

Upgrade of ESO's FIERA CCD Controller and PULPO Subsystem

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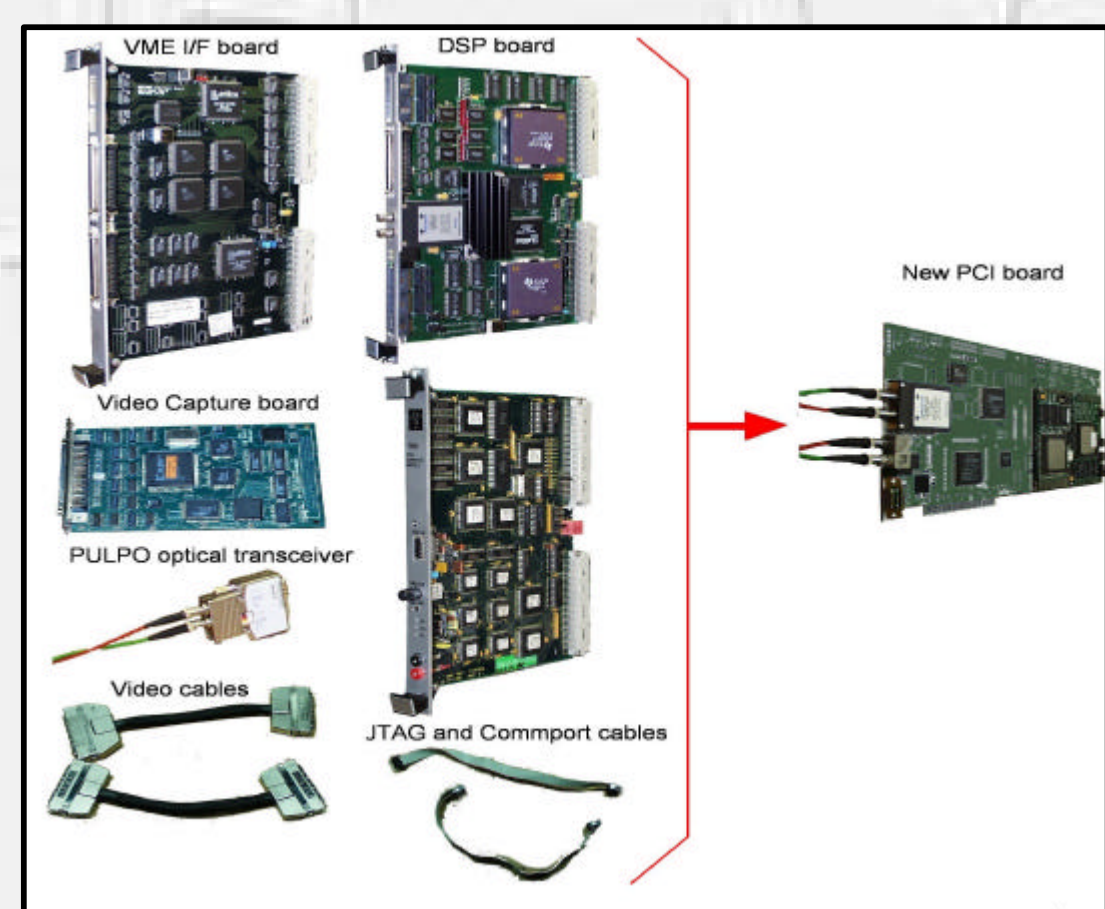
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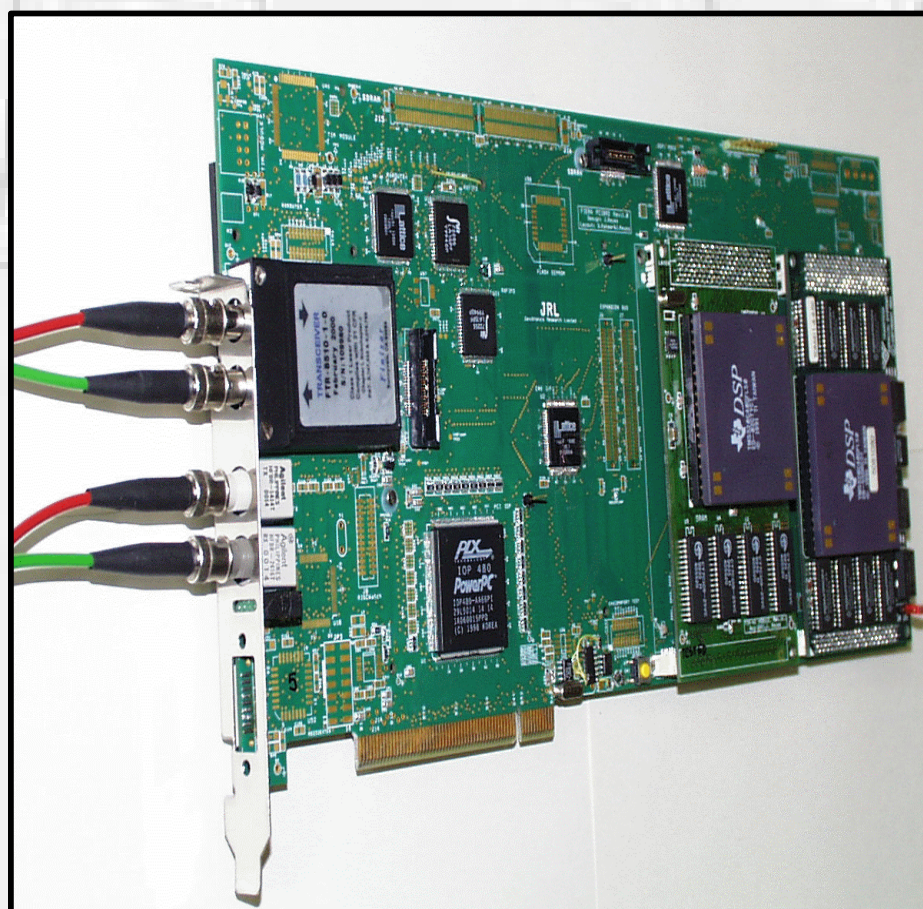


