New VME-Based Hardware for Automation in BINP

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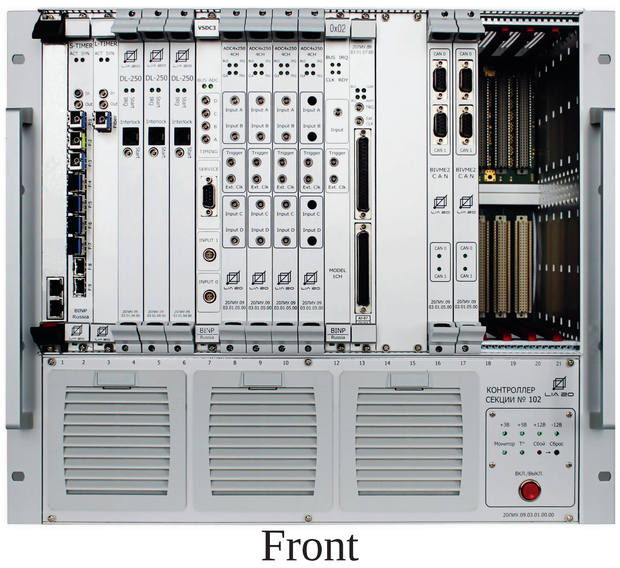
Introduction

A new VME-based crate and modules are presented in this work. This hardware is primarily intended for LIA-20 control system, but we also plan to use it for the upgrade of the controls of existing complexes such as: VEPP-2000, VEPP-4, VEPP-5 Preinjector. Modules were designed with an ability to be used for planned projects such as Super c-tau factory. All modules are cost effective and have TANGO device servers developed for them.

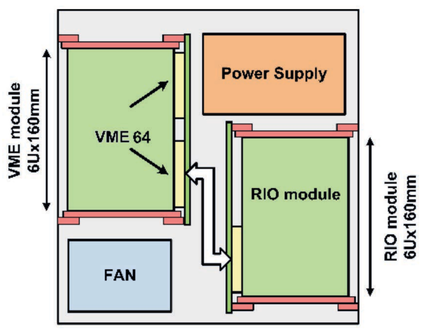
VME64-BINP Crate



Front

Rear

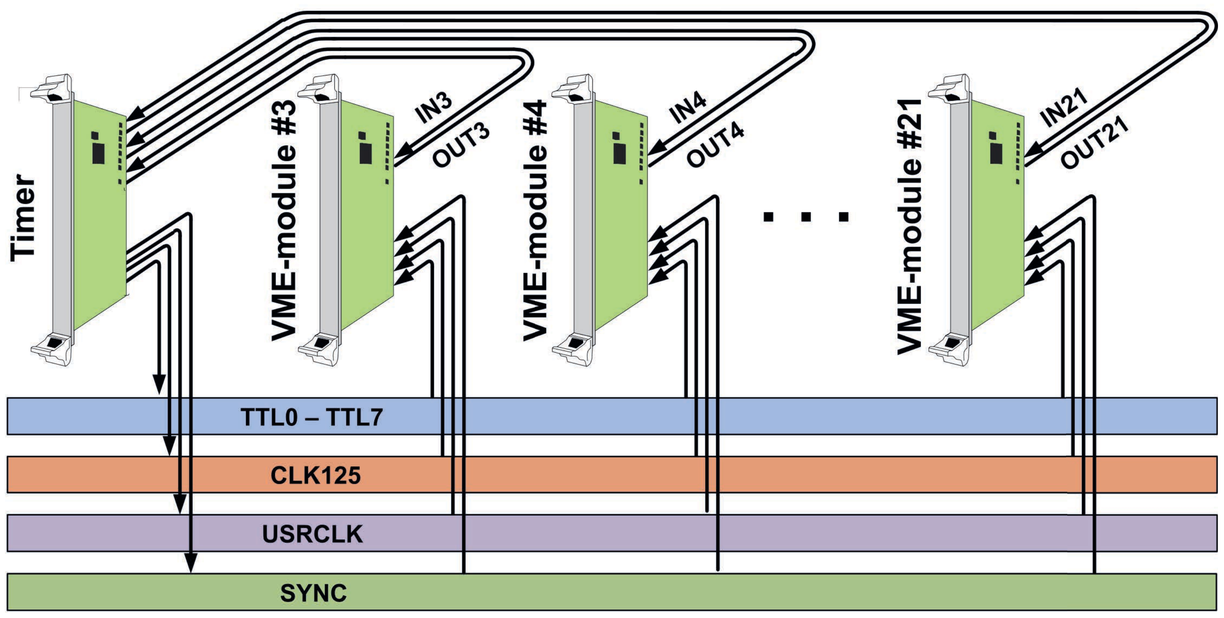
VME-BINP is a 10U VME-64x compatible crate with 21 positions. Designated positions: 1 is used for controller, and 2 is used for timer/commutator. It allows plugging in 6U front modules and 6U RIO-modules.



An upper (J1) connector is a standard one while the lower (J2) has specialized U/D pins assigned to special functions. Additional lines are used for:

Synchronization CLK125 - 125 MHz, USRCLK - user defined clock, TTL0÷TTL7 - trigger/block choose lines, SYNC - Synchronous start line. All the lines except TTL use LVDS and first 8 positions are aligned better than 100 ps.

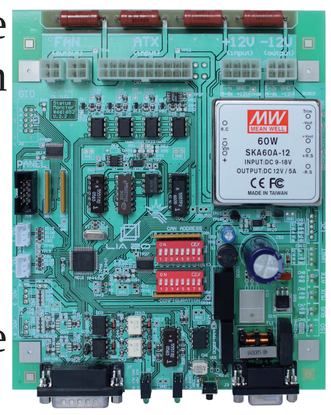
Intermodule LVDS IN3÷IN21, OUT3÷OUT21. LVDS lines that could be used for fast synchronization or intermodule communication. Timer/commutator is used as a cross-switch.



