PACIFIC POWER SOURCE
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APPLICATION NOTE

Synchronizing Two AC Power Sources

Abstract

This application note describes how to synchronize two programmable AC Power Sources using the Sync In and Sync Out control signals found on the Auxiliary I/O interface of Pacific Power Source's LMX, LSX and legacy AMX and ASX models. This applies to both two AC source from the same product series as well as a mix of power sources from different series such as syncing an AMX to an LMX.

Test Setup

The setup used for this application note is shown in Figure 1. An Adaptive Power Systems M2003D Power analyzer was used to display the output voltage waveforms of the two power sources. In this example, the AMX AC source is used as the Master unit while the 312LMX will be used as the auxiliary. That means the SYNC OUT of the AMX (master) will be used to drive the SYNC Input of the LMX (auxiliary).

Figure 1: Dual Sources Synchronized setup with Power Analyzer

A DB25 to DB25 cable is required that connects the SYNC Out and Sync In functions on the Auxiliary I/O of both power sources as follows (see Figure 5):

- 312AMX-UPC12
  - SYNC Out pin 5
  - LV Common pin 17
- 312LMX
  - Sync In – Phase Sync Input pin 8
  - GND – Chassis Ground pin 9

Figure 2: Power Analyzer in Scope Mode - Not Synced

Both power sources were programmed to 120Vac @ 60Hz. Synchronization was not enabled.

Figure 2 shows the phase A outputs of both AC power sources in unsychronized mode of operation. Even if the frequencies are both the same, the phase angles are different so both outputs are out of sync. The Blue trace represents the 312AMX-UPC12 output and the red trace is the 312LMX.

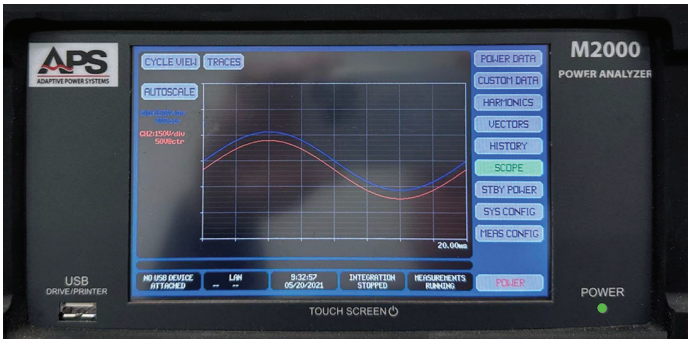

Figure 4: Power Analyzer in Scope Mode - Synced

Configuring Sync Mode on Auxiliary Unit

The External Sync Input was enabled and the Sync Source was set to Digital Input TTL. On the LMX, this setting can be made from the front panel or using the web browser interface.

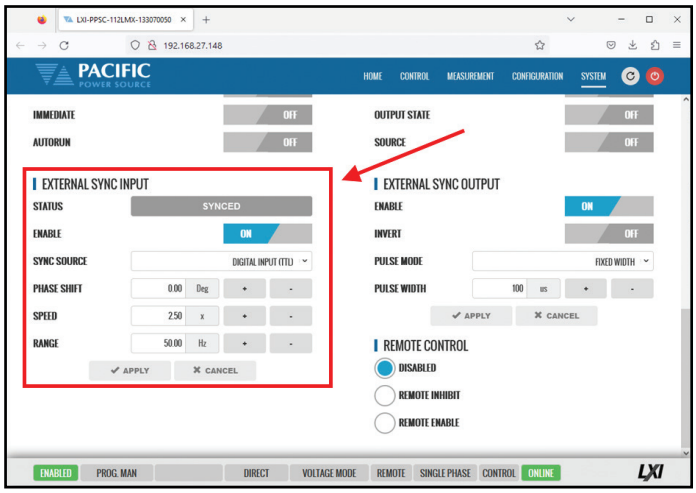

Figure 3: LMX Sync Input Setting Web Browser screen

Once SYNC was enabled the output frequencies matched. Making minor changes in frequency on the 312AMX-UPC12 will cause the 312LMX to match its output. Large changes in frequency however will cause the 312LMX to become unsynchronized until the 312LMX is re-programmed to match the output frequency of the 312AMX-UPC12 again.

