V165
Digital Signal Processor

The V165 is a single-width, C-size, register-based, VXIbus module that provides realtime processing for data collected from other modules within the VXI chassis.

ATI-based DSP with 40 MFLOP processing power

TYPICAL APPLICATIONS

Wind tunnel data acquisition

Aerospace tests

Automotive tests

Acoustic tests

General-purpose signal analysis

High-speed control loops

FEATURES

- Performs FIR & IIR filtering
- Computes FFTs
- Performs signal averaging
- Executes limit checking
- Converts to engineering units
- Executes at 40 MFLOPS
- Performs 32/40-bit floating point operations
- Includes 1 to 16 Mbyte DRAM
- Has DMA capability
- Options for Digi-bus™ input and output data paths

GENERAL DESCRIPTION

The V165 is a single-width, C-size, register-based, VXIbus module that provides realtime processing for data collected from other modules within the VXI chassis. The processing power for this module is provided by the Texas Instruments TMS320C30 ('C30) Digital Signal Processor (DSP). This DSP provides 40 MFLOP operation and its 32/40-bit floating-point arithmetic capabilities simplify the development of applications, eliminating the effects of scaling, normalization, and overflow. Implemented with low power CMOS, the 'C30 also provides 16- and 24-bit integer operations, IEEE floating-point conversion capability, a bit reversal addressing mode, eight 40-bit accumulators, two 32-bit timers, and a 64 x 32-bit instruction cache. It can implement FIR filters at 50 ns per tap and compute a 1024-point complex FFT in 3.04 ms.

The 'C30 has two blocks of 1K x 32 single-cycle, dual-access, on-chip RAM. A range of 1 to 16 Mbytes of dual-ported RAM is also provided on the module. All dual-access memory is addressable from the VXIbus as well as by the DSP. This allows application programs and data to be downloaded from the host computer and to dynamically change as conditions require. Instructions and data can arbitrarily reside in either the on-chip or off-chip memory.

Data to be manipulated by the DSP may be obtained from various sources and stored in various destinations. The data may be read or written by the V165 using Direct Memory Access (DMA). The V165 can become a master on the VXIbus and transfer data to and from other VXIbus modules within the chassis. Data may also be sent into and out of the V165 using the VXI Local Bus. For the V165-Bxy 1 option, this module supports a KineticSystems-developed Local Bus interface and protocol called Digi-bus™. Digi-bus provides the mechanism to transfer digital data between adjacent modules at high speed without degrading the performance of the VXI system bus or introducing latency from "slow responding" VXIbus modules within the chassis.

Digi-bus data enters the V165 from the module on its right (the next higher numbered slot) and is passed to a selection mechanism on the V165 Digi-bus mezzanine board. The V165 can be programmed to accept all the incoming data or only selected subsets. The selected data is then available to the DSP through a 32 kword buffer. Circuitry on the mezzanine board allows the DSP to send data to the module on its left (the next lower numbered slot) by writing the word to a register on the mezzanine board.

The V165 can synchronize with other modules in the chassis by the use of its VXIbus triggers and interrupts. The V165 can be programmed to generate any number of simultaneous VXI triggers using the Synchronous Trigger protocol and to generate a VXI interrupt on any one of the eight VXI interrupt sources. The V165 can also be programmed to interrupt the DSP on the occurrence of a selected VXI trigger or when a VXI request is made with a write to a Generate DSP Interrupt register in A32 space on the V165. In addition, the 'C30 DSP provides two internal, 32-bit timers which can be programmed for periodic interrupts.

A 32-bit digital input register, which is directly readable by the DSP, can be written from the front-panel connector. Reduced data and results from the DSP's operation can be sent either to other VXI modules via DMA or to other Digi-bus equipped KineticSystems VXI modules downstream from the V165. Also available at the front connector are two DSP serial ports capable of 7.69 Mbit/s operation. These ports can be used to transmit or receive serial data between this module and an external source, such as another V165 DSP module, for multiprocessor communication.

The V165 supports both static and dynamic configuration. Access to the DSP and its associated memory is through memory locations selected by the Offset Register within the VXIbus Configuration Register set. Access to these registers and memory is accomplished within A32/A16 address space using D32/D16 transfers.

