

# Model 7072T Dual Timing ADC ADC / TDC / SVA



## FEATURES

- Three individually selectable modes of operation for each input channel:
  - ADC mode with 500 ns Fixed Conversion Time
  - TDC mode with  $\ll 25$  ps Time Resolution
  - ADC/SVA (Analog Sampled Voltage Analysis) mode
- Full 8k Conversion Gain and Range
- Dual 10-LED Indicator bar for Instantaneous Dead-Time display, level setting
- Lower Level and Upper Level Discriminator on each ADC input
- Three modes of operation independently selectable for each input channel: Pulse Height Analysis with automatic peak detection / Time-to-Digital conversion and Analog Input Sampling selectable by frontpanel switch
- Simultaneous Single-Channel Output / TDC Monitor
- Designed for easy interfacing to our MCD-2, MCD-2E, SPA-3, MPA-3 Systems, MCA's from other manufacturers (special cable and external ADC interface required) and Computers

In the SVA mode a voltage level or waveform can be sampled when a gate signal is applied.



## DESCRIPTION

The Model 7072T is a unique dual channel device that can operate either as an ultra fast analog-to-digital converter with a fixed conversion time of 500 ns\*, a time-to-digital converter (TDC) or an analog SVA. The 7072T is ideally suited for high counting rate applications in energy and time Spectroscopy. The combined ADC/TDC function finds applications in time resolved photon, ion-, neutron- and X-ray imaging.

The built-in Single Channel Analyzer has a separate output on the front panel. This output can be used in the ADC and SVA mode. An analog output is available for monitoring the TDC.

\*) Conversion time of ADC. For dead time calculation add time-to-peak and 100 ns transfer time to data buffer

Model 7072T Rev3 14112006



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# SPECIFICATIONS

## INPUTS (front panel)

**Signal Inputs:** BNC-Connector accepts +25mV to +10V (standard / +8V optional) linear pulses,  $Z_{in} = 1k \text{ Ohm}$ , risetime:  $\geq 100\text{ns}$  to  $100\mu\text{s}$ , fall time:  $200\text{ns}$  to  $100\mu\text{s}$ , dc coupled or a varying voltage level when used in SVA mode.

**Gate/Start inputs:** BNC-Connector accepts positive TTL for the Gate mode, FAST NIM pulse start input for TDC.

**Stop Inputs:** BNC-Connector accepts FAST NIM pulse (Stop signal) in TDC mode

## OUTPUTS (front panel)

**SCA:** TTL output in PHA and SVA mode (TTL pulse of approx.  $0.5\mu\text{s}$  duration. One output pulse for each input signal that falls between the ULD and LLD setting), analog signal in TDC mode. The amplitude of the output signal is proportional to the time.

Outputs monitor levels in adjustment mode

## OUTPUTS (rear panel)

**Data:** 13 bit binary data lines and data transfer commands, 25-pin female D-Sub-connector.

## Front Panel Controls by Mode Select push-button

**Conversion Range:** Push button switch selects quantization of 256, 512, 1k, 2k, 4k, or 8k channels for full scale input.

**Time Range:** Push button switch selects full scale time range of 50 ns, 100 ns, 200 ns, 500 ns, 1, 2, 5, 10, 20  $\mu\text{s}$

**Coincidence/Anticoincidence:** Push button switch selects "COINCIDENCE/ANTICOINCIDENCE" mode

**LLD:** adjustment by up/down pushbutton sets the lower level discriminator. The voltage is displayed on the DEADTIME/LEVEL LED indicator and output on the monitor connector for precise adjustment

**ULD:** adjustment by up/down pushbutton sets the upper level discriminator. The voltage is displayed on the DEAD-TIME/LEVEL LED indicator and output on the monitor connector for precise adjustment

## Front Panel Mode Controls

**PHA:** Pulse Height Analysis mode.

**SVA:** Analog Sampled Voltage Analysis

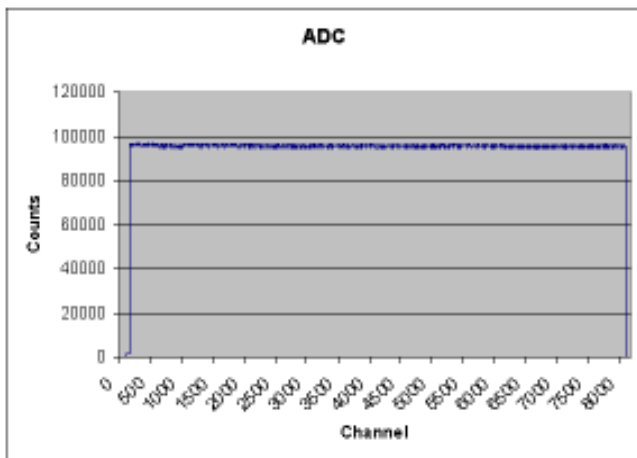
**TDC:** Time to Digital Converter

## Indicators

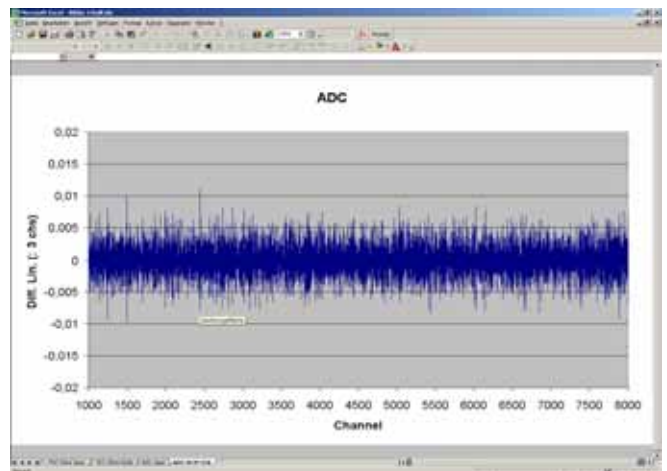
**DEADTIME/LEVEL:** Dual 10LED-bar indicates activity of the ADC. Range 0 to 100% deadtime or actual voltage level indication of ULD and LLD setting