An overview of FIERA is presented with emphasis on its recent upgrade to PCI. The PCI board hosts two DSPs, one for real time control of the camera and another one for on-the-fly processing of the incoming video data. In addition, the board is able to make DMA transfers, to synchronize to other boards alike, to be synchronized by a TIM bus and to control PULPO via RS232. The design is based on the IOP480 chip from PLX for which we have developed a device driver for both Solaris and Linux. One computer is able to host more than one board and therefore can control an array of FIERA detector electronics. An increase in performance, versatility and reliability is achieved along with a reduction in cost, weight and volume. In addition, the bias and video boards have been upgraded.

PULPO is a multifunctional subsystem widely used at ESO for the housekeeping of CCD cryostat heads and for shutter control. The upgrade of PULPO is based on an embedded PC running Linux. The upgraded PULPO is able to handle 29 temperature sensors, to control 8 heaters, read out a vacuum sensor and log any combination of parameters. The new PULPO also features a display to show the data to the user locally and on ethernet connection to check the status remotely. This upgrade also satisfies the complex requirements of the OmegaCAM 16K x 16K mosaic camera.

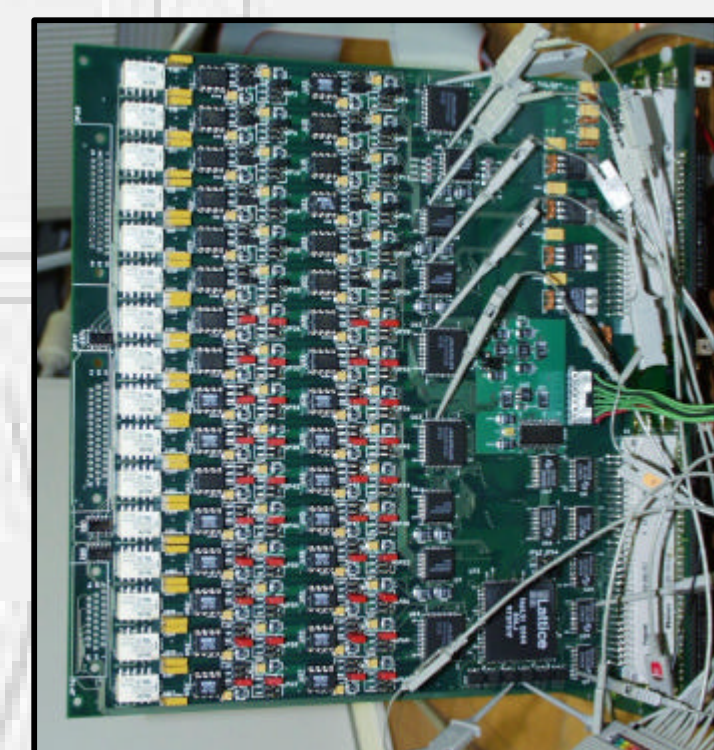


PCI BOARD

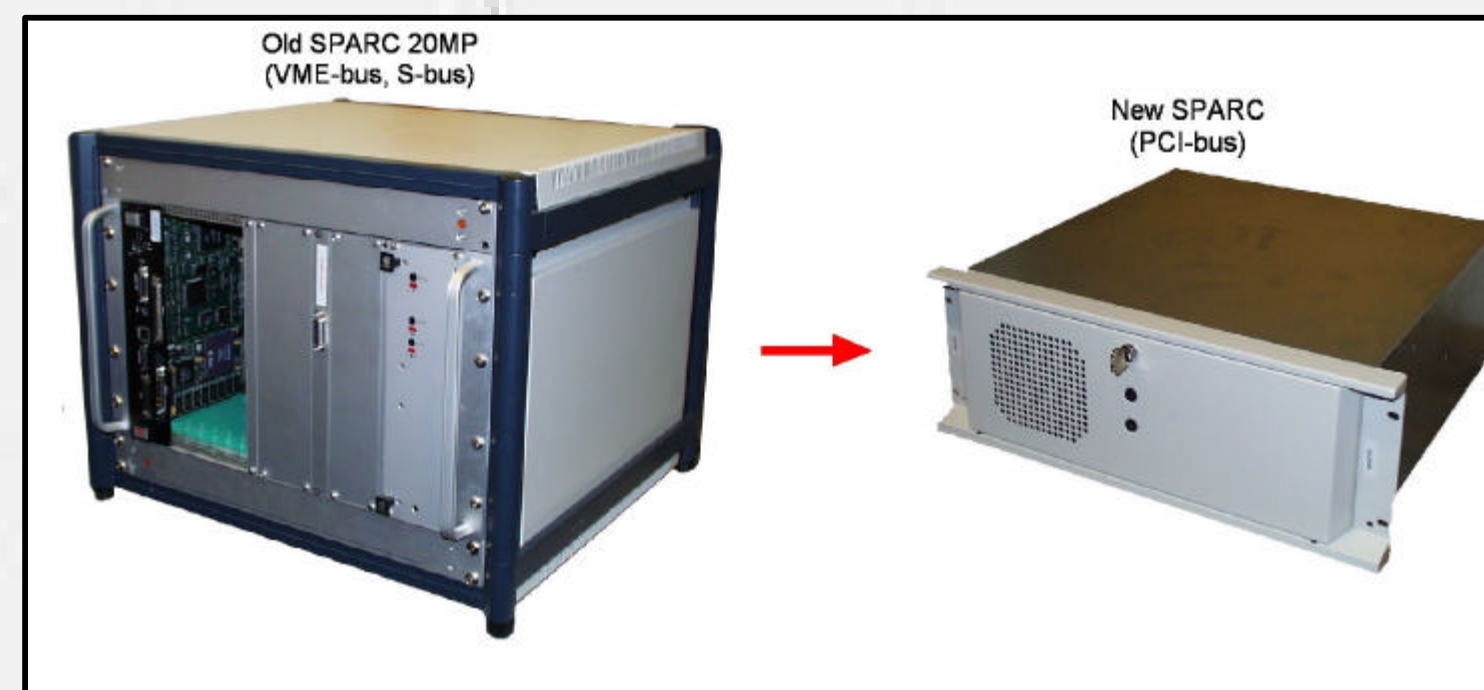


- Interface of DSP and SLCU via PCI
- Platform independent
- DMA engine integrated
- DSP real time controller
- Second DSP for on-the-fly video data processing
- Synchronisation lines for event triggering
- Integrated TIM (absolute time bus reference at Paranal) for absolute time synchronisation
- Direct fiber connection to PULPO
- 32-bit interface to RTC (Real Time Computer)
- DSP module piggy-back eases the move to the C60 family of DSPs

