Board and System test can be carried out using PXI technology that maximizes the universal nature of Virtual Instrumentation while protecting investment in capital equipment, eliminating the dedicated test equipment that is made obsolete by new product design. With an ever-increasing base of PXI equipment available to the test engineer, selection of form factor should not be made, predicated on a specific chassis, such as a 3-U or 6-U chassis. The test engineer must first evaluate which measurements must be made on his or her system, perform a thorough search of available equipment to perform these measurements or excitation of the unit under test, and from that analysis select the appropriate hardware.

In my specific application, the system under test required AC and DC voltage measurements and also highly accurate resistance measurements needing a 4-wire Kelvin configuration. Measuring the voltage drop across precision low resistance current shunts made all current measurements. Voltage and amplitude needed to be measured simultaneously. In addition to the digital multimeter (DMM) requirements, timing between pulses (both TTL and higher voltage), frequency of signals, and complex multi-channel event sequencing measurements were made. To power the system under test, three isolated programmable DC voltages up to 33 volts, with two supplies up to 3 amperes, and the third supply up to 50 amperes were needed. Other requirements included a group of variable resistors that had a 1% resistance tolerance from a range of 7 ohms to several hundred thousand ohms and the ability to provide both TTL level pulse sequence and variable DC level pulse streams, based on the specific test being accomplished. The connectivity to the equipment was via 27 complex high-density circular military connectors, which were fixed by the system requirements. All of these measurements and stimulations were sequenced under program control, and there was less than 6 months to develop complex testing algorithms and the respective programs that executed those algorithms.

Switching requirements for the equipment under test did not match appropriately with switch matrix or switch multiplexer architecture. The vast number of connections, along with the number of unique connections required using general-purpose relays, both SPST and SPDT with current ratings of under an ampere, and over 5 amperes. A search of available switching boards indicated that the lease expensive and most dense approach was to go with 6-U technology. Interconnection was accomplished using a custom printed circuit board, with mating connectors to match the COTS cables. The power supply requirements were better met in 6-U than in 3-U. Having a complete suite of peripherals (Floppy Disk, USB, CD ROM, Ethernet) in the main chassis was mandatory (the system was both developmental and production). All the instrumentation fit into a 3U chassis. Therefore the final architecture was a mix of 6U and 3U devices along with a 3KW rated GPIB controlled switching supply.

The overall system will save millions of dollars in testing, and perform more repeatable tests. The hardware investment is preserved for future systems.