AMETEK®
PROGRAMMABLE POWER

WHITE PAPER

# Emulation Builds Bridge to Future for Programmable AC Power Sources


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In our white paper, Understanding the Product Lifecycle to Ensure a Smooth End-of-Life Transition we note that at some point, legacy designs fall by the wayside, replaced by something better, smaller or more cost-effective. While this is the natural progression of the product life cycle, EOL can have serious implications for legacy test systems with otherwise useful life remaining in them. Is there a replacement? Is it compatible? Are software changes necessary, and are time or resources available to make them?

That is where emulation comes in. A new product with legacy emulation capability can mimic the old one and require minimal if any, hardware or software revisions to your legacy system. Emulation helps address issues customers experience when using automatic test equipment with software-controlled instruments, whether AC sources, DC supplies, loads or any other instrument used in a rack configuration. You can think of emulation as a discontinuation tool that helps transition from an EOL legacy product to a new one.

## Emulation Preserves Your Investment But Presents Challenges

Although emulation is a valuable tool that helps protect your test-system investment, it presents challenges related to form, fit and function. In general, you can find easy workarounds for form and fit. Power densities are increasing, so a new AC source will take up less rack space than the legacy model. Add a blanking panel to your rack if your legacy unit is 5U or 6U high and your new product is 4U. In addition, your legacy unit may have a GPIB interface. GPIB is seldom offered as a standard on modern sources, but it is generally available as an option. You may also have to change other cables connecting to your new model.

## Software Functionality Presents the Most Significant Challenge

Whereas form and fit issues are generally easy to address, the function aspect presents the most significant challenge—particularly with respect to the software functionality. Your vendor understands both the old and new products and will handle the development of the emulation software. However, your legacy software may take advantage of certain features of the old product in ways even you need to be made aware of, requiring emulation features that your vendor cannot anticipate.

Often, legacy software may have been written decades ago with minimal documentation, and the original programmers have retired or moved on to other jobs. Modifying that program is likely a lengthy and expensive process and requires extensive verification. If you have many identical test systems worldwide and a significant software upgrade, you need skilled teams to go out and deploy the modified program to remote sites.

## Emulation Is Not A Long-Term Solution

Although emulation can minimize the software revisions you need to make, remember that emulation is not the ultimate solution—it is a stop-gap approach. It can be a very effective tool if you are facing immediate resource constraints and you need to act fast to keep a legacy system up and running. But once you have the new source with emulation capability in place, you will benefit greatly from embarking on a long-term project to upgrade your software to allow use of the new source without emulation. An effective upgrade strategy will avoid the possibility of having a source approaching EOL emulating an even older model, and emulation across multiple generations may not be feasible.

There are other drawbacks as well. Keep in mind that emulation involves dealing with hardware limits and software limits. As mentioned, hardware limits related to size and interface cables can usually be easily addressed, but unforeseen hardware issues can arise that limit the effectiveness of emulation. Your power source's manufacturer can usually address software limits, but some may not manifest until you use emulation in a production environment.

For instance, your test program may have relied on limitations in the legacy source for proper operation. Consider a current-limit function as an example. With the legacy source, the current limit might have acted slowly, which was acceptable for your application—allowing, for instance, a motor under test to draw sufficient inrush current at startup. However, the current limit on the new source might operate very fast, preventing a realistic startup test. You can provide this feedback to the manufacturer, which can alter the emulation software to mimic the current-limit function of the legacy source more closely. You may need to go through several closed-loop iterations of feedback and revisions to get the emulation just right.

## Opening Communications Channels

Rather than viewing emulation as a permanent solution to an EOL problem, consider it as an initial opportunity to talk to your vendor about an upgrade path that may begin with emulation as a practical initial step in a long-term plan to make the capital expenditure necessary to upgrade your test systems to modern hardware and software, as painful as that may be. The vendor should work with you to understand exactly what features and limitations are essential to your application.

Note, too, that emulation can only provide a partial drop-in replacement. And with emulation, you risk the possibility that firmware changes during repair by a third party might prevent the emulation from working. Work with your vendor to learn about any limitations and risks you may face, and consider obtaining a demo unit to try out within your software environment.

## Product-Transition Emulation Example

Consider AMETEK Programmable Power's CSW Series programmable AC, DC, and AC+DC sources as a specific example of emulation capability. Many customers use CSW sources in their ATE systems, relying on the specific functionality of the CSW to perform their tests.