BIAS BOARD

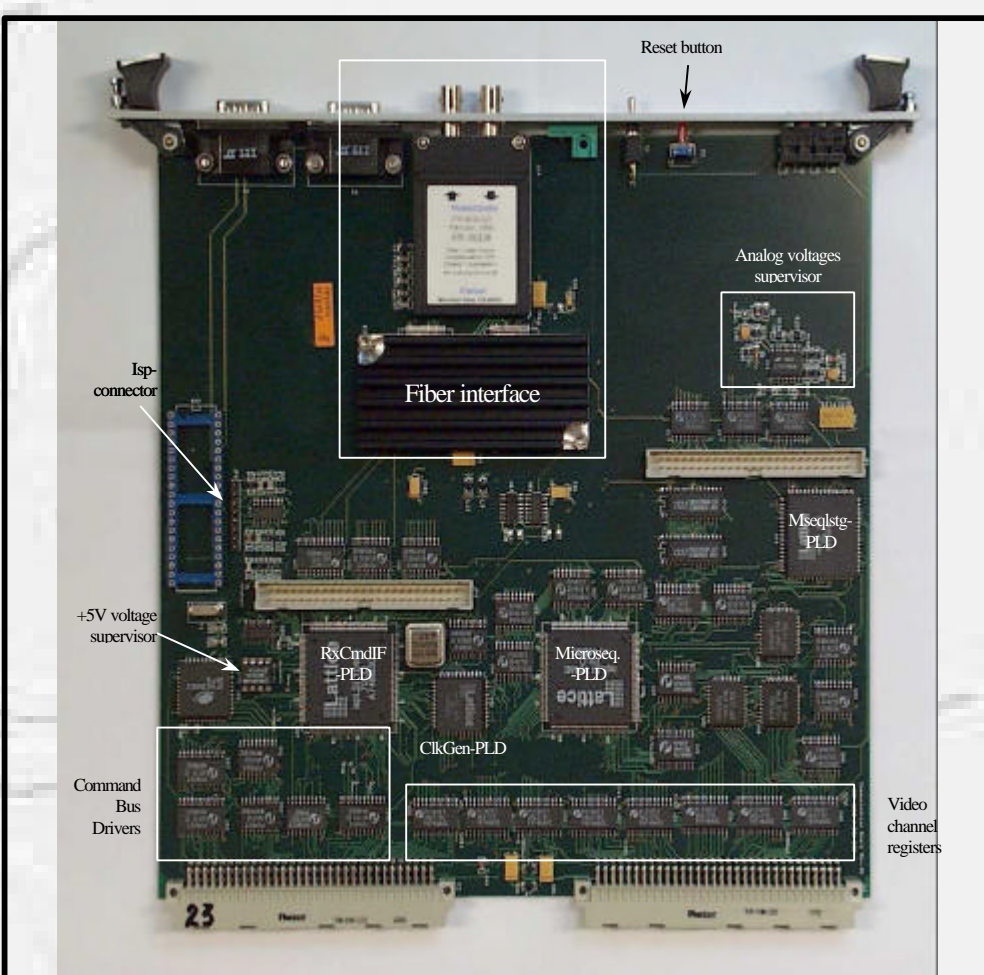


- 32 channels per board with -15 to +30V output range.
- Voltages remotely controlled by software in steps of 2mV
- Output relays
- Up to 4 boards per Detector Electronics



