ORTEC®

digiBASE-E

High Performance, Digital Gamma Spectrometer

A Complete, All-in-One, High Performance Digital Gamma Spectrometer in a PMT Base for Scintillation Detectors.

AMETEK®
ADVANCED MEASUREMENT TECHNOLOGY

digiBASE-E

- All-in-one solution for scintillation spectroscopy in a 14-pin tube base based on high performance digital signal processing, suitable for most 10-stage PMTs.
- Ideal for most types of scintillation detectors, including NaI(Tl), LaBr3(Ce), etc.
- Integral preamplifier, HV, and digital MCA.
- Stable up to high count rates; HUGE maximum throughput[1] ~200k cps at ~530k cps input count rate.
- PHA and List Mode data acquisition plus 32-bit counter input.
- Power-over-Ethernet (PoE) makes for ease of system implementation in networks and other applications. (Standard RJ45 connector).
- Flexible gating and synchronizing of multiple spectrometers.
- Industry Standard TCP/IP protocol compatible with most networks and routers.

The digiBASE-E is a complete spectroscopy solution for most scintillation detectors. It comprises, high voltage, digital signal processing of the detector pulse stream and high performance MCA functionality all within a standard 14-pin PMT base. Connection to the controlling PC is easy; the integral Ethernet RJ45 connector features Power-over-Ethernet (PoE) allowing a simple single cable connection. A flexible system of gating logic facilitates configuration of multiple units as part of an integrated system where time synchronicity is needed. The digiBASE-E is therefore ideal for remote monitoring applications and detector networks and arrays. Various scintillators can be used with the digiBASE-E. NaI(Tl) detectors have been historically the most popular, but digiBASE-E is also compatible with the newer “lanthanum halide” scintillators such as LaBr3(Ce), which are growing in popularity.

Flexible Acquisition Modes

Both the familiar Pulse Height Analysis (PHA) acquisition mode and List Mode Acquisition are provided in the digiBASE-E.

In list mode, each (gamma ray interaction) event is recorded both with energy (as in PHA mode) and with time of occurrence (not recorded in PHA mode). This mode of data collection means that the data set can be sorted on the basis of both time and energy. This has proven invaluable in many applications such as homeland security, where, for example, a source is moving relative to a detector. Data without the source present may be discarded on the basis of time of occurrence, potentially enhancing signal-to-noise.

In addition to PHA and List Mode an external input allows the digiBASE-E to perform as a 32-bit counter.

Flexible Gating

In measurement systems employing multiple detectors, there is often a need to synchronize data acquisition (for example in a mobile gamma-ray search system the data from all detectors must be correlated to correctly map out the activity distribution over an area). DigiBASE-E provides flexible gating features; events from multiple spectrometers may be correlated to within <100-milliseconds.

This is achieved by the use of a gate input and a gate output.

The gate input can accept multiple signal types, which can be enabled from the MAESTRO MCA emulation program (supplied) or from a user program. (Command syntax is provided in the documentation.) Gate input modes are:

1. Coincidence Gate mode. In this mode, during acquisition, the gate is only open to the passage of data when this input is “True.”

2. Trigger mode (“ACQ gate”). In this mode, application of a “True” pulse to the gate will start data acquisition.

3. EVENT GATE mode. Here, when in PHA mode the presence of a “True” level will result in data being routed to an alternate spectral memory.

4. List Mode Event Gate. In this mode the presence of a TRUE level at the gate input will result in the associated list mode event(s) receiving a data tag.

The gate output is a bridged version of the gate input. It provides the “master output” for use with “slave” digiBASE-E instruments in a multi-detector system. In this mode, the master gate out connects to the slave gate(s) in.

The gate input can additionally operate as a 32-bit event counter for LVTTL pulses. The counter may be read through the MAESTRO MCA emulation software or user program.

Spectral Stabilization

NaI(Tl) detectors have a gain that is sensitive to changes in the ambient temperature and magnetic fields. DigiBASE-E incorporates a gain stabilizer to significantly diminish this sensitivity. It works by monitoring the centroid of a designated peak in the energy spectrum. The fine gain is automatically and continuously adjusted to maintain the centroid of the peak at its desired position.

[1]Actual maximum depends on the scintillation detector used; peaking time (Rise Time + Flat Top) should not be less than ~4 X the light collection time of the scintillator; i.e. NaI should not be less than about ~1-microsecond.

MCA Emulation and Spectral Analysis

MAESTRO MCA Emulator Included

The MAESTRO software provides a graphical user interface for all the controls needed to adjust the acquisition parameters, acquire the data, set the master timer digiBASE-E, and save the spectra. MAESTRO is a member of the CONNECTIONS family of ORTEC products, thus providing full networking with other ORTEC spectrometers and supporting computers. Since the digiBASE-E is a TCP/IP device, the IP address must first be defined by running the Ethernet Device Controller, then run the MCB.config program to establish communications. The final step is to start MAESTRO.

