N2000 Series
Universal Neutron Counter

The ANTECH Universal Neutron Counter 2000 Series combines Total Neutron Counting, Shift Register Coincidence Counting, Multiplicity Counting and List Mode (LM) data acquisition in a single portable package to provide a state of the art instrument. With this new Virtual Instrument (VI) it is not necessary to choose between neutron multiplicity counting or list mode pulse acquisition for a safeguards inspection in the field. The 2000 Series combines the benefits of both measurement techniques; immediate measurement results are provided by the Virtual Instrument (VI) real-time software, while the time stamping information saved on a hard disk can be re-analysed as necessary. The acquired pulse train can be analysed with future techniques or improved instrument parameters.

The unit has a maximum of 19 inputs, which provide at least one input per amplifier board for the small to medium detector systems. The use of Low Voltage Differential Signaling (LVDS) with twisted wire ribbon cable (a round shielded cable is also available) provides an effective solution for sending pulses from amplifier board outputs to instrument inputs. A single D-sub connector provides signal and 5Vdc power supply connections. For this purpose a special interface board must be embedded in the junction box of a neutron detector for TTL to LVDS level conversion. For example, upgrading a standard Active Well Coincidence Counter with LVDS signaling dramatically reduces system dead-time and improves the detection of faulty amplifiers or counter ^{3}He tubes. A cable testing feature makes it possible to check the integrity of the cable and is a rudimentary anti-tampering measure.

The four BNC inputs on the front panel are compatible with current single TTL output neutron counting systems. These inputs allow up to 3 pulses per acquisition interval of 70 ns, preventing the loss of pulses, and enable connection for up to four detector banks or amplifier arrays of a Passive Neutron Coincidence Counter.

Besides List Mode and Virtual Instrument acquisitions (neutron coincidence and neutron multiplicity), which can be enabled or disabled by the user, a third acquisition, i.e. Totals counting is running in the background.

Each input is equipped with a 32 bit totals scaler that is read out at a rate of 100 Hz. Totals Counting acquisition can be used for flashing virtual LEDs on a PC screen or for anomaly detection .

The unit also has a 'Synch In' LEMO connector to combine multiple units in a single multiplicity counter in case more inputs are required. This input can also be used to trigger an acquisition, at a sufficiently high rate for Differential Die-away Techniques (DDT) with pulsed neutron generators (Up to 100 Hz rate).

Features

- High frequency 20 MHz acquisition clock for improved accuracy and backward compatibility with older systems that use 4MHz clocks
- Very high count rates inputs: 4TTL (BNC) — up to 60MHz
- High count rates inputs: 15 LVDS (D-sub connector) — 20 MHz
- Proprietary data compression technique for time stamping information allowing very high count rates while minimising disk space requirements
- High Voltage supply for ^{3}He neutron detectors—max 2000 Vdc
- Low voltage 5 Vdc supply for a maximum of 8 amplifier boards via front-panel BNC connector
- Count Gate Out connector (LEMO S0) to signal when the unit is effectively counting (used for synchronizing multiple units)
- I/O connector (LEMO S00) can be defined by user to be an input or an output. When used as an input it can be used to start/stop an acquisition. When configured as an output it may be used to signal the end of a measurement or to trigger an alarm (for instance when a certain count rate occurs)
- The operator can select which inputs contribute to the coincidence count and which don't. All inputs also function as a scaler (a simple pulse counter)
- Each input has an input inhibit function. When enabled, input is disabled for a fixed time

Benefits

- Simultaneous neutron totals, coincidence, multiplicity counting and list mode (time stamping) acquisition
- Compact portable design
- Virtual Instrument design: various pulse train analysis techniques are possible with real-time software
- Fully compatible with INCC and ANTECH MasterPassiveActive software
- Reduction of system dead-time through embedded pulse mixer with multiple inputs (software controllable enable/disable): 4 TTL and up to 15 LVDS
- Powered via 12 Vdc mains adaptor

Specification

Dimensions (H x W x D)		53 x 129 mm x 156 mm (includes front and rear panel connectors)
Weight		476g
Temperature range	Operation	5°C to 40°C (up to 90% RH)
	Storage	0°C to 50°C (up to 90% RH)
Input power		12 Vdc, 0.5 A
Output power	LV	5 Vdc, 1.0A maximum
	HV	2000 Vdc, 100 µA maximum
Safety		EN60601-1
EMC		Complies with 2004/108/EC
Maximum input count rate		60 MHz for BNC/TTL inputs
		20 MHz for D-sub/LVDS inputs
Minimum input pulse width		70 ns
System clock		20 MHz (time stamping resolution 50 ns)
Interfaces		USB 2.0
Scaler		32 bit totals on each input
Inputs	BNC	4 BNC (LED pulse indicators for each channel)
	LVDS	15 (D sub-connector)