HP SCMVX008
TI based VXI DSP Module
Distributed Product

Product Overview

**Concentrated
computing power with
high performance I/O**

When your data acquisition and
signal processing tasks demand
concentrated computing power,
the HP SCMVX008 is the answer.

Use the HP SCMVX008 when
your acquisition or processing
task is more than your system
controller can handle. Add
TIM-40* type DSP modules to
the HP SCMVX008 to handle
even bigger jobs in the future.

- **Two 60 MHz
  TI TMS320C40 DSPs**
- **Six TIM-40 mezzanine
  card slots**
- **Eight C40 comm ports
  on front panel**
- **Local bus support**
- **VXI shared memory**
- **Two application specific
  connectors**
- **JTAG connection**
- **Standard C40 software
  development**
- **Single-slot, C-size,
  VXI module**

* The Texas Instrument Module
  (TIM-40) for the C40 is a widely
  accepted mezzanine card standard
  generated by Texas Instruments.

Processing power

The HP SCMVX008 brings one of the most popular digital signal processors in the world to VXI. This C-size single-slot VXI module contains two of Texas Instrument's high performance 60 MHz TMS320C40 digital signal processors. These are 32-bit resolution, general purpose, floating point DSP chips, ideal for application in communications, signal analysis, process control, data acquisition, and test. On this board each C40 comes standard with a total of 1 MB of 0 wait state SRAM memory.

Expanded processing power

Increase the computing power in your HP SCMVX008 by using its six expansion slots to add processors. Each slot holds a TIM-40 type mezzanine card. Different cards have different combinations of DSP, memory, and I/O capabilities. By mixing and matching TIM-40 modules you can build a processing system suited to your application.

The Options and Accessories section at the end of this datasheet has a complete explanation of the options available to you for expanding the computing power of the HP SCMVX008.

DSP-to-DSP communication

The TMS320C40 DSP is noted for the DSP-to-DSP communication flexibility provided by its six high-speed communication ports. The layout of the HP SCMVX008 uses that flexibility to move data efficiently among multiple DSPs. Each C40 and TIM-40 node in the module is connected to its five nearest neighbors and to one of the eight buffered C40 comm port connectors on the module front panel, see Figure 1.

Figure 1:
HP SCMVX008
C40 comm port
connections
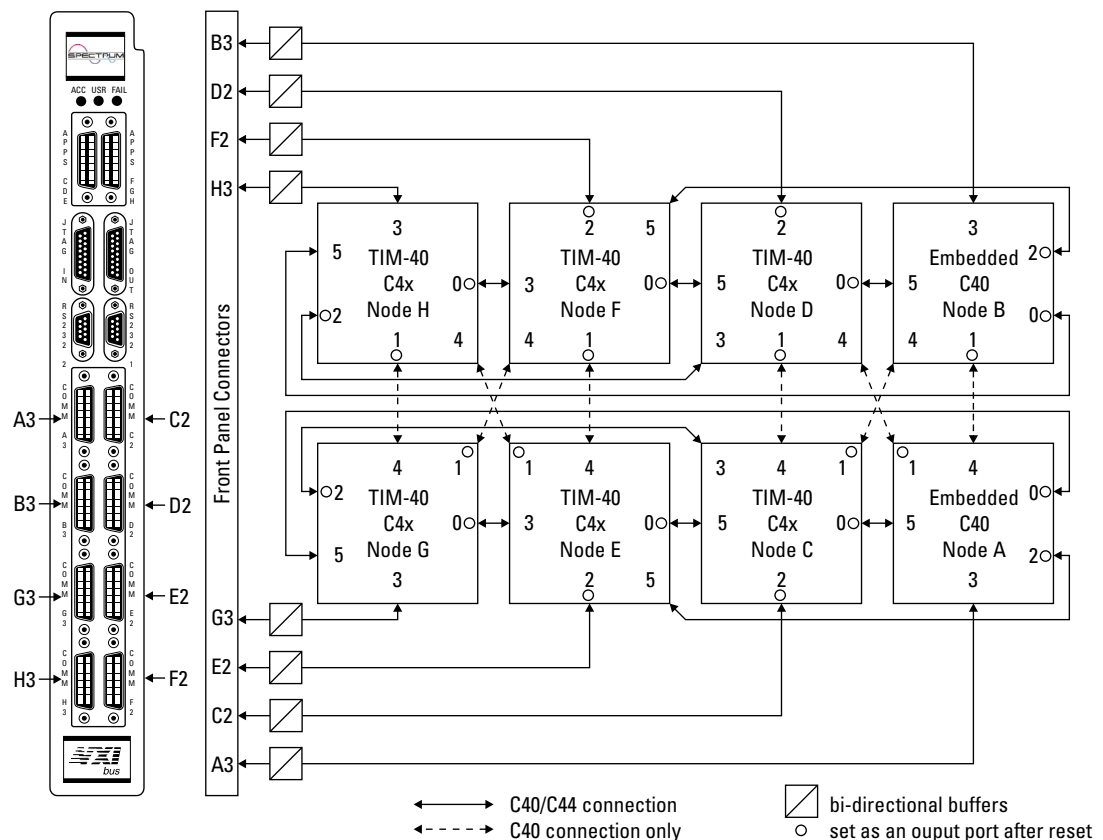
High performance I/O