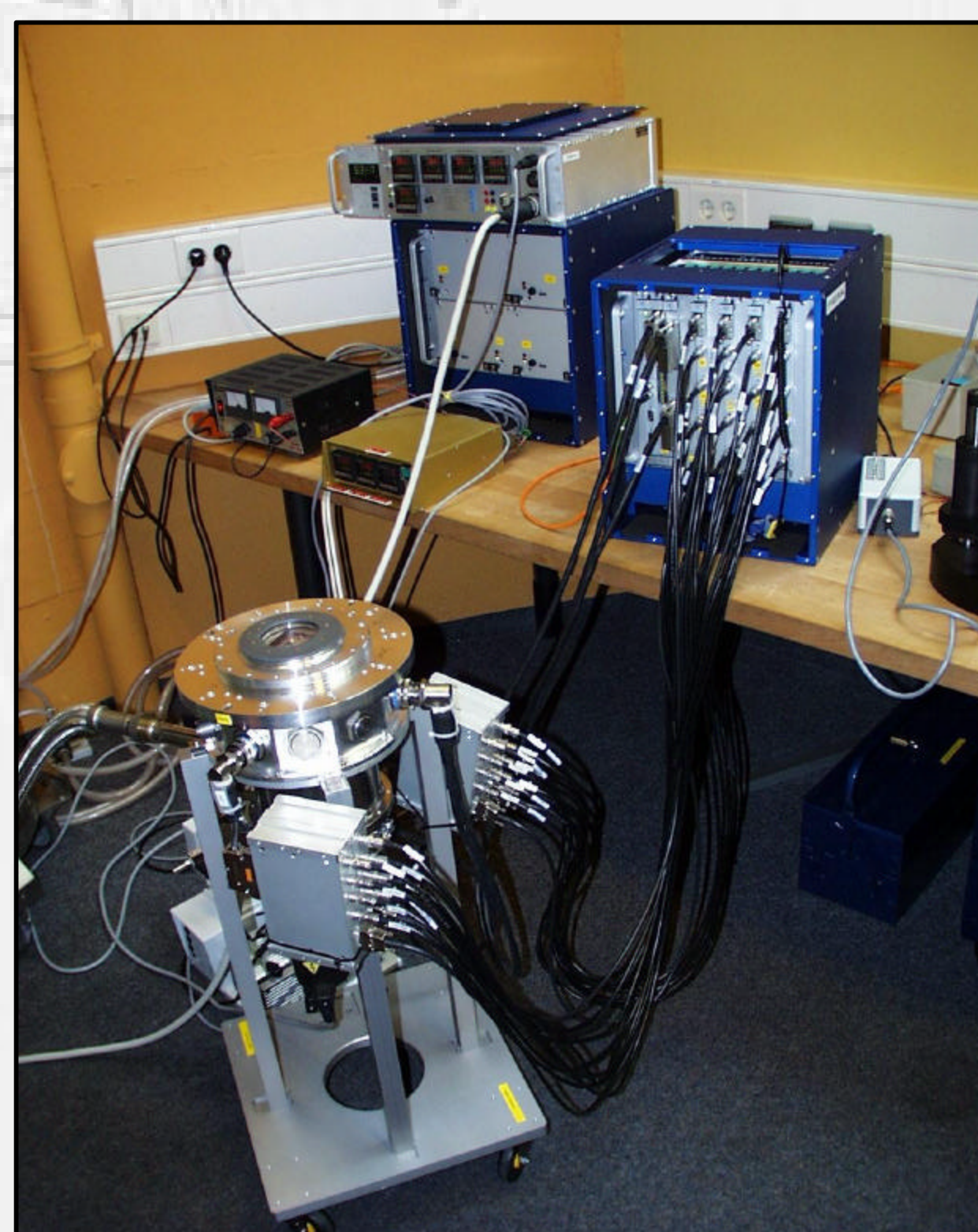
- Higher data throughput: 132MB/s against 40MB/s (S-Bus)
- Significant SLCU cost reduction. Factor of five
- System more compact. Volume reduction of 30%
- PCI: Platform independent
- Array of Detector Electronics with one SLCU
- Less cabling. Improved reliability