Daisy-chain DI0÷DI7, DO0÷DO7. They are used to pass signals between consecutive modules (e.g. Interlock signal).

RIO RIOA0÷RIOA31, RIOC0÷RIOC31. 64 RIO-lines and 12V, -12V, 5V, 3.3 V power lines allow the creation of versatile full-size RIO-modules. Crates use cost-effective ATX power supply. To improve reliability, each crate is equipped with a status monitor:

- Power state indication
- Voltage measurement, peak noise detection
- Temperature control
- Remote control using CAN-Bus with reserve power

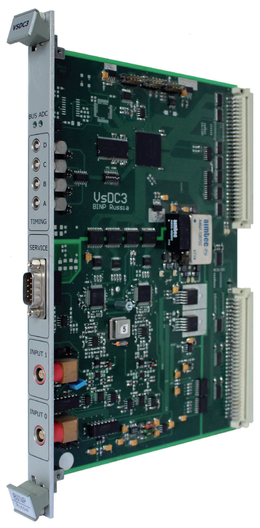


All modules have TANGO support described at TUPHA169!

BIVME2CAN allows to connect CAN devices to VME Crate.

- 2 Channels
- 125 Kbit ÷ 1 MBit
- SJA1000 (Can4Linux and SocketCAN drivers)

VsDC3 Integrator



Ultra-low integration noise makes this module one of the best in the world for magnetic measurements with induction coils.

Integration Error relative to $U_{range} \cdot T_{int}$	10^{-4} (T_{int} = 5 us) $5 \cdot 10^{-5}$ (T_{int} = 50 us) 10^{-5} (T_{int} = 500 us)
Integration noise relative to $U_{range} \cdot T_{int}$	10^{-5} (T_{int} = 5 us) $5 \cdot 10^{-7}$ (T_{int} = 500 us)
ADC	24 bits
Nonlinearity $U_{min} \div U_{max}$	$\pm 2 \cdot 10^{-5}$

ADC4x250 and ADCx32

ADC4x250 is a module with several variants:

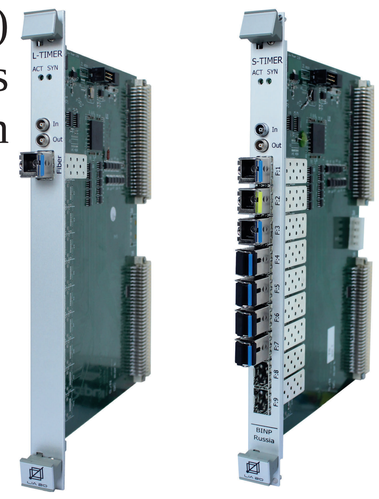
- 1 ch., 1 GSPS, BW 300 MHz, ENOB 7.3
- 4 ch., 250 MSPS, BW 75 MHz , ENOB 10
- 4 ch., photodiode, k = 100, BW 145 MHz

ADCx32 is a module with four multiplexed 8-ch. 1 MSPS ADC's for a total of 32 channels.

For more details visit THMPL09!

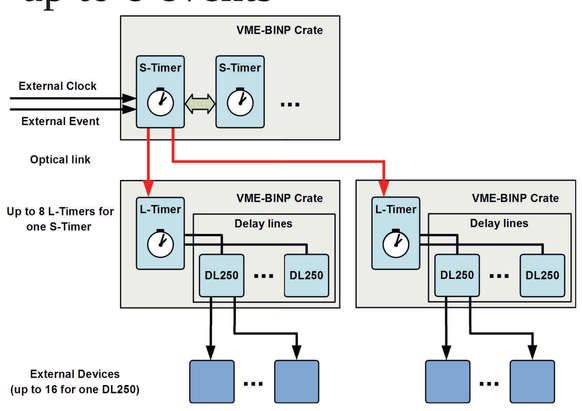
S-TIMER and L-TIMER

S-Timer (System) and **L-Timer** (Local) synchronize the modules between crates using an optical communication line with encoded clock and event sequence.



S-Timer provides:

- 8 output/1 input optical channels
- ±2 ns delay measurement
- 2 synchronization inputs/outputs
- up to 8 events



L-Timer provides:

- All synchronization signals
- <100 ps jitter
- ±2 ns synchronization error
- 32-bit event counters
- 2 synchronization I/O
- intermodule commutation

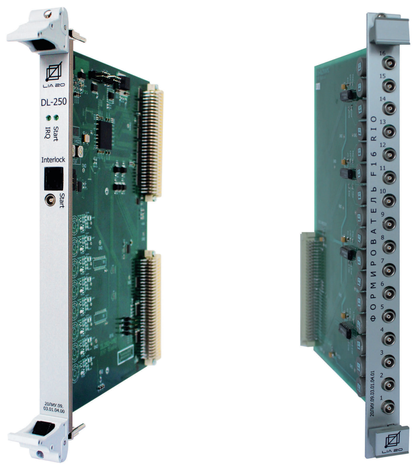
DL250-VME and DL-250RIO

DL-250VME provides:

- 8 Front + 16 RIO channels
- 4 ns quantum, <100 ps jitter
- 17 s range
- 5 us pulse length

DL-250 RIO provides:

- 200 mA output current
- 5 ns rise time
- up to 500 V galvanic isolation



Most of the presented modules were based on the same template project, to reduce development effort. All of them have been produced in small parties (5 - 20 units) and we plan to manufacture more than 500 modules for the following 2 years to be used in BINP projects.

We are going to develop a VME-controller based on a TI Sitara ARM SOM.

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