Processing power is wasted without fast, flexible data I/O. The HP SCMVX008 module has a selection of data ports to assure fast input of raw data and efficient output of processed data.

Use the VXI Local Bus port for fastest data transfer to and from other VXI modules, see Figure 2. HP's implementation of this module-to-module bus enables data transfer rates as high as 100 MB/s. The HP SCMVX008 RAM achieves input rates of 60 MB/s.
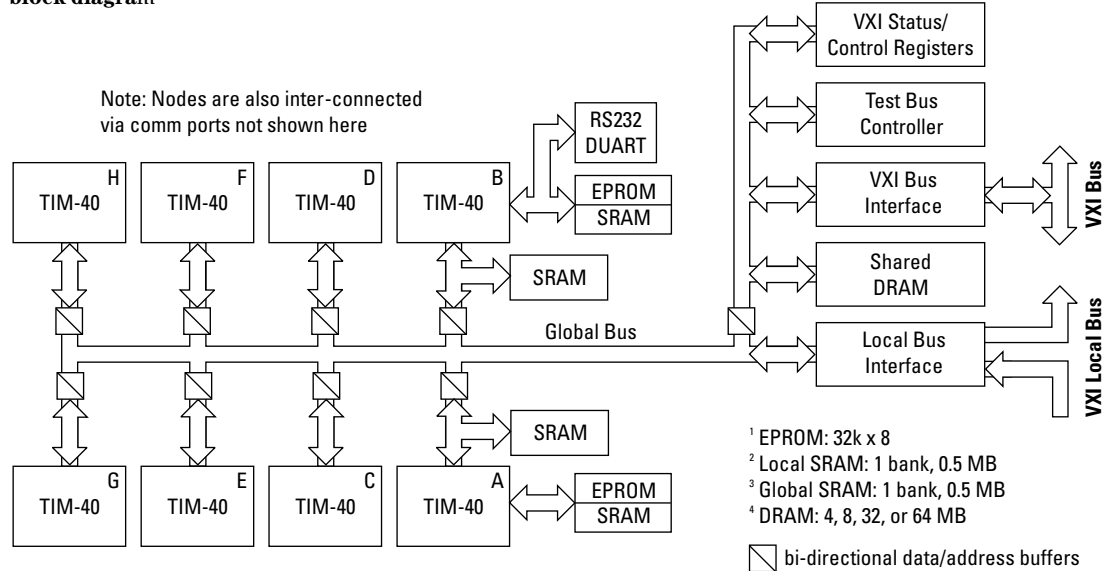
Increase data throughput rate by broadcasting Local Bus data to multiple DSP nodes at once. Every C40 and TIM-40 node in the HP SCMVX008 is connected to the VXI Local Bus port via its global bus connection. You can broadcast to all nodes at once or to selected node subsets only.

Use the VXIbus port to transfer processed data to and from the host and other VXI modules. This is a particularly efficient data path when used in conjunction with the VXI shared RAM capability of the HP SCMVX008.

You can also use this port to download programs to the C40s and to communicate with the host and other VXI modules.

Share data directly with external C40 comm port compatible resources via the eight C40 comm ports on the HP SCMVX008 front panel, see Figure 1. Use these ports to expedite direct, high speed, DSP-to-DSP I/O when your application demands multiple HP SCMVX008's. Or, connect directly to non-VXI resources. These connectors also provide direct links to non-VXI resources.

Figure 2:
HP SCMXV008
block diagram

Note: Nodes are also inter-connected via comm ports not shown here

¹ EPROM: 32k x 8
² Local SRAM: 1 bank, 0.5 MB
³ Global SRAM: 1 bank, 0.5 MB
⁴ DRAM: 4, 8, 32, or 64 MB

bi-directional data/address buffers

Special I/O

The HP SCMVX008 has special purpose I/O. Two application specific connectors on the front panel provide direct access to the TIM-40 nodes. Each node has eight pins that can be used by mezzanine cards designed to use them as inputs or outputs, to pass analog signals or digital data (see four channel tuner with DAC (Option 040) description in Options and Accessories Section).