COMMUNICATION BOARD

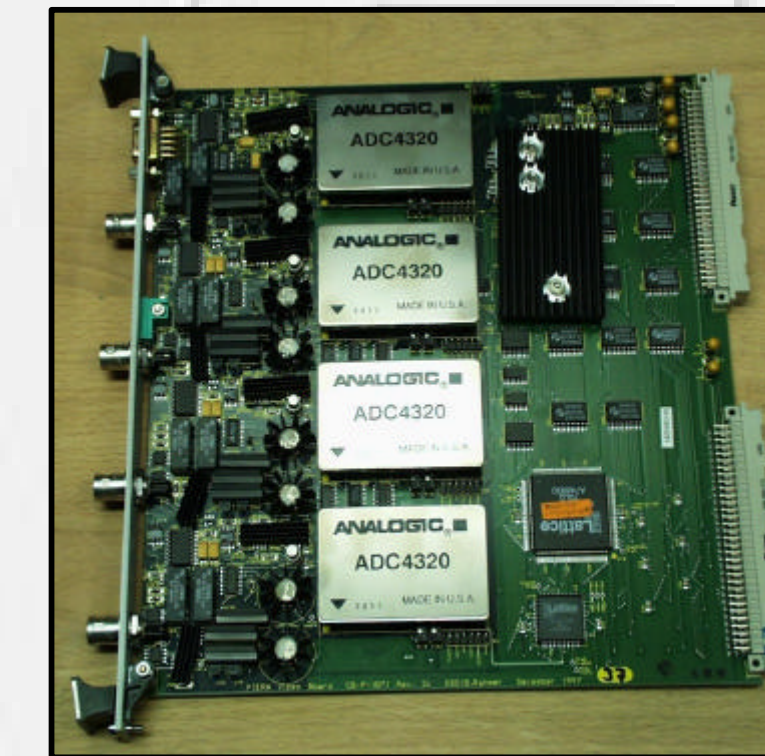


- It is the only master of the command bus
- Master clock derived from master clock of the DSP and synchronous to it
- Therefore, synchronous operation of detector head electronics and DSP (real time controller) can be guaranteed

