At the time of this publishing, the programming and customization of this mode are only available with SCPI commands. This setting may be added in the future to the Front panel and webpage user interfaces of the AZX Series.

Refer to the AZX Operation Manual for a complete listing of all available remote-control commands available for programming the unit.

4 Additional Mitigation Measures

The dynamic behavior of the voltage spikes depends on the device under test (DUT), overall capacitance and programmed current level on the electronic load.

If further mitigation of these voltage spikes is desired, a pre-charge resistance, added output capacitance, and/or active voltage clamping methods could be used as well. For those cases, please contact PPS support for suggestions or recommendations.

5 Summary

The ability of the AZX user to enable high impedance mode can be a beneficial feature for many test applications where the EUT can enter a high impedance condition. By enabling this capability and setting the right threshold and hysteresis for the sense voltage, either in relative of absolute values, the user gains important control over the interaction between UUT and electronic load.

6 Customer Support

For application support, contact Pacific Power Source's Customers Service - Toll Free US: +1 (800) 854-2433 / support@pacificpower.com or your local authorized Pacific Power Source distributor.

PACIFIC® POWER SOURCE
2802 Kelvin Ave, Suite 100
Irvine, CA 92614 USA
Phone: +1 949.251.1800
Fax: +1 949.756.0756
Toll Free: 800.854.2433
E-mail: sales@pacificpower.com
www.pacificpower.com