Universal Detector Interface

UDI-1

Key features

- Charge sensitive amplifier
- Single channel analyzer
- RS422/485 output
- Built in diagnostics
- Rack or wall mounted

Overview

Curtiss-Wright's Universal Detector Interface (UDI-1) provides a high performance, low cost interface between detector and counting system. A flexible output stage is designed to drive long cables reliably and is compatible with standard counting electronics.

Technical specifications

Area monitoring

A major benefit of the UDI-1 charge-sensitive input is the ability to remotely site the detector from the monitoring station, either up to 100 meters remotely powered or 1km when powered locally. A single cable to a Lab Impex Systems CMS provides the necessary power and signal connection to produce a powerful and flexible area monitoring
system at minimum installation cost.

Traditional counting applications

The UDI-1 is extremely flexible
and can replace several expensive standard modules including
high voltage, pre-amp, amplifier discriminators and single channel analyzer. This can produce an extremely compact, low cost counting system when compared with a standard rack installation.

Detector inputs

The detector connects via coaxial
cable to a charge sensitive amplifier which converts negative going current pulses into positive going voltage pulses. The circuit consists of a fast operational amplifier with capacitive feedback. The amplifier input is coupled to the EHT supply by a high voltage capacitor and is protected from transient voltage spikes by fast diodes.

Linear/Log amplifier

Pulses from the input stage are routed to an amplifier with a gain range of 128 to 1 selected by a switch on the PCB. The amplifier incorporates differentiation and integration shaping with pole zero cancellation for improved performance at high count rates. The standard linear transfer function can be modified to a quasi-logarithmic response for dynamic range compression. This is ideal for separating pulses of wide energy range e.g. for a combined Alpha/Beta detector. A high speed version (UDI-1HS) is available for extra high count rate operation (up to 106cps).

Analyzer/Discriminators

From the amplifier the pulses are fed to a pair of comparators with independent thresholds which can be set by two multi-turn potentiometers or, optionally, by external DC control voltages.

A pluggable link on the PCB configures the circuit as a single channel pulse-height analyser (window discriminator) or as two independent discriminators. The comparator input pulses are also available at the external connector for routing to a multi-channel analyzer if required.

Outputs

Pulses within the analyzer window range generate fixed width output pulses for subsequent counting.

Two types of output signal are provided:

- Differential (RS422/485 levels) for driving twisted pair cable to a remote counter/ratemeter (e.g. CMS Gamma)
- Positive 5V TTL pulses to drive standard counting electronics. As an aid to setting up and for fault diagnosis the output pulses trigger a bi-color LED mounted in the end panel.

Technical specifications

High voltage supply

A stabilized adjustable high voltage supply is incorporated, suitable for a range of different detectors. The output is via a PET100 socket which is common to the pre-amp input allowing connection to the detector with a single coaxial cable. The voltage is normally set with a multi-turn potentiometer mounted on the PCB. It may also be controlled from an external DC voltage, or an optional external control mounted on the end panel.

Power requirements

An internal regulator allows the UDI to work with an unstabilized DC supply of 10-20V. The LED on the UDI end panel shows 'Green' to indicate that power is connected.

Cable requirements

Detector: High voltage coaxial cable: PVC sheath LIIC-N Flame retardant sheath LIIC-F

Output: Screened dual twisted pair: PVC sheath LIOC-NFlame
retardant sheath LIOC-F

Test facilities

The UDI was designed to simplify setting up and troubleshooting. An on-board 10kHz test oscillator can be enabled to inject pulses at the detector input. One the end panel
is a bi-color LED which changes from 'Green' to 'Red' when output pulses are present giving instant visual confirmation of operation.

The amplifier output (analyzer input) pulses are available at the external connector for monitoring with an oscilloscope or multichannel analyzer. By grating the amplified pulses with the analyzer output, the threshold levels can be optimized using an MCA to display the window settings as they are adjusted.

Fifteen test points are provided on the UDI printed circuit board.
A comprehensive installation and maintenance manual is supplied with each unit along with two mating connectors and a detector mounting clip.

Performance specifications

UDI-1 performance specifications	
Configuration guide models	• UDI-1G: Geiger-Muller Version (single discriminator) • UDI-1S: Scintillation/Proportional Version (pulse height analyzer) • UDI-1HS: High Speed Version of UDI-1S
Amplifier	• Charge sensitive input connected to high voltage supply • Maximum Sensitivity: 10-13C (2 x 10-11 for G version) • Gain Adjustment: x1 to x128 in 8 steps • Input Capacitance: 20nF • Pulse Shaping (S): Double differentiation, single integration with pole/zero cancelling • Pulse Shaping (G): Single differentiation, single integration (G) • Shaping Time Constant: 3µs
Analyzer/Discriminator	• Two comparators with adjustable thresholds configurable as independent discriminators or single channel analyzer • Input Range: 1 to 3V • Adjustment: Multi-turn potentiometers (optional voltage control) • Modes: Low level/high level or SCA plus high level • Resolving Time: 5µs
Pulse outputs	• RS422/485 differential driver for remote monitoring. Two standard outputs for local counting • Standard Outputs: 0.4 to 5V typical • Remote Outputs: 0.8 to 3.5V • Pulse Width (S): 2µs • Pulse Width (G): 15µs
High voltage supply	• Voltage Range: 20 to 1500V • Current: 500µA max • Ripple: 20mV max • Stability: 0.01% per ºC • Adjustment: Multi-turn potentiometer (voltage control optional)

Performance specifications

UDI-1 performance specifications	
General	• Supply Voltage: +10 to +20VDC • Maximum Current: 100mA • Operating Temperature Range: -10 to +45ºC • Storage Temperature Range: -25 to +70ºC • Weight Nett: 0.52kg

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