EXAMPLE OF A 16-CHANNEL FIERA

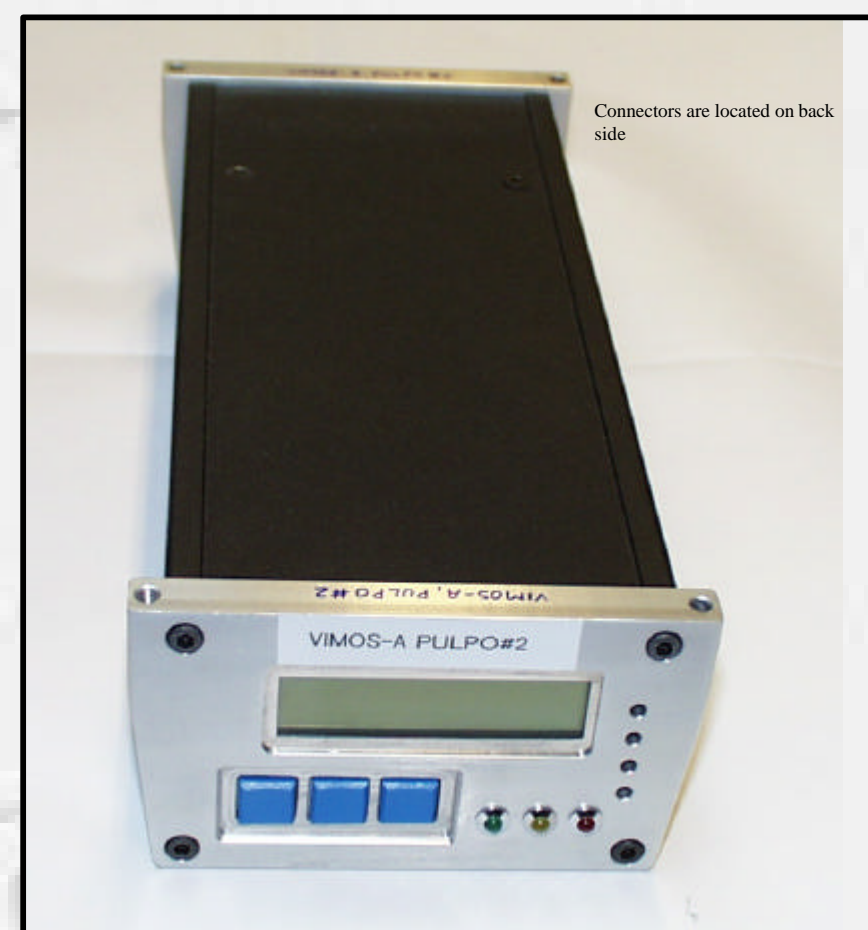


VIDEO BOARD



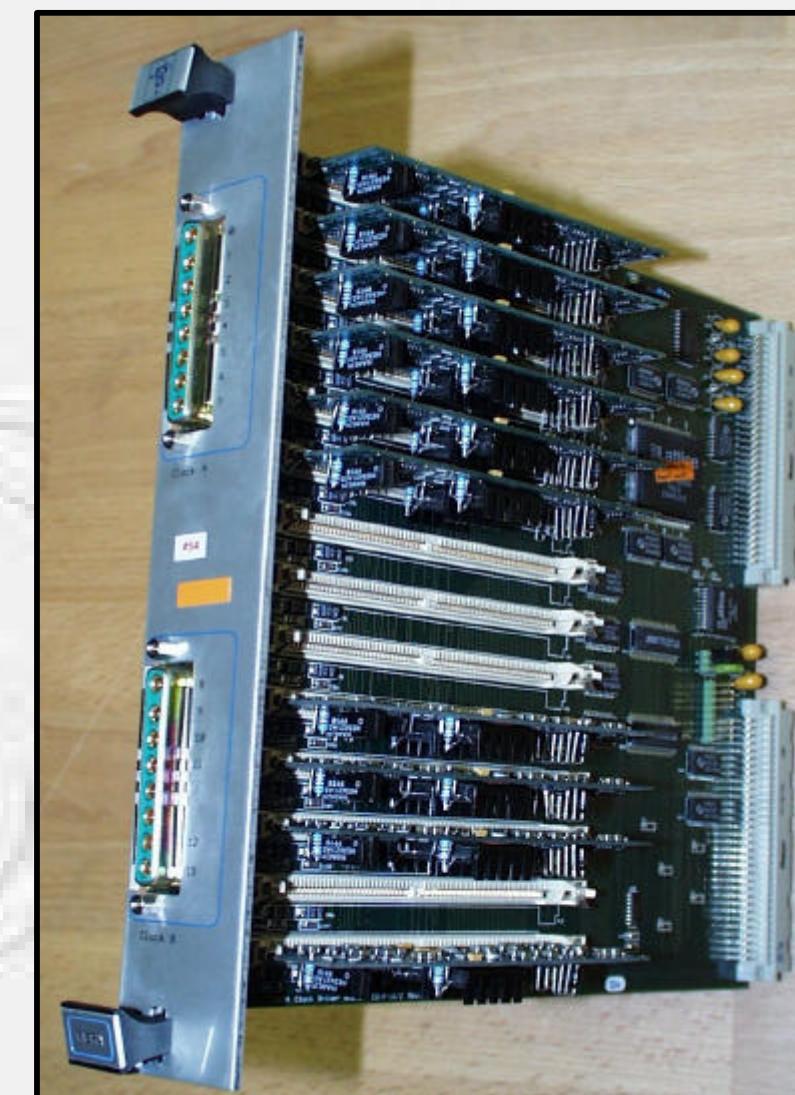
- 4 channels per board
- 16-bit resolution per pixel
- Up to 2MHz sampling rate
- Clamp-and-sample
- Adjustable RC time constant
- 2 selectable gains
- Adjustable clamp offset
- Internal test video generation
- Up to 4 boards per Detector Electronics

