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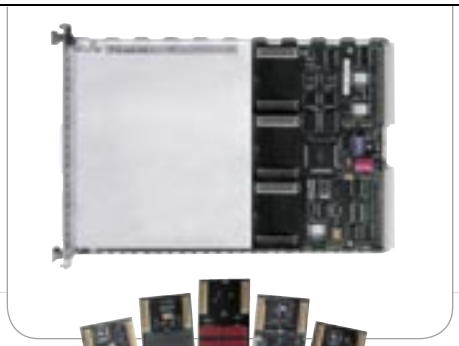
VM9000



Features

In order to configure your modular VXI card, follow these simple steps:

Step 1: Start with the VM9000 base unit. This includes the interface and appropriate housing.

Step 2: Select up to three VMIP™ instruments to configure your own single-slot C-size module.

Step 3: Order your multi-function instrument and receive it fully configured with modules installed at the factory.

Single-slot Base Unit

Overview

The award winning VXI Modular Instrumentation Platform (VMIP™) provides customers with a level of modularity for instruments that is unmatched in the industry. The VMIP™ makes a single VXIbus card slot three times more powerful than single device solutions. Each VMIP™ instrument can be mixed and matched with other VMIP™ devices for added flexibility.

The VMIP™ is designed for high performance instrumentation, i.e., 6.5 digit DMMs, 1 ns counter/timers, 50 MSa/s AWGs. As such, the VMIP™ design supports all aspects of the VXI specification including access to all seven power supply lines, TTLbus triggers, and interrupts. Each VMIP™ product is an independent VXIbus device with its own unique logical address (ULA) and VXI*plug&play* drivers.

The VMIP™ is an open-platform, allowing anyone to design a product that can be mixed and matched with other VMIP™ instruments found in this catalog or from other suppliers. To aid in development, VXI Technology offers a complete prototyping module (VM7000) that allows custom instruments/circuitry to be integrated into the VMIP™ family. The VM7000 manual (available online at www.vxitech.com) provides concise documentation that includes timing, mechanical, and control information, along with example designs for common circuitry.

More than 20 unique instrument modules are available on the platform, bringing robust performance and design flexibility to ATE systems. Today, VMIP™ products are the choice of many system developers with over 1000 VM9000 base units shipped per year. For example, VMIP™ products have enabled designers of the following systems to leverage off the most popular modular mezzanine platform on the market:

- **Boeing 777 NxGen**
- **Lockheed LMSTAR Avionics**
- **Raytheon STEP Missile Testers**
- **International Trucking ECM EITS**
- **Dell Computer ESS Testing**
- **Schlumberger Drill Head PCB**
- **Delphi R&D**

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Single-slot Base Unit

The Origin of VXI

The original need for VXI was to establish an instrument-on-a-card platform that provided significant improvements over traditional rack and stack instrumentation, particularly in the areas of:

- **Cost**
- **Footprint**
- **Transportability**
- **Communication Speeds**
- **Modularity and Connectivity**
- **Interoperability**
- **Reliability**
- **Maintainability**

Shortly after the standard was adopted in 1987, instrument manufacturers quickly converted designs that existed on other platforms and adapted them to the VXI form factor. Manufacturers who converted GPIB instruments introduced them as message-based VXI products, focusing on ease of use for existing GPIB customers. Manufacturers who converted VME products typically introduced them as register-based VXI devices, focusing on customers who needed faster communication speeds. The reason for converting existing products was to obtain quick market acceptance for the VXIbus standard.

The high-cost and uninspiring performance of these first VXI products left the commercial ATE market less than enthused about the platform. In subsequent years, the VXI community combatted these perceptions with innovative solutions to unique requirements, enhanced hardware and software specifications, and has exhibited the ability to quickly adapt to the latest technology. Today, almost 20 years after the first VXIbus products were introduced, the platform is thriving in mil/aero and commercial applications and has proven to be an important foundation in most ATE and data acquisition applications.

Modular, Multifunction VXI Instruments

The VXIbus specification anticipated the need to incorporate more than one instrument function in a physical slot and, unlike first generation VXI products, the VMIP™ family takes advantage of this. The VXI standard provides specific details as to how modules with multiple instruments and logical addresses should be designed. Each instrument must have the required VXI registers for the specific type of instrument (message-based, register-based, memory device, etc.), but each instrument will respond to the single MODID line routed to that module.

This allows the Slot 0 controller to recognize that there is more than one instrument in the slot. In addition, when multiple instruments are in a single module, their logical addresses must be sequential and may share decoder logic. With regard to the Offset Register which controls the logical address of the instruments which support dynamic configuration, the VXIbus specification, revision 1.4 states:

F.2.3 Offset Register

Multiple device modules may share address-decoding hardware. This can result in a significant hardware reduction. In such a case, the devices will share one or more Logical Address bits. A set of such devices is defined to be "address-blocked". These devices will be configured to a block of contiguous Logical Addresses. The Offset Register is used to indicate the number of devices sharing the addressing hardware.

