

VSIC Universal VSI-H Converter Board

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1 Introduction

VSIC universal differential signalling to VSI-H converter board makes it possible to convert several existing differential ribbon cable VLBI signals to conform to the new LVDS-based VSI-H signalling and connector standard. Furthermore, it is well-suited to xxx.

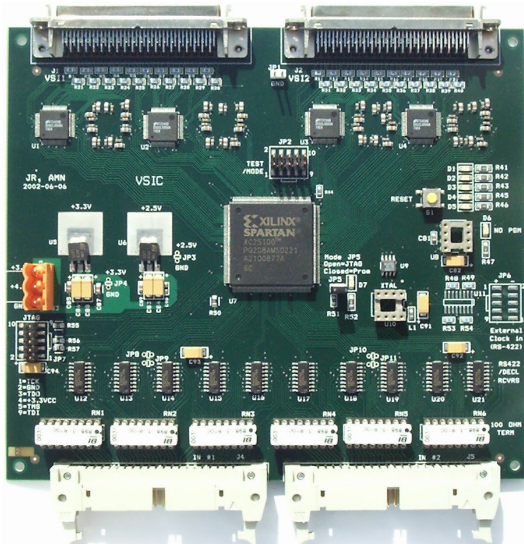


Figure 1: The VSIC universal VSI-H converter board.

Because of board simplicity and low cost, and because of the use of standard PC

hardware and low-cost IDE hard disks, even high-volume, high-throughput data acquisition systems can be realized at exceptionally low cost.

2 Features

VSIB has been designed as a standard half-size 32-bit, 33 MHz PCI expansion board. It is compatible with both 5V and 3.3V bus signalling with its “universal” dual-slot PCI card edge connector and it can thus be used also in most 64-bit, 64 MHz PCI slots.

2.1 Universal Differential Inputs

xxx DS34LV86 common mode +/-10V, 32MHz

2.2 On-Board Logic

Differential LVDS signals are processed with bus LVDS transceivers terminated

with 100Ω resistors at both ends, ensuring that cable connections are always correctly terminated. A Xilinx FPGA provides signal routing and processing, and a 4 kB buffer FIFO memory between VSI and PCI bus interface, ensuring continuous data flow regardless of PCI bus latencies.

The Xilinx logic allows selection of all 32 VSI data bits, or a subset of 16 or 8 (VLBI “Mark 5A” compatibility). It also allows skipping VSI input data words with a counter in the range of 1..65535. Both of these features can be used to direct a single VSIB to process a subset of the whole VSI data stream. For instance, four VSIB boards can be set up to repeatedly “demultiplex” four consecutive VSI data words to four VSIB boards in a chain, effectively reducing the data rate requirements for a single PC host to a quarter of the original data stream.

2.3 VSI Data I/O Connectors

The board features two bidirectional 32-bit parallel differential LVDS connectors which comply to the VSI, “VLBI Standard Interface” specification.¹ The connectors are female 80-pin MDR (“Miniature D Ribbon”) PCB connectors, as specified in the VSI-H standard. The main connector is located in standard PCI back plate, and the auxiliary (or chaining) connector is at the opposite end of the board.

In input mode, 32 parallel data bits are received and clocked in from the main VSI connector at the pace of an external clock.

The maximum clock frequency is 40 MHz. A copy of the data is reclocked and regenerated at the auxiliary VSI connector, facilitating arbitrary chaining of multiple VSIB boards.

In addition to data and clock, the board relies on an external synchronization signal (called “1pps”, one pulse per second in the VSI specification) to start data capturing operation. This allows multiple VSIB boards to start at precisely the same time. “1pps” signal is passed along in the main–aux signal chain delayed by the same amount as data, retaining synchronization information for boards participating in a VSI chain.

In output mode, the board sends and clocks out data at the auxiliary VSI connector at the clock rate received in main VSI connector clock pins. Again, data reproduction is started at the occurrence of an external synchronization signal.

3 Software Development

The VSIB board comes with a “vsib.o” Linux character-mode device driver and its source code. It utilizes Linux “bigphysarea=” memory management scheme for its large main memory ring buffer and presents a simple “open()/read()/write()/close()” paradigm for user software operation.

In addition to low-level drivers, a sample data collection application featuring TCP/IP remote control with “VSI-S” commands and messages is provided.

¹<http://web.haystack.edu/vsi/index.html>

4 Typical Applications

While initially designed as a replacement for a 1inch magnetic tape instrumentation recorder (Honeywell/Metrum Model 69) used in radio astronomy VLBI measurements, the VSIB board can be used in a wide variety of instrumentation data acquisition tasks. A companion “VSIC” converter board is available to ease converting various digital interfacing standards such as TTL, RS422, RS485, differential ECL, and more to the standard differential LVDS 32-bit parallel format accepted by VSIB. The data rates supported by VSIB are so high that recording for instance multiple uncompressed digitized video signals on a single PC is possible. For digital multi-channel audio on a single PC, VSIB offers the bandwidth capability of over 720 simultaneous audio channels digitized at 44 kHz and 16 bits.

5 Ordering Information

Model variants:

VSIC-R VSIC recording board with universal differential RS422/ECL receivers.

VSIC-P VSIC playback board with differential RS422 transmitters.

Board variants cannot be modified to each other since different RS422 receiver/transmitter chips have been installed on different variants.

6 Specifications

Dimensions xxx x6.875in.

Connectors 3M (or equivalent) 80-pin MDR Miniature D Ribbon connectors, one main VSI connector (back plate), one auxiliary connector (opposite board side); differential LVDS signalling for 32 data bits, external clock, and external synchronization (start) signal. 10-pin ribbon cable connector with LVTTTL test signalling.

Power Supply +5VDC 1500mA max, 800mA typical. On-board regulators for +3.3VDC and +2.5VDC operating voltages.

LVDS Interface National Semiconductor DS92LV090 differential bus LVDS transceivers.

Logic FPGA Xilinx Spartan2 XC2S100-6PQ208C, with a socketed firmware PROM for easy firmware updates.