V165 Block Diagram
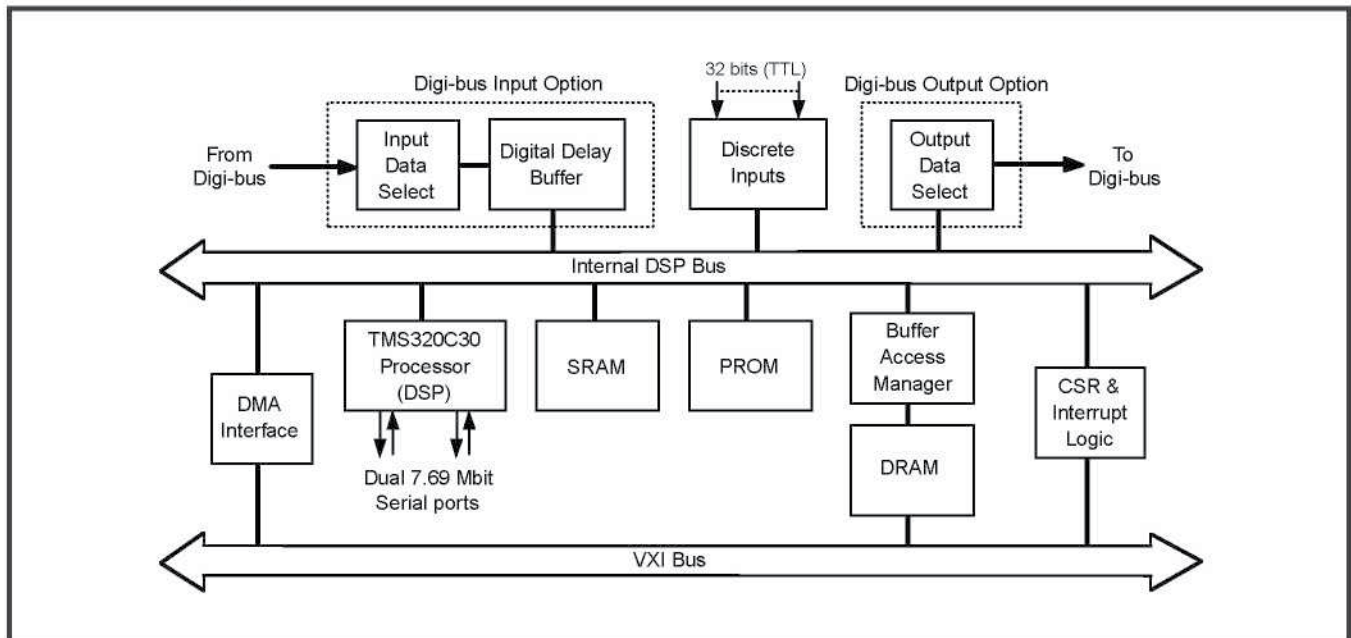
CROSS-DEVELOPEMENT SOFTWARE AND UTILITIES

The Texas Instruments TMS320 Floating-Point DSP Optimizing C -compiler, assembler, linker, emulator, and simulator are available to support application programming. This software is available for the PC/MS-DOS, VAX/VMS, and SUN-3/UNIX platforms. We also support Momentum Data Systems' QEDesign 1000 Digital Filter Design package. This package allows the user to design FIR and IIR digital filters for the V165. This software is available for the PC under Windows as well as for SUN workstations.

KineticSystems has developed a support library for the V165 DSP which offers a high-level interface to the module's hardware features. The library functions include DMA read and write, Digi-bus acceptor and source, VXI trigger interrupt service, VXI trigger and interrupt source, and timer interrupt service. Other V165 hardware features, such as the front-panel TTL inputs and the 8-bit LED status register, also have interface functions in the support library. The library distribution also includes a library header file with prototypes for all the functions, working code examples for each hardware group, and utilities which download the user's 'C30 application code to the V165 and execute it.