Observation F.3.5

An address block group of devices will modify only the shared bits of their Logical Addresses. The hard coded bits will cause the devices to occupy the lower available Logical Address within the block defined by the shared bits. As a consequence, the first device will have Logical Address B*2H, where B is the value assigned to the shared Logical Address bits and H is the number of hard-coded Logical Address bits. The last device will have Logical Address B*2H+D-1, where D is the number of address blocked devices in the group. The Logical Address B*2H+D through (B+1)*2H-1 will be used and available for assignment to other devices.

Because the VXIbus standard defines a consistent way to share decoder logic, multi-instrument modules can enjoy reduced logic content and allow the more densely packaged logic boards to make multiple and modular instrument VXI modules a viable alternative to their full-sized counterparts.

VM9000

VXI Technology's VMIP™ product family utilizes shared decoder logic, and allows three independent VXI devices, that support all aspects of the VXIbus to be housed in a single C-size card.

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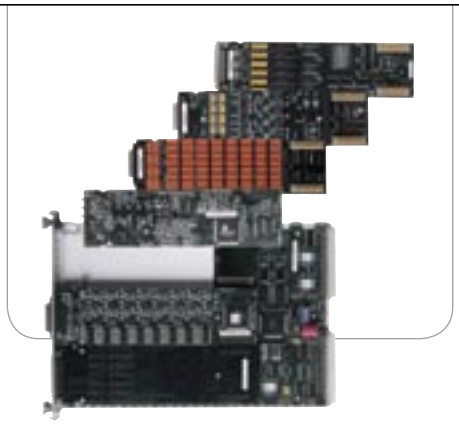

Single-slot Base Unit

The VXIbus standard was designed to be a very forward-looking standard, allowing for the downsizing of test stations if technology allowed, as it does today. For example, per Section A.2.3.3 of the standard:

A.2.3.3 VXIbus System Architecture

The VXIbus device protocols define how modules are granted non-conflicting portions of the VMEbus address space. A device is typically a single module, but that is not required.

Several devices may exist on a single module, and a single device may consist of multiple modules. Two-hundred fifty-six devices may exist in one VXIbus system, and are referred to by logical device addresses ranging from 0 to 255.

Reducing Cost

Because instrument manufacturers looked to recoup their significant investments in the development of such a powerful open instrument standard, the first products released for the VXIbus came with an inflated price. Even though the hardware costs were excessive, users still purchased VXI products because of the significant intangible cost savings vs. Traditional rack and stack boxes. These savings could be achieved because faster communication speeds meant that the daily volume of product through test could be increased, test sets could be supported for longer periods of time, system development times were reduced, systems took up less space, and instruments could be reused. The savings, however, are difficult to quantify and prospective customers may only compare hardware costs from one platform to the next.

The VMIP™ series not only enhances the intangible savings, but also reduces the actual hardware costs, making VXI an attractive option for many ATE system requirements. The success of the VMIP™ has driven other vendors to develop mezzanine-style platforms which continues to fuel the growth of the industry and further entrenches the VXIbus as the leading modular standard on the market for high-performance instrumentation.

Every system that utilizes a modular instrument architecture incurs a cost that goes beyond that of the particular instruments installed in the mainframe. For example, a mainframe with twelve usable VXIbus slots has the following costs:

VXIbus mainframe (model CT-400)	$4850
Slot 0 w/ IEEE-1394 interface	$2395

The total 'entry-cost' is $7245, which equates to approximately $600 per slot. If a single-slot device only provides one function (such as a DMM), the per-slot cost is absorbed by that particular function. If, however, a single-slot device can provide three functions as in the VMIP™ family, the premium is considerably reduced ($200 per function in this example). Since more functionality can fit in a smaller footprint, overall system costs can further be reduced by making use of a smaller, lower cost mainframe such as the CT-100C 6-slot ($2900).

Reducing Size

The perception of only having 12 instruments in a 13-slot VXI card cage was generated by first generation VXI products, because each VXI instrument was a re-hosting of an instrument from an existing platform. The VXIbus specification was developed to allow instruments and instrument control to be slot-independent, providing room for up to 255 devices (ULA 255 reserved for dynamic addressing) in a single VXI mainframe, or even a single VXI card. Portable testers such as those used for flight-line testing are now being developed utilizing modular multi-function VXIbus instruments because of the impressive combination of density and performance that can be achieved.

The proliferation of VMIP™ series products has set a trend in the VXI industry for mezzanine-style cards that is bringing the cost and size of ATE test solutions down at a very rapid rate. For high-density applications, VXI has proven to be a cost competitive solution when compared to CPCI (PXI), GPIB, and VME for both intangible and actual hardware costs. The cost and size advantage of VMIP™ instruments, coupled with the benefits of VXI, such as software standards, VXI*plug&play* drivers, and independent control of each modular instrument, provides the test and data acquisition marketplace with a very powerful tool to help reduce the size and cost of a system design.

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