

## Flexible Power for Critical Mission Systems

June 2016

Author: Gerald Hovdestad

Director COTS Engineering, Behlman Electronics

Member of VITA Committee 46.11, 62 & 65

*Whether to be used for testing, measuring, design engineering, manufacturing, commercial or industrial applications, or global military operations, the need for a new power supply paradigm is upon us.*

As system power requirements become more complex, the need for flexible, reliable power conversion is becoming increasingly important. This is especially important in today's COTS environment, where it is very beneficial to make use of available COTS technology for the many inherent cost, risk and performance benefits. One serious obstacle to utilizing a proven technology is power compatibility. While there are numerous power systems and specifications in the vast world of DOD and industrial environments, there is an even larger array of existing, well-developed products that would very readily fulfill new system needs, if only they were compatible with the power available. Most system designers see a wide selection of displays, servers, printers, memory, sensors and other devices, many with proven track records in operating systems. The choices, however, are usually significantly limited by the available power.

When faced with an array of power specifications, such as MIL-STD-1399, MIL-STD-704, MIL-STD-1275, and DO160, plus a multitude of generator specifications and the large number of IEEE and IEC specifications, the compatibility issue becomes a serious problem. This problem becomes exponentially more challenging, considering the fact that there are multiple revisions of most of the above specifications. When a manufacturer claims compatibility with a specification, such as MIL-STD-704, a knowledgeable prospective customer typically questions which version is being cited.

Besides the diversity of specifications, most of the above also require many greatly different types of power.

DC: 12 V, 28 V, 48 V, 270 V are common with other voltages possible.

AC: 50 HZ, 60 HZ, 400 HZ and wide frequency operation are detailed, along with single and multiple phases, wye and delta arrangements, and voltages ranging from 115V to 440V in all the above combinations.

As you might imagine, a system designer has to be very careful when mixing and matching components to ensure compatible operation. One way of doing this is to use flexible power conditioning equipment, such as power supplies and frequency converters, and even a UPS, as required, to permit the use of the desired hi-reliability COTS components. The use of the proper power supply can help significantly in reducing power problems and allow the use of the best, most reliable and most cost-effective design. Input power can be stabilized, removing voltage and frequency fluctuations, as well as momentary transients and dropouts, listed in the above specifications. A clean 115V 60 HZ or a stable 28VDC could be produced without 180VAC transients or 50ms or 200ms dropouts. For the most critical requirements, power supplies can be configured in a redundant N+1 configuration so that even if there is a single failure, the mission will not be affected. The redundancy might be individual plug-in units or redundant components may be contained in a single supply.

As the need for more reliable and flexible power has grown, the availability of power solutions for these needs has also kept pace. COTS supplies have steadily decreased in size with improved reliability and reasonable cost, while reducing the time needed for product and system development. The use of proven COTS power

modules allows manufacturers to offer units in the 2 KW to 4 KW range with MTBF as high as 300,000 hours, both calculated and demonstrated. Power devices such as Behlman's DCR2U Critical Mission Power Supply are now configurable to accept DC inputs (28 V, 48 V or 270 V) or AC inputs (single or three phase, 47-440 HZ or wide frequency), and provide up to 4 KW out of up to four DC voltages, from 3.3 V to 48 V, all in a 2U, 30 lb. package. Where even smaller size is required, 6U or 3U VPXtra power supplies are available that weigh 2 to 4 lbs. and produce up to 1500 W of DC from an AC source. These can be paralleled where higher power is desired.

An example of how a flexible input power source can drastically decrease system development time was recently highlighted when a major prime contractor came to Behlman with a COTS solution to an important development program, but a major power problem. The US Navy was in need of a dipping sonar for a shipboard application, and a full development program had been ongoing for several years with no clear end point. The prime manufacturer noted that he had an existing product that was already qualified and would meet all the specifications without any further work, except that this sonar was designed to work on aircraft, and not compatible with shipboard power. Available power was MIL-STD-1399 115 V single phase or 300 VDC. The existing sonar required three phase 400 HZ power 200 V L-L per MIL-STD-704. To solve the problem, Behlman was able to combine three standard COTS frequency converters producing approximately 5 KW of power, and package both the power supplies and the customer's dipping sonar in a water-cooled enclosure. The Behlman supplies were conduction-cooled and mounted to a water-cooled plate. The dipping sonar required air-cooling, so the plate had a heat exchanger on it which cooled the air, allowing the sonar to work as designed.

The net result of this effort was that the Navy had a working solution to their problem in less than six months, using this COTS solution, compared to the two years of effort that would have been required for a completely new R&D program using a non-COTS approach.

The increasing need for higher levels of performance for virtually all electronic systems is putting new pressures on the power supply industry at every level. Whether the power needed is for a T&M bench in a lab, support of production on a manufacturing floor, or powering the most sophisticated electronics on military ships, aircraft or ground vehicles, two things are certain: The need for critical mission power flexibility has become essential, and the versatility of COTS power supplies is setting new paradigms for rapid, cost-effective solutions.

## REFERENCES Behlman DCR2U Critical Mission Power Supply



[www.behlman.com](http://www.behlman.com)