MAESTRO includes features for identifying peaks, editing libraries, and creating, printing and saving Regions of Interest (ROI), performing energy calibrations, automating tasks via using simple "Job Streams," AND MORE!

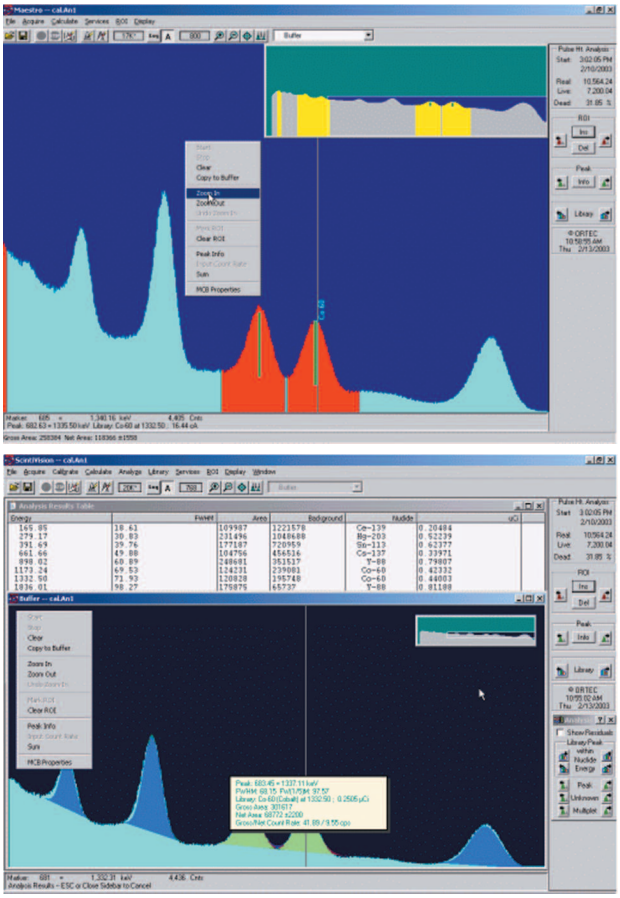
A66SV-BW GammaVision Gamma Spectroscopy for Scintillation Detectors

GammaVision software is available for applications requiring isotope identification and activity quantification. It provides the features of the MAESTRO MCA emulator, including automation of tasks through Job Streams, but adds the ability to fit and deconvolute spectral peaks for the analysis needs of more complex spectra in which peaks overlap. After analysis, results can be reviewed easily and quickly using a variety of on-screen, informative, interactive plotting routines.

GammaVision also includes the Quality Assurance features useful in monitoring system performance. Results are stored conveniently in a Microsoft Access® database for easy retrieval and review.

Create Your Own Custom Software with the A11 Toolkit

The A11 CONNECTIONS Programmer's Toolkit is available for those who wish to integrate the digiBASE-E into their own software systems. The Toolkit offers ActiveX Controls to simplify programming with LabVIEW, Visual C++, and Visual Basic. For more information on the Toolkit, ask for copies of the A11 Programmer's Toolkit brochure.



Automate complex spectral analysis with GammaVision

Specifications

Conversion Gain Range of 256 to 2048 channels. Optional 1024 or 512 selectable in MAESTRO.

Coarse Gain Jumper selectable for X1, X3 or X9.

Fine Gain 0.33 to 1.0.

Integral Non-Linearity <±0.05% over the top 99% of the range.

Differential Non-Linearity <±1% over the top 99% of the range.

Dead Time Accuracy <5% error up to 50k cps input count rate. Dead time is measured with a Gedcke-Hale Livetime clock.

Detector Bias Voltage 0 to +1200 V in steps of 1.25 V under computer control.

Offset Drift <50 ppm of Full-scale range per °C.

Gain Drift <150 ppm per °C

Presets

Live Time Up to 8.5 x 10^7 seconds in steps of 20 ms.
Real Time Up to 8.5 x 10^7 seconds in steps of 20 ms.

Trapezoid Shaping

Rise/Fall Time 600 ns minimum to a maximum of ≤2 µs.
Flat Top Time 40 ns minimum to a maximum of ≤2 µs.

Throughput Maximum throughput with the appropriate scintillator is 196k cps with a 532k cps input rate. Note that peaking time (Rise Time + Flat Top) should not be less than ~4 X the light collection time of the scintillator; i.e. NaI should not be less than about ~1 µs.