The HP SCMVX008 also supports RS232 communication to one of the embedded C40's.

VXI shared memory

VXI shared memory facilitates data transfer to the host or other VXI modules. Order as much as your processing needs demand. Select as little as 4 MB, or as much as 64 MB.

Software

Develop software for the HP SCMVX008 using standard C40 software tools.

TI offers a proven, mature set of development tools for their TMS320 DSP family. This first-class combination of software and support is utilized by a broad range of third parties. TI's C4X Assembler/Linker and ANSI C compiler (TI TMS320C4X code generation tools, release 4.70 and higher) are available for PCs and HP-UX workstations, enabling users to develop DSP applications in standard ANSI C. The compiler makes use of chip features such as parallel instructions, optimized multi-pass data addressing, and the repeat block instruction to ensure the code produced is as efficient as possible. TI's assembly language tools support coding in mixed assembler and C for greater control over code efficiency.

Download prototype code via standard JTAG connectors. Or, if your development environment is a VXI embedded PC or work-station, download prototype code over the VXI backplane via the Test Bus Controller. The HP SCMVX008 supports full JTAG functionality including single step execution.

Host DSP communication is supported with a complete VXI I/O library (part of the SCM04008 I/O Library and JTAG kit) that runs on either SICL or VISA. The library is HP-UX, Windows NT®, and WIN95 compatible.

Options and accessories

The HP SCMVX008 has several options and accessories to enhance its functionality.

TMS320C40 TIM-40 card (Option 011).

Use this option to increase the number of C40s in your HP SCMVX008 module. Each Option 011 TIM-40 card adds a single, 60 MHz TMS320C40 DSP with 1.5 MBytes of 0 ws SRAM.

Option 011 comes standard with a global bus connection so the processor can access the VXI Local bus, VXIbus, VXI shared RAM and other DSPs. All six C40 comm ports are brought off the card to facilitate direct DSP-to-DSP communication.
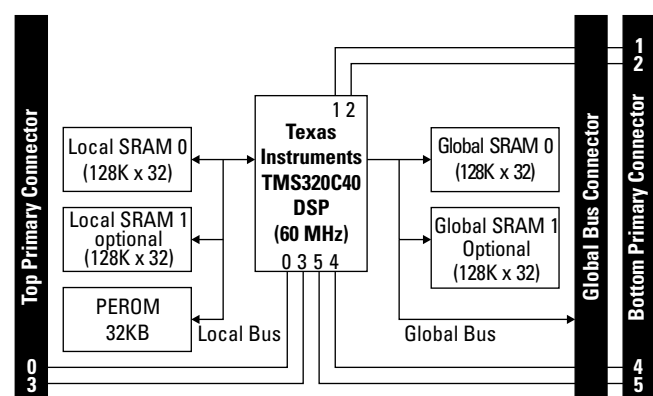
This card includes a 32KB PEROM that acts as an IDROM to comply with the Texas Instrument TIM-40 specification and as a boot ROM to assist downloading software from a host. The PEROM is user programmable.

You can add six Option 011 C40's to a single HP SCMVX008.

Dual TMS320C44 TIM-40 card (Option 012).

Use this card to increment the DSPs in your HP SCMVX008 by two using only one TIM-40 slot. Each option 012 holds two, 60 MHz TMS320C44 DSPs. The C44 has the same functionality as the C40 but is enough smaller that two can fit on one TIM-40 card. Each C44 has 1 MB of 0 ws SRAM divided equally between their two busses.

Figure 3: Option 011 block diagram

Figure 4: Option 012 block diagram
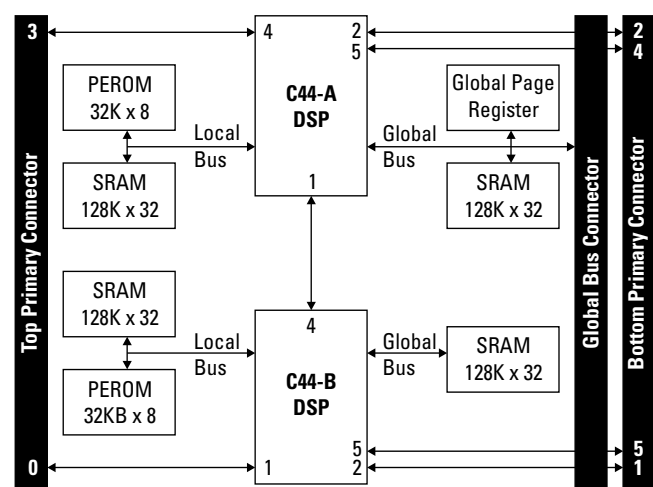
Option 012 comes standard with one processor connected to the global bus connector so the card can access the Local bus, VXIbus, VXI shared RAM and other DSPs. Six of the eight available C44 comm ports are brought off the card to facilitate direct DSP to DSP communication. The remaining two connect the C44's (see Figure 4).

