B3001-600
Universal Multi-Detector Counting System

Introduction

The Universal Multi-Detector Counting System (UMDCS) Model B3001-600 is a self-contained electronic module designed to be used with various radioactive analysis systems employing both gamma-ray and neutron detectors. It can accommodate pulse outputs from plastic scintillators, sodium iodide detectors or ^{3}He neutron detectors.

It consists of amplifiers, discriminators, configurable single-channel analysers, and programmable microprocessor control of inputs and outputs, with custom-configurable microprocessor analysis algorithms for varied applications. It provides for communication with external annunciators, control panels, or computers via serial links utilising the RS-232, RS-485 or 4..20 mA current loop protocols at baud rates up to 38.4 kbaud. It is powered from universal mains (100-240 VAC, 47-60 Hz) or optionally +12 volts DC.

Detector Inputs

The UMDCS Model B3001-600 is provided with six independent BNC detector input channels, which can be individually configured to accept pulses from photomultiplier (PMT) tubes or ^{3}He detectors. It provides the adjustable high voltage up to 2 kV to drive these detectors and is connected to the detector via a single coaxial cable up to 60 meters (197 feet) in length.

If a single detector input is used, the other amplifier/discriminator units can be configured to serve as single-channel amplifier/discriminators to provide region-of-interest count values for different energy signals. Thus, each input can either be connected to a separate detector or, by internal switch selection, can be linked to other inputs to provide selective counting of adjustable region-of-interest count scaling, for example for gamma-ray spectrum analysis.

These inputs are high-impedance capacitive-coupled amplifier inputs with the high voltage supplied to the detector (either PMT or ^{3}He tube) through the same coax cable that carries the signal. In this way only a single cable connects the detectors to the electronic module through the BNC connectors.

### External Digital Inputs and Outputs

The UMDCS Model B3001-600 is provided with up to four digital inputs which can be used to connect external push button switches or relay contact closures to initiate programmable actions within the microprocessor. These can be used, for example, to initiate measurements on demand or when some external condition is satisfied. They can also be used to halt a measurement or initiate data downloading to an external computer via the serial communication link.

The unit also provides up to six voltage-free relay contact closure outputs to drive external annunciators, as in the case of alarm conditions, background determination, or assay completion. Some of these relay contacts can be configured to incorporate both audible and visual alarms.

Each input and output port is individually programmable as to its specific function.

Algorithm Implementation

The UMDCS Model B3001-600 is fitted with a programmable microprocessor which contains its own non-volatile memory and can be custom programmed for the specific application. It controls the acquisition of data from each of the six input channels, monitors the digital inputs, controls the digital relay outputs, and provides the communication link with the external system elements and optional computer. It can store calculation parameters, and can receive commands from the external computer to change internal equation constants, as for example, counting times, alarm cut levels, statistical variables, etc.
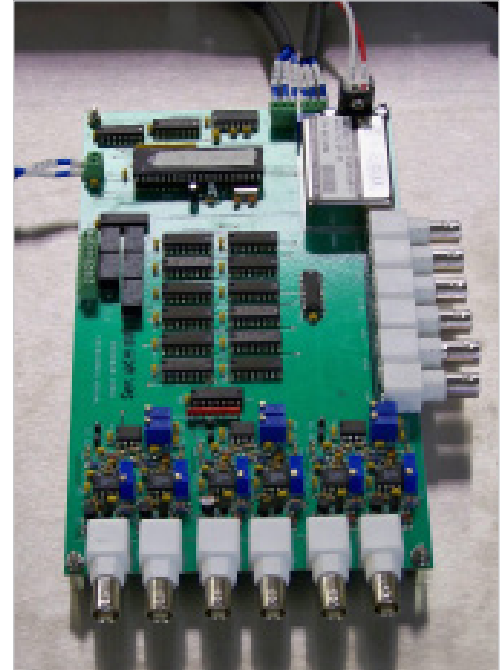
The microprocessor provides maximum flexibility in customising the unit for particular applications without making hardware changes, thus affording quick and cost-effective application versatility. As the microprocessor programming is implemented in firmware, the UMDCS Model B3001-600 is suitable for use in applications where there is a safety critical function requiring a degree of Safety Integrity Level (SIL).

Serial Communication Links

Commands and control parameters are received (when desired) and data are downloaded from the system via asynchronous serial communications links. The unit is capable of two separate UART operations via RS-232, RS-485 or 4..20 mA current loop.

Communication protocol can be set at any baud rate up to 32.4 kbaud, with 8 bit, 1 stop bit, no parity, and no handshaking used. For RS-232 communication, cable lengths up to 100 metres have been tested at 38.4 kbaud. For RS-485 or 4..20 mA current loop, communication lengths of several kilometres are feasible.

Features

- Six independent BNC input channels

- Up to four digital inputs which can be used to connect external push button switches or relay contact closures to initiate programmable actions within the microprocessor

- Up to six voltage-free relay contact closure outputs to drive external annunciators

- Programmable microprocessor which contains its own non-volatile memory and can be custom programmed

Benefits

- BNC detector input channels can be individually configured to accept pulses from PMT tubes or ^{3}He detectors

- If a single detector input is used, the other amplifier/discriminator units can be configured to serve as single-channel amplifier/discriminators to provide region-of-interest count values for different energy signals

- A single cable connects the detectors to the electronic module through the BNC connector inputs

- Flexible programmable microprocessor which can store calculation parameters and receive commands from an external computer

- RS-232 communication possible with cable lengths up to 100 metres

Specification

No. of detector inputs	Up to 6
Single Channel Analysers	6 configurable Single Channel Analysers
Detector types	Plastic scintillator, NaI or ^{3}He
Outputs	6 volt-free output relay contacts
Digital inputs	4 digital inputs
Microprocessor	ATMEL microprocessor
Communication	RS-232, RS-485, 4..20 mA current loop