Copperhead - High Current System

Date: February 2009

The Copperhead High Current System is designed to meet the demanding requirements of both Research and Development and Product Qualification Environments.

This system is capable of delivering a full 15,000 Adc with a 25msec rise time from no current to full current. It is intended to meet current-mode application requirements such as superconducting wire research, and contact current and circuit breaker qualification.

From the input AC distribution to the 810 lbs. (368 Kg.) of copper output bus bars, the Copperhead employs all of the system integration necessary to meet the application requirements. The control wiring implementation has been designed to provide the customer with a summed current readback so that current monitoring is easy.

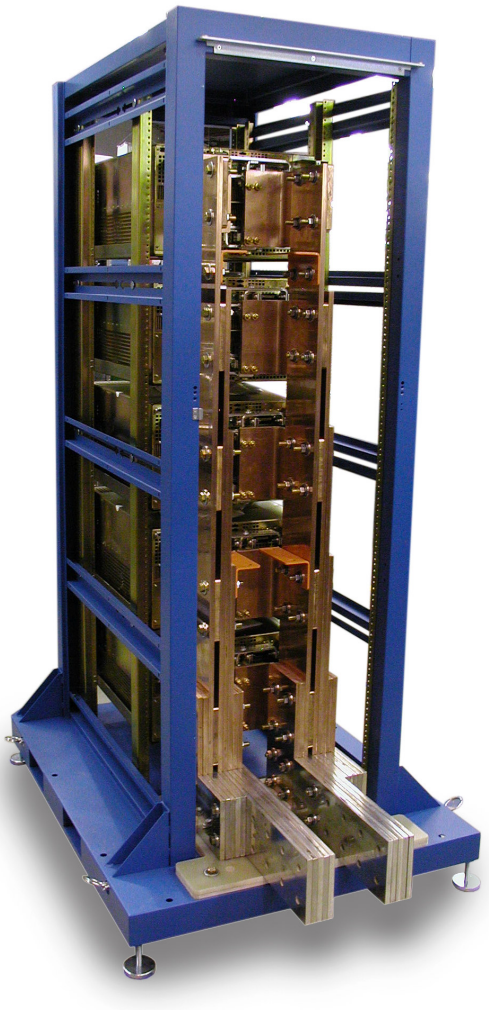
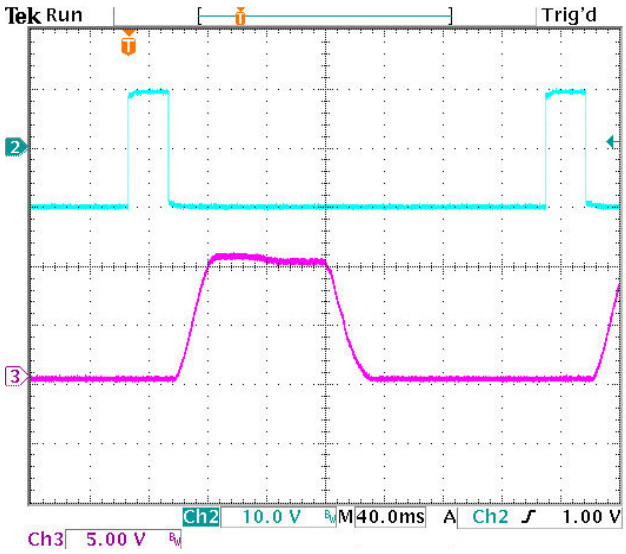


Image shown with covers off and I/O panel removed

The figure below depicts the Copperhead performance:



With the understanding that the bottom trace above represents a full 15,000A of current, the system response time is well controlled and with little overshoot. The top trace depicts an ~ 40msec input control pulse and the bottom trace depicts the output response to this control pulse. Due to the power supply control loops and required stability of the output, the output pulse is delayed ~ 30msec and with a ~25msec rise time. There is also a delay once the falling edge is detected on the control pulse and is approximately the same with approximately the same fall time. Therefore, a 40msec pulse with a 3hz repetition rate is the fastest control signal possible to obtain a full 15,000A output with an output pulse ~120msec in duration and ~70msec at full current.

ENGINEERED SOLUTIONS GROUP

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Specifications	
Voltage	0 to 5 VDC
Current	0 to 15,000 A (Also available in 9,000A and 12,000A versions)
Regulation	Current-Mode Only – This system is not intended to run in Voltage-mode Line: For input voltage variation over the AC input voltage range, with constant rated load. Load: For 0-100% load variation, with constant nominal line voltage. Current: 0.5% of maximum rated output Voltage: 0.1% of maximum rated output
Transient response	A 30% current load step will recover to within ± 2% of compliance voltage within 10 msec.
Stability	± 0.05% of set point over 8 hours after 30 minute warm-up with fixed line, load, and temperature.
Temperature Coefficient	Change in output per °C change in ambient temperature, with constant line and load. 0.03%/ °C of rated output current
Operating Temperature	0 - 50°C, No derating
Cooling	Each power supply has internal fans and rack system has three exhaust fans
Programming	Analog Programming; 0-10V equals 0 to full scale output
Regulatory	TUV NRTL to UL1950, TUV to IEC 950, CE Mark (Power Supplies)
Input Requirements and Physical Parameters	
AC Input Voltage	3-phase Delta or Wye C: 190-253Vac, 47-63Hz (Standard) D: 360-440Vac, 47-63Hz (Optional) E: 432-528Vac, 47-63Hz (Optional)
AC Input Current Maximum Consumption	At 380Vac (Typical at full load) 150A per phase
Power Factor	0.72 minimum
Dimensions	80" high x 36" wide x 45" deep (2040mm x 915mm x 1140mm)
Weight	2100 lbs (955 kg)
Remote Control Interface	
On/Off control	Contact Closure, TTL/CMOS or Isolated AC/DC (6-120V)
Current Control	0-10Vdc controls 0 to 100% of rated current
Current Control Accuracy	1% of full rated current
Current Monitor	0-10Vdc proportional to 0 to 100% of rated current
Current Monitor Accuracy	2% of full rated current, Output Impedance = ~200Ω
Voltage Monitor	0-10Vdc proportional to 0 to 100% of rated voltage
Voltage Monitor Accuracy	2% of full rated voltage
Connection	D-Sub 25 female connector