When used in conjunction with the Texas Instruments TMS320 Floating-Point DSP Optimizing C-Compiler package (Model AB11-DPA1), the support library can simplify the development of DSP applications for the V165. Programmers can establish the data path into and out of the V165 with DMA or Digi-bus function calls, leaving them more time to implement signal processing algorithms. While C should be the language of choice, the compiler package includes a 'C30 assembler (and other programmer's tools such as a linker and archiver) when the application must execute as quickly as possible. Both the compiler and the library support Interrupt Service Routines (ISRs) are written in C. The compiler generates entry and exit code that preserves the machine environment. The library simplifies the use of VXI and timer interrupts by setting up the interrupt vector and the interrupt masks, leaving the programmer to concentrate on the application. The distribution disk contains source and object code for VXI trigger and DSP timer ISR examples to facilitate development.

Please contact KineticSystems or your local representative for additional information about these software products.

Item	Specification
DSP	
Cycle time	50 ns
Operations per second	40 MFLOPS
Instructions per second	20 MIPS
Instruction cache	64x32
On-chip RAM	Two blocks of 1Kx 32
Timers	Two, 32 bits each
DSP Support Circuitry	
Dual-ported dynamic RAM	1 to 16 Mbyte, 80 ns pipelined-access
Static RAM	8 kbyte to 128 kbyte, 0 wait state; optional 128 kbyte, 1 wait state
ROM	32 kbyte to 128 kbyte, 1 wait state
DMA	Supports 8, 16, and 32-bit data transfers
Digi-bus input port	32 kbyte x 16-bit sample buffer
Digi-bus output port	16-bit samples configurable via DSP
Discrete Digital Inputs	
Number of inputs	32
Input signal level	TTL
Input signal logic level	High true (0 V read by DSP as a logic "0")
Input signal termination	Pulled up to +5 V through 4.7 kΩ resistors
Serial Ports	
Number of ports	2
Port direction	Bi-directional
Bits per serial word	8, 16, 24, or 32
Maximum serial rate	7.69 Mbit/s
Connector Type	50P High Density
Power Requirements	
+5V	6.8 A
-5.2 V	125 mA
-2V	125 mA
Environmental and Mechanical	
Temperature range	
Operational	0°C to +50°C
Storage	-25°C to +75°C
Relative humidity	0 to 85%, non-condensing to +40°C
Cooling requirements	10 CFM
Dimensions	340 mm x 233.35 mm x 30.48 mm (C-size VXIbus)
Front-panel potential	Chassis ground

Related Products

Model 5819-Bxyz	Cable—50S High Density to Unterminated
Model 5819-Dxyz	Cable—50S High Density to 50S Amphenol Ribbon
Model 5819-Fxyz	Cable—50S High Density to 50P High Density
Model 5819-Gxyz	Cable—50S High Density to 50S High Density
Model AB11 -DPA1	V165 TI Cross-development Package for MS-DOS
Model AB12-DPA1	V165 Full Development Package for MS-DOS (Cross-development routines plus KineticSystems Software Support Library)

Please contact the factory for information on software packages for other operating systems.

Model V110	4 to 128 Megabyte Memory
Model V207	16-bit, 500,000 Sample/second ADC Subsystem
Model V208	16-bit, 100,000 Sample/second ADC Subsystem
Model V285	8 or 16-channel, 16-bit, 500 kHz DAC/Waveform Generator
Model V387	128-channel Discrete Input/Output
Model V765	Rack-mount Termination Panel

KineticSystems Company, LLC

900 N. State St.
Lockport, IL 60441-2200

Toll-Free (US and Canada):
phone 1-800-DATA NOW
            1-800-328-2669

Direct:
phone +1-815-838-0005
fax +1-815-838-4424

Email:
mkt-info@kscorp.com

To find your local sales representative or distributor or to learn more about KineticSystems' products visit:

www.kscorp.com

ORDERING INFORMATION

MODEL	DESCRIPTION
V165-wxyz	Digital Signal Processor

w: Option cards
    A = no options installed
    B = Digi-bus™ Local Bus option
x: DRAM Size
    A = 1 Mbyte DRAM
    B = 4 Mbyte DRAM
    C = 8 Mbyte DRAM
    D = 16 Mbyte DRAM
y: SRAM Size
    A = 8 kbyte SRAM
    B = 32 kbyte SRAM
    C = 128 kbyte SRAM
    D = 256 kbyte SRAM	

V165-0001	Digi-bus Factory Upgrade