A CSW source has a 5.5-kVA rating with output voltage ranges of 0 to 156 VAC or 0 to 312 VAC at frequencies ranging from 40 to 5,000 Hz in single- and three-phase configurations. Other features include a constant-power mode in which available AC output current increases as AC output voltage decreases and standard GPIB and optional Ethernet/LXI interfaces. In addition, the CSW can tolerate a crest factor of up to 3.25:1. The CSW is housed in an 8.71-in.-high (equivalent to 5U) enclosure. As many as six CSW chassis can be paralleled for a total rating up to 33.3 kVA.

The CSW continues to be manufactured and is available for order. But an EOL event is inevitable. In anticipation of that eventuality, AMETEK Programmable Power has introduced its California Instruments Asterion AC Series, which offers power ratings from 500 VA to 36,000 VA. Of particular note is the Model AST6003, a 4U version that delivers 6,000 VA. AC output voltage ranges from 0 to 200 VAC and 0 to 400 VAC in single- or three-phase configurations. Crest factor is 5:1. Compared with the 5U CSW, the AST6003 is smaller, offering a 36% improvement in power density (Figure 1).


***Figure 1.*** *A 4U Asterion AC model (top) can emulate the 5U CSW model (bottom).*

Table 1 compares some topline features of the CSW and AST6003. The key takeaway is that in terms of specifications, the AST6003 is a superset of the CSW in a smaller form factor. Consequently, through software modifications, AMETEK Programmable Power can offer an emulation option that enables the Model AST6003 to emulate a CSW Series source.

| | CSW | AST6003 |
|---|---|---|
| **Output Power** | 5,500 kVA | 6,000 kVA |
| **Output Voltage Range (Low)** | 0 to 156 VAC | 0 to 200 VAC |
| **Output Voltage Range (High)** | 0 to 312 VAC | 0 to 400 VAC |
| **Phase Configuration** | 1-phase, 3-phase | 1-phase, 3-phase |
| **Crest Factor** | 3.25:1 | 5:1 |
| **Rack Height** | 5U | 4U |
| **Constant-Power Mode** | Yes | Yes |

***Table 1.*** *CSW and AST6003 key feature comparison*

In emulation mode, the Model AST6003 will report to the host that it is a CSW when powered on. It will respond to commands to set the CSW's high- or- low-voltage ranges, mirror the current-limit profile of the CSW, and otherwise imitate the CSW. If you choose a Model AST6003 to emulate a CSW with a GPIB interface, you must remember to specify that while ordering. Although standard on the CSW, GPIB is an option on Asterion AC models.

Recognizing that legacy programs are written in various languages and that the programmers who wrote them use different methods, AMETEK Programmable Power has developed its emulation capabilities to support all of them.

To ensure the emulation works, AMETEK Programmable Power creates a design-verification test process that hardware and software specialists review. Any identified issues are fixed, and the test process is repeated iteratively until all issues are resolved. When approved, the design-verification process creates a hardware and software test platform. The platform is thoroughly exercised, leading to the publication of a test report.

## Conclusion

Adapting your test-system software to accommodate a new power-source model may seem manageable, but customers who attempt it find it daunting. Emulation offers an alternative, and it can be an effective strategy in the short term as you embark on a multi-year project to update the software to accommodate a modern source without the emulation.

Emulation is not an end in itself but should be considered part of a strategy of supporting legacy ATE and managing EOL products. Carefully consider hardware and software limits before determining how to proceed—whether to continue on the emulation path or dig into your legacy software to see if it can be modified to support the new source without emulation. And consider obtaining a demo unit to test the limits.

Work remains to extract the most benefits from emulation. AMETEK Programmable Power is identifying other targets for emulation and will be addressing them based on customer feedback. In addition, some customers are currently using the CSW to emulate the older EOL SmartWave product, and work remains to determine the effectiveness of emulation across multiple generations of products.

For more on successfully managing an EOL event for a critical source or supply in your legacy system, see our white paper "Understanding Product Lifecycles to Ensure a Smooth End-of-Life Transition." And for more on the benefits of transitioning to new products, see our white paper "Top Considerations When Choosing Modern AC Sources and DC Power Supplies" and two blog posts: "Purchasing Criteria for Programmable DC Supplies Evolve as Performance and Features Advance" and "Programmable AC Sources Add Features to Expand Purchasing Options."

## Emulation at a Glance

### What It Is:

- A new product that mimics a legacy product
- A stopgap approach to managing a product's EOL status
- An effective short-term strategy at the beginning of a long-term project to update legacy hardware and software

### What it is not:

- A permanent long-term solution
- A 100% guaranteed drop-in replacement for a legacy product