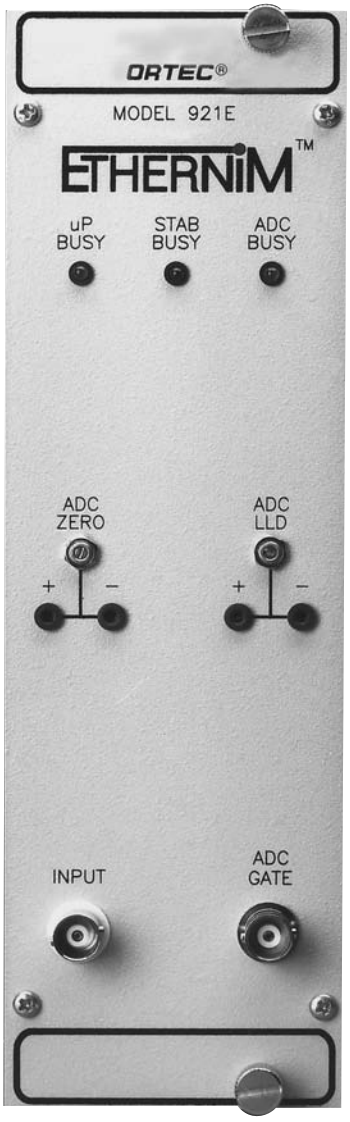
ORTEC®

921E
High-Rate Multichannel Buffer

- **High-speed MCA in a two-wide NIM**
- **Integral Ethernet connection for instant integration into CONNECTIONS spectroscopy networks**
- **Ultra-fast, 16k-channel <1.5 µs conversion time ADC**
- **16k-channel data memory, 2^{31}–1 (2 billion) counts per channel**
- **Digital spectrum stabilizer**
- **Sample changer control port**



The ORTEC Model 921E is a member of the EtherNIM family of multichannel buffers. Combined with appropriate computer hardware, ORTEC signal-processing electronics and ORTEC *CONNECTIONS* applications software running under Windows® 2000/XP, EtherNIM multichannel buffers are the ideal data acquisition hardware for a wide variety of applications in pulse-amplitude spectrometry.

The Model 921E provides the following functions (see Fig. 1):

1. Fast, 16k-channel, successive-approximation ADC, with fixed conversion time of <1.5 µs

2. Digital Spectrum Stabilizer

3. Nonvolatile data memory: 16k channels, 2^{31}–1 (2 billion) counts per channel

The 921E is simply connected into an Ethernet environment under Windows 2000/XP. It may be integrated easily into existing networks. Control and spectral display is achieved by the use of a suitable ORTEC *CONNECTIONS*-32 applications package such as MAESTRO-32, GammaVision-32, ScintiVision-32, or Renaissance.

The two-wide NIM 921E employs a dual Direct Memory Access (DMA) architecture to maximize system throughput. It provides the very best in throughput performance for ultra-high-rate spectrometry with a germanium detector. Figure 2 shows some actual performance data taken with a Model 921E used in conjunction with its companion product, the Model 973U Ultra-High Count-Rate Amplifier. The upper curve shows the throughput to memory when the integration time of the 973U is at its lower setting, 1.5 µs. The lower curve depicts the throughput to memory when the integration time of the 973U is at its higher setting of 3 µs. In both cases the pile-up rejection circuitry of the 973U and 921 were enabled. The maximum throughput to memory is almost 100k counts/sec. At this maximum throughput, the accuracy of the livetime clock is ±3%.

The high pile-up-free throughput and highly accurate deadtime correction make the 921E EtherNIM MCB the instrument of choice for ultra-high count-rate spectrometry with germanium detectors.

The communications protocol used by the 921E is the "traditional" NIM digital bus NIM/488[1] per DOE/ER-0457T (formerly NIM/GPIB) method used for several years in all ORTEC MCB products.[2]

For the "do-it-yourself" programmer, software toolkits are available to simplify the task of making a user-written application communicate with the 921E.

---

[1]Please refer to "Standard NIM Digital Bus (NIM/488)," DOE/ER-0457T, U.S. NIM committee, May 1990; Standard NIM Instrumentation System, NTIS, U.S. Department of Commerce, Springfield, Virginia 22161.

[2]The 921E also provides the ORTEC Dual-Port Memory connector on the rear panel. DPM communications are still supported by ORTEC applications packages for historical reasons, but Ethernet communications are recommended in most cases as more convenient (especially over large distances) and, in most cases, less expensive to implement. An RS-232-C port is also provided for diagnostic purposes.

