PROJECT: *E9904 high performance data logger.*

The results of 20 years of evolution in the development of high end quality control systems

Commercial Name: E9904 - BY2K.

- *E9904* is modular, 19" rack based ballistics data logger for the maximum flexibility and expandability
- *BY2K* is small footprint stand alone desktop units based on E9904 cards (1 time acquisition E9904b, 1 analog acquisition E9904c)

Description: Rugged, high performance, high reliability, easy to use modular data logger for ballistics analysis.

Purpose: quality control, research & development of ammunitions, primers, weapons, propellants, explosives, fuses rockets, helmets, armor & bullet proof structure. Forensic medicine analysis. Impact test for aircraft structures, rotors, jet engines & propellers . Transducers calibration, Closed vessel analysis. High speed timing.

Compliance: fully compliant with ballistics controls commercial (C.I.P.) and military rules.

Man Machine interface : Any personal computer can be connected with standard interface

Main applications & tests:

- ✓ Time & related ballistics data (velocity, energy, momentum etc)
- ✓ rate of fire
- ✓ shooting coordinates,
- ✓ pressure,
- ✓ light;
- ✓ force, trust ;
- ✓ acceleration;

- ✓ sound;
- ✓ ergonomics measures (recoil, yaw, vibration, stress, blunt trauma etc);
- ✓ scientific accurate high speed timing.

Main characteristics:
The system is modular and is based on double size Euro board (233x160 mm) that can be placed on a standard 19" rack enclosure for high modularity (up to 64 time channel and up to 64 analog-pressure channel per rack) or be placed in a proprietary desktop enclosure that include, in a small footprint unit all signal conditioning modules and acquisition cards; with BY2K the time acquisition channels are limited to 8 and the analog channel to 4.
BY2K / E9904 time and analog acquisition blocks are based on high speed logic controller that performs acquisition without the use of PC, this allows high speed acquisition without time constrain. Every board have a dedicated connector to piggy back special function or interface card. All the board inside the systems are connected together via proprietary bus that optimize the systems performance.
The calibration look up table is automatically loaded by the software to minimize error and improve linearity in any conditions.
Thanks the his high speed control the **BY2K / E9904** can be used with ours TRIO© barriers that measure bullets velocity and error of the measure in the same time. **BY2K / E9904** are compatible with almost all sensor for the measurement of ballistic or ergonomic parameter available on the market.

Time - 8 to 64 synchronous channels; **very low aperture time** (minimum time between two events. (BY2K 8 channels)
The time acquisition section of the E9904b is really very powerful, have a 100 ns time resolution and a error of less than +/-10ppm (10-40 ^{0}C). Board have aperture time (minimum time between two different signal to be logged) of less than 600 ns.
The standard on board memory buffer depth is higher that 810 events expandable to more then 16000. Each events log include the source code and the time mark acquired with a 100 ns resolution over 420s.
Each board have 8 fully independent high impedance inputs. Each input have a standard 50 Ohm BNC connector and have the following characteristics:

- ➢ can be individually programmed to trigger signal from high to low transition or from low to high;
- ➢ have programmable repetition rate (time between one signal to the follower when the input is lock on to avoid noise input) ;
- ➢ allows input signal span from –15 to + 15 Volts.
- ➢ have fixed input threshold for the use of TTL-CMOS input signal or can be fitted with programmable threshold control (for 4 or 8 inputs) that allows to trigger independently each channel for signal from –10 to + 10 Volts.
- ➢ Can be pulled on to 5V with 18 KOhm resistor.

The system was designed to assure that each input line have a maximum delay error (maximum delay versus any other input lines) of less than 40ns using a comparable trigger threshold, or an error of approx. 1 *10^{-7}s for each Volt of difference in threshold value. (error is less than 2 ns if customer require logic inputs 0 - 5 V)
Reference signal can be generated by software. A complete set of control led is available on all board to easy control of the system working and the input status.

Analog - 4 to 64 synchronous fully programmable (4 channels per board) 12 bits resolution channels, up to 1 MWords memory per channel, up to 1 MSPS (2 **M**ega **S**amples **p**er **S**econd 8 bits) fully programmable acquisition and sample time and block length.

- Trigger mode "Internal", "External" , "software controlled" on falling or rising edge of the signal,
- Trigger type "Pre", "Pre-post", "Post", "Delayed acquisition".
- Block mode memory partitioning for automatic weapons testing.
- Broad range of internal and external signal conditioning modules.
- Piggy back connectors on all boards to hold customized signal conditioning units
- Built in self test.
- Possibility to relocate driver and to use system connected to a PC in local and geographical area network**.**
- Easy to use and to install.

The input bloc
The 4 input can be factory configured as gain programmable (2048 steps) unipolar or bipolar mode or for the use of on board conditioning units. The ballistics standard version is delivered with unipolar input for the use inner conditioning units.

The board manufactured for ballistics analysis have 2 very high impedance, very low overshot, high bandwidth charge amplifiers (channel 1-3). The charge amplifiers can have a reed relay reset units (for closed vessel ballistics analysis or general purpose pressure test) or semiconductor reset (for automatic weapons pressure control). Charge amplifier have 3 gain steps.
The other two channels can be used for any external signal conditioning units (recoil amplifier, luxmeter etc)
All channel are factory calibrated and the look up table is automatically managed by the software to insure highest linearity (> 0.05%) and accuracy (>0.05%).
Amplifiers have high frequency anti-aliasing filters. The low frequency filtering must be done by the software.

Software : fully integrated with ours ballistics analysis software. Can be supplied with software driver only for the use with customer's legacy software.

Dimensions :
BY2K: 420w x 110h x 320d (mm), weight approx 6 kg.
E9904 : 19" 6U rack units; weight start from 7 kg (depend on the number of module installed).

Ordering information:

All BY2K code referred to BY2K Block 2. (to upgrade existing Block 1 and Block 1A to block 2 contact factory).

Product code	Description
844	BY2K 8 time input, 810 events memory, 4 programmable threshold input. 2 analog channels, 1 charge amplifier, 512 KWords memory.
845	BY2K 8 time input, 810 events memory, 4 programmable threshold input. 4 analog channels, 2 charge amplifier, 512 KWords memory.
846	Basic E9904 module, power supply, enclosure.
847	E9904b time acquisition board 8 time input, 810 events memory, 4 programmable threshold input.
848	E9904c analog acquisition board 4 analog channels, 2 charge amplifier, 512 KWords memory.
849	Kit to add 4 more programmable threshold input (to extend time threshold programmability to all time inputs).
850	Kit to extend analog board RAM to 1MWords per channel.
851	Kits to share analog 12 bit memory with 4 channel 8 bit 2MSPS converters.
852	Software driver for E9904 series instruments. (included in X-BAL software series)

Data Subject to change without notice

PAINI SISTEMI ITALCACCIA s.r.l.
Electronics & Systems Division
Via Rossini 8 – 43011 Busseto (PR) ITALY
tel . +39 0524 332150 e-mail: info1@paini-esd.it

URL : www.paini-esd.it

quam ludus durus fuit
duri ludere incipiunt

Painisistemi
Electronics & Systems division