INPUTS and OUTPUTS

A-IN SMA input connector accepts LVTTL signals (+3.3 V) that function depending on the MAESTRO software GATE setting. Input impedance is 1-kΩ to +3.3 V protected to ±5 V.

COINCIDENCE GATE When input is low (false), real-time and live-time operate normally, but no counts are stored in memory. When high (true), normal acquisition occurs (cannot be used with R-TIME SYNC).

ACQ GATE When input is low (false) real-time, live-time, and data acquisition is stopped. When high (true), real-time, live-time, and data acquisition is enabled (cannot be used with R-TIME SYNC).

ROUTE GATE Routes input to spectrum 1 when high (true) and spectrum 0 when low (false). In List Mode this adds a flag to data events generated when this gate is present (cannot be used with R-TIME SYNC).

EVENT Rising edges are counted by a 32-bit event counter. The contents of the counter can be monitored on the Status tab in MAESTRO software (cannot be used with R-TIME SYNC).

TRIGGER IN Input rising edge starts the acquisition.

R-TIME SYNC When multiple digiBASE-E instruments are in List Mode and one digiBASE-E must be designated the R-Time source (Master Timer) for the other systems connected, the B-output will provide a real time synchronizing pulse that will connect to the A-input of the second digiBASE-E. The B-out will be a bridged output to provide this same real time signal to the A-input to a third digiBASE-E and so on for up to 12 digiBASE-E instruments. The final digiBASE-E should connect the B-output back to the R-Time source (master timer).

B-OUT A second SMA connector with nominal 100-Ω output Z labeled "B" provides a bridged output for the input provided to the A-IN input. This output provides the Master Sync if this digiBASE-E is designated the "Master Sync."

Interface Ethernet provides Power-over-Ethernet (PoE). RJ45 connection.

Electrical, Mechanical and Environmental

Dimensions 2.51 in. (6.38 cm) diameter x 4.7 in. (11.94 cm) length.

Weight
Net 0.79 lbs. (0.36 kg).
Shipping ~5 lbs (2.27 kg).

Power Requirements ≤3 watts from PoE.

Ambient Operating Environment –10 to +60 °C at 0 to 80% non-condensing humidity.

Synchronous Operation Operation of up to 12 each model digiBASE-E systems with one Master and all other devices slaved to the Master for time correlation of no more than 100-ms between all units.

CE Conforms to CE standards for radiated and conducted emissions, susceptibility, and low-voltage power directives.

NRTL: Certification verifies, through OSHA-approved NRTL certification authority TÜV SÜD, that the product meets U.S. electrical safety standards (UL/ANSI).

List Mode Acquisition Each valid event is converted to a digital value and transmitted to the computer along with a time stamp accurate to 160 ns.

Histogram Mode Acquisition Data is presented as a histogram inside the digiBASE-E. Data channels are 32-bits. Most significant bit is ROI bit.

Spectrum Transfer Transfer of any single spectrum to require ≤15 ms. This transfer is independent of the acquisition and does not create dead time for the acquisition of additional data.

Spectrum Stabilizer The digiBASE-E features a built-in gain and offset stabilization circuit. Stabilization is performed by providing a reference peak in the spectrum which the MCA can monitor, should drift be detected, the gain and offset of the system are adjusted automatically to correct for the drift. The stabilizer can correct for 10% of Full-Scale Reading (FSR) error in offset and uses the full-range of the Fine Gain to correct for gain errors.

Use with Lanthanum Chloride and Lanthanum Bromide Detectors The latest Lanthanum halide detectors are appearing with 12-pin PMTs for the smaller size 1" x 1" crystals on 1-1/2" PMTs and 8-stage (as opposed to 10-stage) 14-pin bases on 2 inch and 3 inch PMTs for the larger crystal sizes. If required, compatibility can be achieved through the use of adaptors. Contact ORTEC or your detector vendor for more information.

Ordering Information

Model	Description
DIGIBASE-E	DigiBASE-E High Performance, Digital Gamma Spectrometer with Single Port Injector to power one unit from Ethernet connection (PoE). Includes MAESTRO software and (2) 10 ft CAT5E Ethernet cables.
DIGIBASE-E-PKG-1	DigiBASE-E with MAESTRO and A66SV-BW Software

Optional Software/Hardware

A66SV-BW GammaVision Gamma Spectroscopy for Scintillation Detectors for identification and quantitative analysis of radioisotopes using NaI(Tl) detectors.

A11-BW Connections Programmer's Toolkit with ActiveX Controls: Write your own special software to control the digiBASE-E from LabView, Visual C++, or Visual Basic. List mode operations are available only using your own custom software.

Power over Ethernet (PoE) Single Port Injector

Specifications subject to change
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