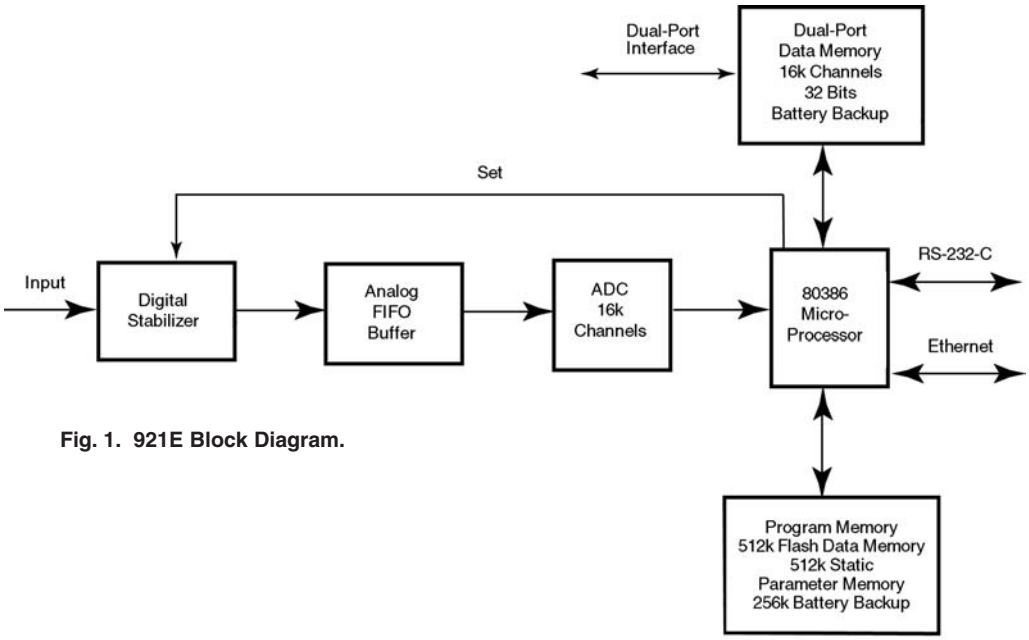
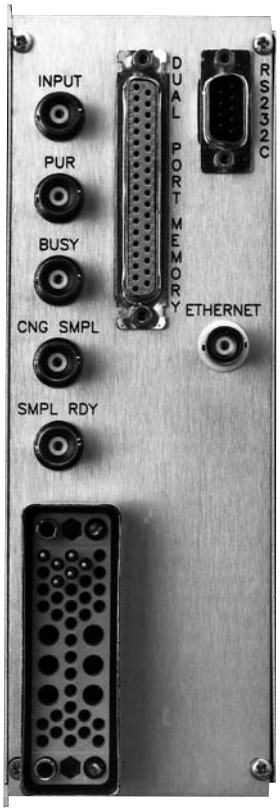


Fig. 1. 921E Block Diagram.



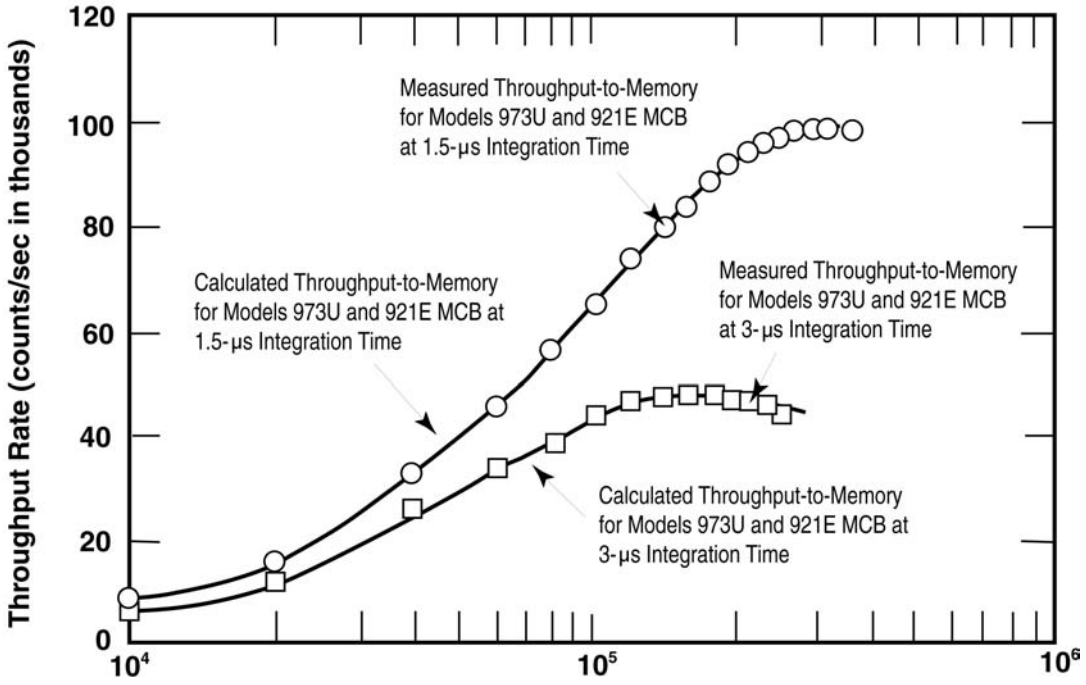


Fig. 2. Throughput to Memory of the Model 921E When Used in Conjunction with Model 973U Ultra-High-Rate Amplifier.