Sync Mode Setting Considerations

Regarding the settings of the auxiliary power source, it is important to set its frequency as close as possible to the master source frequency setting. For example, if the master is set to 60Hz, setting the auxiliary source to 10Hz, it may not sync sometimes or may take a while to lock in to the master sources sync out signal. In general, it is best to program the expected frequency on the auxiliary power source to that of the master power source so the PLL doesn't have to go too far to sync.

The basic operating principle is that the frequency you program in the LMX auxiliary is the initial frequency for the PLL and it can go +/- the range (10Hz by default) until it syncs. Every time you change a setting on the master source, the PLL resets and starts from the initial frequency. If you set a higher adjustment speed, the PLL will lock in faster but it will also be more sensitive to noise or small variations so this is not recommended.

Synchronizing Two AC Power Sources

This sync method (with a PLL) is best used for fixed frequencies. If the frequency changes in real time - for example as a result of running a frequency transient on the master source, the auxiliary source can loose sync, so it's not efficient for frequency sweeps or big frequency steps.

Summary

Synchronizing two Pacific Power AC Power Sources is straightforward, even between different models and/or power levels and allows for creating of multi phase test setups.

To learn more about the LMX Series or LSX Series, follow these links:

https://pacificpower.com/product-lmx

https://pacificpower.com/product-lsx

Customer Support

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

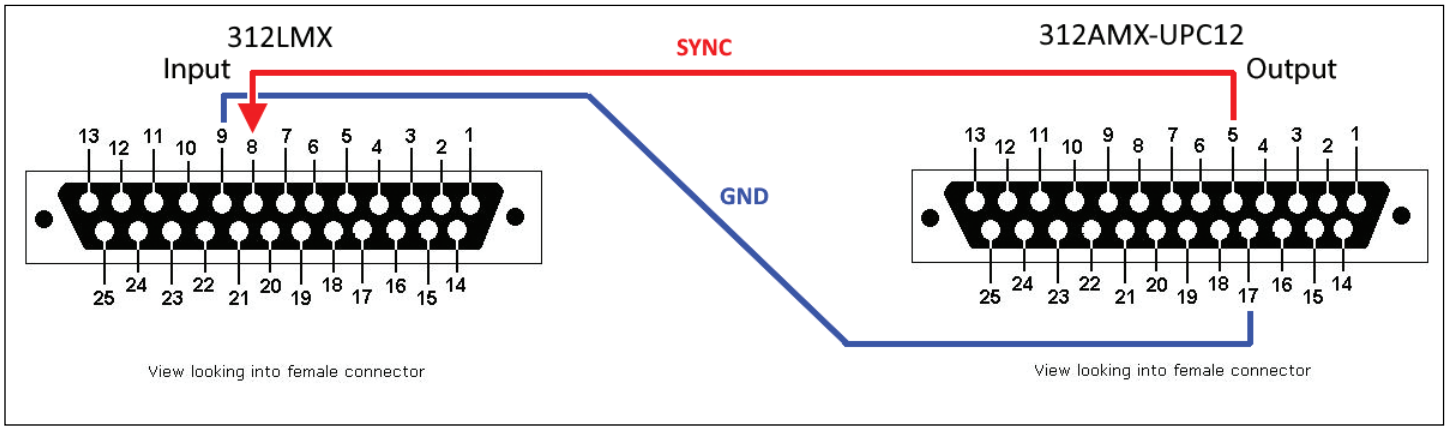

Figure 5: AMX to LMX DB25 to DB25 Aux I/O Cable connections for SYNC mode

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