PULPO



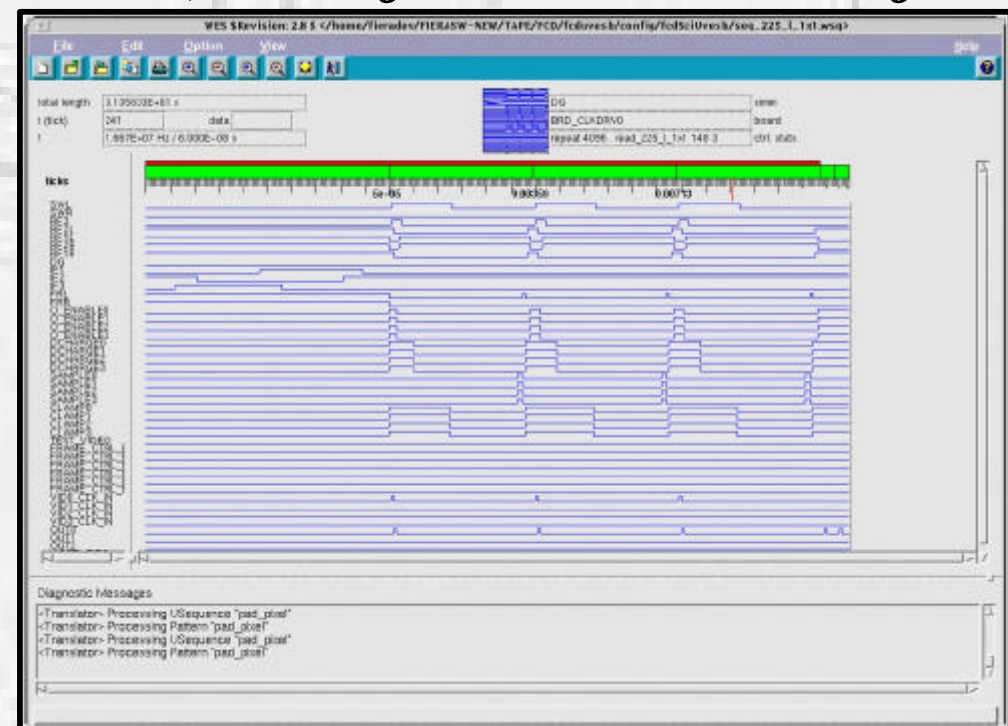
- 29 temperature sensing circuits (PT100)
- 8 heater control circuits
- Vacuum monitoring
- Flexible interface to a wide range of shutters
- Optical serial interface to the SLCU
- Data logging of parameters
- User interface based on an LCD-panel and keypad
- Able to communicate to other PULPOs

CLOCK BOARD



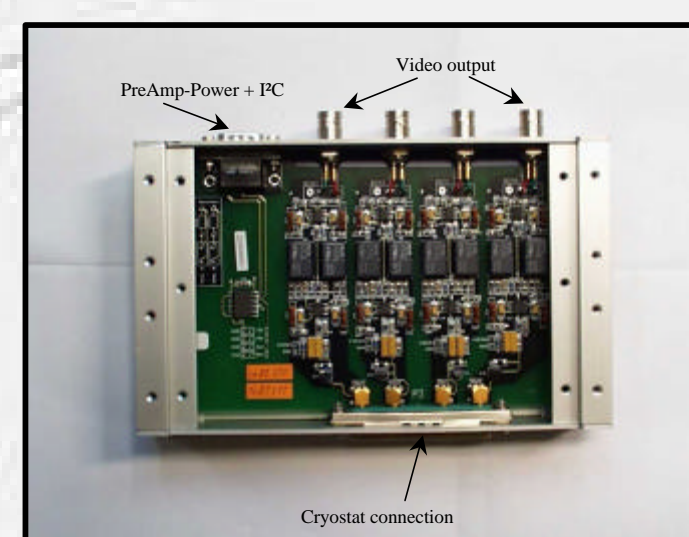
- 14 clock lines with +/- 14V swing and 25MHz clocking frequency
- Modular design:
 - Bilevel: Two clock level output
 - Multilevel: Programmable fine-tune clock transients
- Up to 4 boards in one Detector Electronics
- Output relays

EXAMPLE OF FIERA SOFTWARE WES (Waveform Editor Software)



Front-end user interface to graphically create patterns, micro-sequences and read-out sequences

PRE-AMPLIFIER



- 4 channels
- Adjustable gain via I2C bus
- Differential output to the video board
- Stackable

FIERA's design, performance and flexibility has been proven extensively in more than fifteen detector systems up to now. It can control a wide range of CCDs like MIT, EEV and chips for Adaptive Optics. FIERA electronics can also handle big CCD mosaics hierarchically.

For more information:

www.eso.org/odt

References:

FIERA: ESO's New Generation CCD Controller, Jim Beletic, Rolf Gerdes and Raymond C. DuVarney

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