This card includes a 32KB PEROM that acts as an IDROM to comply with the Texas Instrument TIM-40 specification and as a boot ROM to assist downloading software from a host. The PEROM is user programmable.

Four-channel tuner with DACs
(Option 040).

This card provides four independent channels of digital quadrature mixing with digital LOs followed by decimation filtering for use in digital radio applications.

Each channel is independently tunable so the card can select four specific signals for demodulation, once a segment of spectrum is downconverted and digitized by other VXI modules. Tuning resolution for each channel is <1 Hz.

Programmable bandwidth filtering in Option 040 enhances demodulation by maximizing signal-to-noise ratio. Filter bandwidths can be programmed between 176 kHz and 86 Hz on data sampled at 20.48 MSa/s.

Decimation, also a standard feature, assures the lowest possible data rate without sacrificing signal information. The decimation factor is programmable from 64 to 131,072 in steps of four.

Because of the digital quadrature mixing, all four channels supply digital I/Q data that is perfect for processing digital modulation formats. Demodulation can then be performed by a C40 (see Figure 6).

Once a C40 has demodulated the signals, return them to the four channel DAC on the Option 040 module. The DAC outputs are routed through the application-specific connectors on the HP SCMVX008 front panel. Connect the outputs to speakers and listen to the demodulated signals. Or keep the signals in digital form and send them to the host for further processing or storage.

You can add six Option 040 four channel tuners and DACs to a single HP SCMVX008.

Figure 5:
Option 040
block diagram
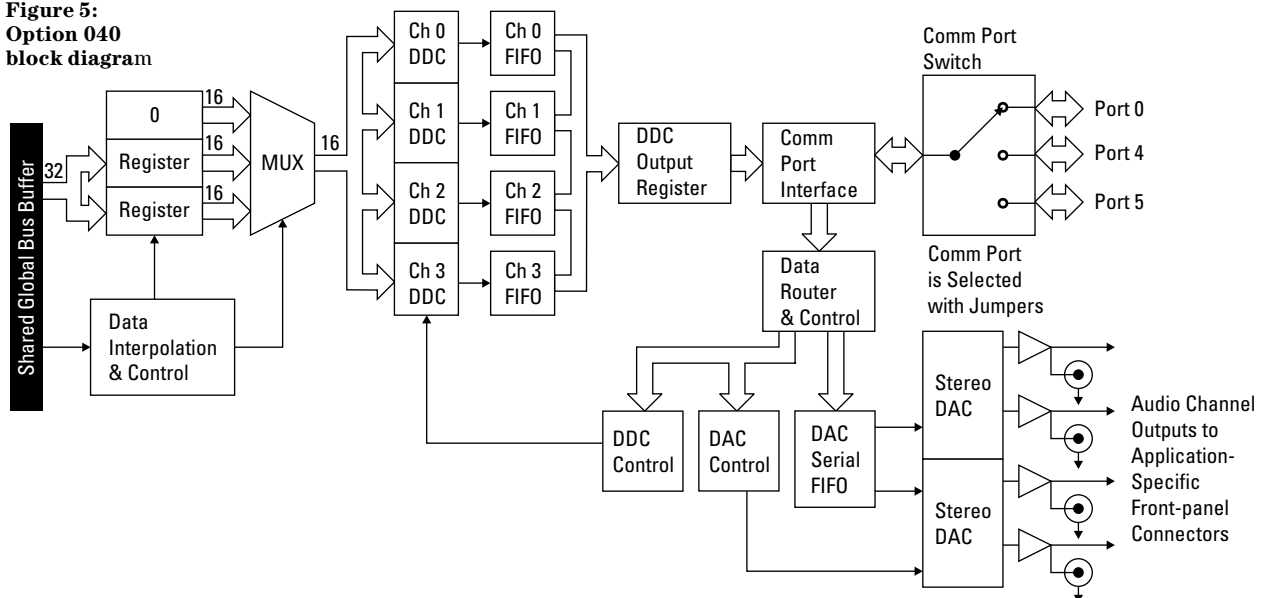
Demodulation software
(Option 140)

Use this software with the Option 040 four channel tuner and DACs TIM-40 card. Option 140 provides programmatic control of the LOs, filters, and DACs on the DDC, and provides AM, FM, and SSB routines to demodulate the signals selected by the tuners.