921E
High-Rate Multichannel Buffer

Specifications

PERFORMANCE

ADC Successive-approximation type with sliding-scale linearization.

MAX RESOLUTION 16,384 channels, software selectable as 16,384, 8192, 4096, 2048, 1024, and 512.

DEAD TIME PER EVENT 1.5 µs, including memory transfer; measured at 5 µs shaping with ORTEC Model 973 High-Rate Spectroscopy Amplifier at 100,000 counts/sec input count rate.

INTEGRAL NONLINEARITY ≤±0.025% over the top 99% of the dynamic range.

DIFFERENTIAL NONLINEARITY ≤±1% (typical).

GAIN INSTABILITY ≤±50 ppm/°C.

DEAD TIME CORRECTION Extended Live Time correction according to Gedcke-Hale method.[3]

DATA MEMORY 16k channels of NON-volatile memory; 2^{31}–1 (over 2 billion) counts per channel.

PRESETS

Real Time/Live Time Multiples of 20 ms.

Region of Interest Peak count/integral count.

Data Overflow Terminates acquisition when any channel exceeds 2 billion.

Peak Uncertainty

Nuclide MDA

DIGITAL SPECTRUM STABILIZER Peak centroid stabilization: either zero, gain, or both. Window width, for both zero and gain: ±1 to ±256 channels.

Correction Resolution At 16k ADC resolution: 0.04 channels (for gain); <0.08 channels (for zero).

ADC Word Size 14 bits (16k channels) maximum.

Setup/Enable/Disable From computer.

FRONT-PANEL INDICATORS

CPU BUSY Red, busy-rate LED; intensity indicates the relative activity of the microprocessor.

STAB BUSY Red LED indicates when stabilizer is active.

ADC BUSY Red, busy-rate LED flashes once for each pulse digitized by ADC.

CONTROLS

ADC ZERO Screwdriver potentiometer adjusts ADC zero offset ±250 mV.

ADC LLD Screwdriver potentiometer adjusts lower level discriminator from 0 to 10% of full scale.

INPUTS

INPUT Accepts positive unipolar, positive gated integrator, or positive leading bipolar analog pulses in the dynamic range from 0 to +10 V; +12 V maximum; semi-Gaussian-shaped or gated-integrator-shaped time constants from 0.25 to 30.0 µs, or delay-line-shaped with width >0.25 µs. Z_{in} ~ 1000 Ω, dc-coupled. No internal delay. BNC connector on front and rear panel.

ADC GATE Optional, slow-positive NIM input. Computer-selectable Coincidence or Anticoincidence. Signal must occur prior to and extend 0.5 µs beyond peak detect; front-panel BNC connector.

PUR Pile-up rejection input; accepts slow-positive NIM signal; signal must occur prior to peak detect. Z_{in} > 1 kΩ. BNC connector on rear panel.

BUSY Busy input used by live-time correction circuits. Accepts slow positive NIM signal, Z_{in} > 1 kΩ. BNC connector on rear panel.

SAMPLE READY TTL input signal to BNC connector on rear panel.

OUTPUTS

CHANGE SAMPLE TTL output signal to BNC connector on rear panel; software addressable.

INTERFACES[4]

ETHERNET Rear-panel BNC connector, accepts IEEE 802.3 10BASE2 (thin-wire coax).

ELECTRICAL AND MECHANICAL

POWER REQUIRED +24 V, 160 mA; –24 V, 240 mA; +12 V, 900 mA; –12 V, 260 mA; +6 V, 1.0 A.

WEIGHT

Net 2.25 kg (5 lb).

Shipping 3.1 kg (7 lb).

DIMENSIONS NIM-standard double-wide 6.90 x 22.13 cm (2.70 x 8.714 in.) front panel per DOE/ER-0457T.

Ordering Information

Model	Description
921E	921 EtherNIM™ High-Rate Multichannel Buffer

[3]Ron Jenkins, R.W. Gould, and Dale Gedcke, *Quantitative X-Ray Spectrometry* (New York: Marcel Dekker, Inc.) 1981, pp 266–267.

[4]The following connectors are also available:

Dual-Port Memory — ORTEC dual-port memory, 37-pin D connector.

RS-232-C — Serial standard RS-232-C 25-pin; male wired as DTE to run at 38.4 kbaud maximum, with modem control. Software selectable baud rate. (For diagnostics)