ADC Performance	Conv. Range	
	4k	8k
Resolution: 500 ns flattop pulses		$\leq 3.4 \text{ chan FWHM}$
Integral Nonlinearity linear fit top 99% of useable ch.	$\pm 0,16\%$ typical	$\pm 0,16\%$ typical
Differential Nonlinearity incl. Effects of int.NL	$\pm 0,7\%$	$\pm 1,1\%$
Differential Nonlinearity for 99% of useable channels	$\pm 0,5\%$	$\pm 0,7\%$
Counting Rate Capability with MCD-2 MCA	$> 1.000.000 \text{ events/s}$	
Peak shift up to 700 kcounts/s SVA mode		$\pm 0,006\%$
Peak shift up to 1.000 kcounts/s SVA mode		$\pm 0,08\%$
Unused channels	approx. Top 1% of range	

**RANGE/MODE:** ADC range 256 to 8k in binary steps, TDC range from 50 ns to 20  $\mu\text{s}$  full scale.



PHA, typical noise spectrum



ADC, typical differential linearity plot

## PERFORMANCE ADC

**Conversion Time:** 500 ns fixed conversion time

**ADC Deadtime:** time-to-peak + 500 ns fixed conversion time + data transfer time of 100 ns to buffer (there could be an additional dead time if the MCA can not accept the data rates generated by the 7072T - this depends on MCA used)

Typical ADC deadtime for fast rising input pulses is less than 2  $\mu$ s per event using FAST ComTec MCA's

**Gain stability:** better than 50 ppm/ $^{\circ}$ C

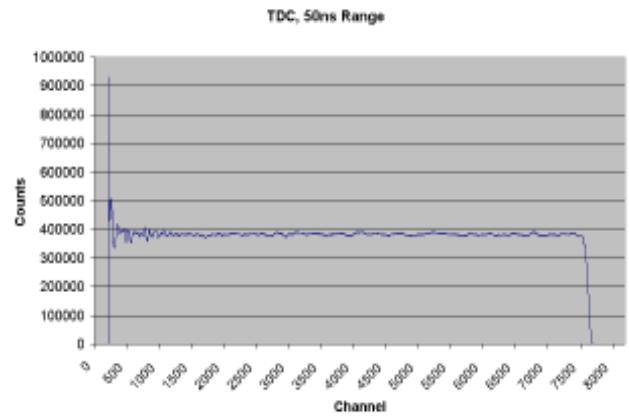
**Baseline stability:** 50 $\mu$ V/ $^{\circ}$ C

## PERFORMANCE TDC

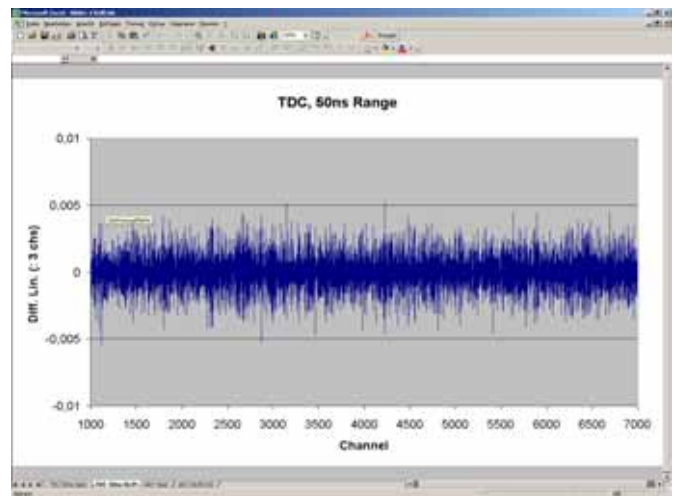
**Time range:** 50 ns, 100 ns, 200 ns, 500 ns, 1  $\mu$ s, 2  $\mu$ s, 5  $\mu$ s, 10  $\mu$ s, 20  $\mu$ s

**Useable times:** >12..15 ns to approx. 95% of selected range

**Conversion range:** 8192



TDC, typical noise spectrum (50 ns range)



TDC, typical differential linearity plot (50 ns range)

TDC Performance at 8k conversion range	
Resolution: @ 50 ns time range	$\leq 4.1$ chan FWHM
Integral Nonlinearity 50 ns range, linear fit	+/-0,12% typical
Differential Nonlinearity 50 ns range	+/-0,5%
Differential Nonlinearity for 99% of useable channels	+/-0,4%
Counting Rate Stability up to 100 kcounts/s	+/-0,003%

### General

**Temperature range:** 0 $^{\circ}$ C to +50 $^{\circ}$ C storing

#### Power Requirements

+24V, 100mA, -24V, 90 mA, +12V, 150mA, -12V, 200 mA, + 6V, 700mA, -6V, 430 mA

#### Physical

**Size:** single width NIM module (1.35 x 871 inches; 3.43 x 22.13 cm) as per TID - 20893 (rev.)

**Shipping weight:** 1.8 kg (net 1.0 kg)