Because the Option 040 tuner card has no processor or conventional memory this software must run on a C40 connected to a comm port (0, 4, or 5) of the Option 040 TIM-40 module.

Use the source code shipped with Option 140 software as example code to create your own control and demodulation downloadable.

VXI I/O library and JTAG kit
(HP SCM04008)

This kit provides the VXI device driver and interface libraries required to interface the HP SCMVX008 and its TIM-40 cards to the host controller.

The driver and interface libraries support operations such as control (reset, initialize, open, close), DSP code download, module I/O, and test. Both HP SICL and VXI*plug&play* VISA standards are supported providing a standard interface to higher-level application software.

The kit includes the I/O library and drivers, VXI manual, TI TMS320C4x users manual,

XDS cable conversion board and VXI JTAG chain cable for downloading and debugging code during code development.

A system library provides developers with a suite of C4x callable functions to exercise the full functionality of the HP SCMVX008. This low-level C4X library optimizes data transfers and simplifies the task of configuring and controlling the HP SCMVX008. Support functionality includes: VXI bus routines (DMA, configuration and VXI master transfers), Local Bus routines (bus configuration and data transfer), RS232 communication, and user-defined LED control.

Utility software is also included in this kit. The software provides easy to use PEROM programming utilities (EEPROM Tools) for programming the boot ROMs, example software (with source code), and built in test software to verify board level functionality at power up.

One of these kits must be ordered with the HP SCMVX008.

Debug kit (DOS)
(HP SCM01545)

This kit provides HP SCMVX008 specific tools to aid software development.

The debug kit includes an XDSC40 emulator board, DB40 debugger software, and an XDSC40 users manual to enable downloading and debugging C40 code from an external PC via the front panel JTAG connector.

Figure 6:
Digital receiver
black diagram
using Option 040
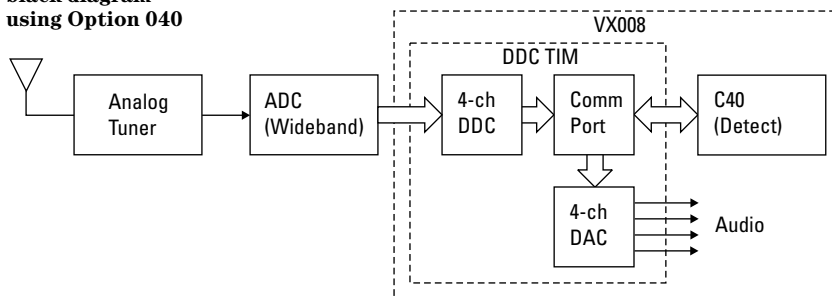
Ordering information

HP SCMVX008	TI based DSP Module
Opt 011	TMS320C40 TIM-40 Card
Opt 012	Dual TMS320C44 TIM-40 Card
Opt 040	Four-Channel Tuner with DACs
Opt 140	AM, FM, SSB Demodulation Software
Opt 082	4 MB DRAM VXI Shared Memory
Opt 083	8 MB DRAM VXI Shared Memory
Opt 085	32 MB DRAM VXI Shared Memory
Opt 086	64 MB DRAM VXI Shared Memory
Opt OB1	Additional Manual
Opt 908	VXI Mainframe Connector Shielding
SCM04008	I/O Library
SCM01545	Debug Kit
SCM00010	C4X Comm Port Cable Kit
SCM00012	JTAG Chain Cable
A2636-6160	RS232 Cable (30 inch)

Warranty

This product is distributed, warranted, and supported by Hewlett-Packard. It is manufactured by Spectrum Signal Processing, Inc.

The HP SCMVX008 comes with a 1-year warranty. During that period, the unit will either be replaced or repaired, at HP's option, and returned to the customer without charge.

Related Literature

HP E3238S Scanning Signal Analysis System Brochure
p/n 5963-6610E

For more information about Hewlett-Packard test & measurement products, applications, services, and for a current sales office listing, visit our web site, http://www.hp.com/go/tmdir. You can also contact one of the following centers and ask for a test and measurement sales representative.

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