FDI2056: THE FIRST OFF-THE-SHELF INSTRUMENT TO QUANTIFY MAGNETIC FIELD TRANSIENTS

The Fast Digital Integrator FDI2056 is the world's fastest and most sensitive voltage integrator. Plug in a sense coil, and for the first time it is possible – even easy – to measure fast, low-level magnetic field disturbances such as eddy currents in a switched magnet.

- Speed: up to 500 000 partial integrals per second
- Resolution: down to 10^{-14} Vs (0.8 µV x 12.5 ns)
- Drift: 10^{-5} Full Scale / minute
- Input voltage: up to ±100 V
- Accuracy and stability in the ppm range
- Trigger sources: external, timer, encoder, software, multichannel
- Number of channels: up to 3
- Interfaces: Ethernet (IEEE 488.2 compliant) or RS-232 (PDI5025 emulation)

The Fast Digital Integrator card is manufactured under license from the European Organization for Nuclear Research (CERN). Based on two decades of experience building the world's accepted standard for precision integrators, the PDI5025, Metrolab has added major enhancements to this card: improved time resolution and trigger rate; synchronized acquisition on multiple channels; a hardware-optimized digital integrator; and a large on-board data buffer.

THE WORLD'S FASTEST VOLTAGE INTEGRATOR

Equipped with a high-speed Analog-to-Digital Converter (ADC), high-resolution clock, and highly optimized digital integrator, the FDI2056 boasts a maximum of 500 000 partial integrals per second: 500 times faster than the Metrolab PDI5025, the previous state-of-the art solution!

Measure with fast rotating coils

Capture rapid transient signals, such as eddy currents and decay & snapback

UNRIVALLED RESOLUTION AND ACCURACY

The FDI2056's programmable gain amplifier, high-resolution ADC and high-resolution clock provide resolution down to an astounding 10^{-14} Vs. The low-noise and high-stability digitizer, high-precision clock, self-calibration, and automatic drift compensation combine to guarantee an accuracy of 10 ppm.

Capture low-level disturbances

Measure magnetic fields with accuracy surpassed only by NMR techniques

Check the integrated field of an undulator magnet quickly and accurately

SOPHISTICATED TRIGGER SUPPORT

The FDI2056 "trigger factory" allows triggering flux measurements with an external signal, internal timer, position encoder, or software command.
All commonly used linear or rotating encoders are directly supported.
Sophisticated trigger programming allows prescaling, counting, and combining sources.

Trigger flux measurements precisely

Choose most appropriate trigger source(s)

Eliminate electronics for trigger logic

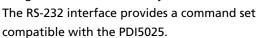**Synchronize** triggers on all channels

Most importantly, Metrolab delivers a complete and user-friendly instrument with a standard communication interface and extended triggering facilities.

The system includes a chassis with industrial computer, one to three channel cards, calibration, software, documentation, and field upgrade support.

INTERFACES: INDUSTRY-STANDARD OR PDI5025-COMPATIBLE

The FDI2056 can be configured to use an Ethernet or an RS-232 interface. The Ethernet interface is compliant with the standards used by most major instrument suppliers, and controls the instrument's full functionality using a standard VISA library.
The RS-232 interface provides a command set compatible with the PDI5025.

Control the FDI2056 using industry standard VXI-11 and SCPI protocols

Integrate the FDI2056 using the widely available and proven VISA library

Upgrade from a PDI5025 to FDI2056 without rewriting your software

STANDARD, CUSTOMIZED OR EMBEDDED SOFTWARE

The FDI2056 includes a LabVIEW application to handle common data acquisition, correction, analysis and recording tasks. For special requirements, custom programming is easy, with full documentation, an Application Programming Interface (API), and source code. For industrial environments, the software can be hosted on the instrument's built-in industrial computer.

Get started immediately, using the standard FDI2056 software for Windows or Mac

Integrate the FDI2056 into a data-acquisition system using Metrolab's API

Shrink system size by eliminating a separate host computer

FIELD UPGRADEABLE

The FDI2056 is designed with future enhancements in mind, and is upgradable on all levels – hardware, firmware and software. Users can download upgrades from the Metrolab web site and install them in the field.

Benefit from the latest improvements

Protect your long-term investment

Adapt to new research challenges

FDI2056: TECHNICAL SPECIFICATIONS

DIGITIZER

Gain	0.1, 0.2, 0.4, 0.5, 1.0, 2, 4, 5, 10, 20, 40, 50, 100	–
Dynamic range	±10 ÷ Gain	V
Input overvoltage protection	±15 ÷ Gain	V
Max common mode voltage	12 ÷ Gain	V
Max input bandwidth	250 @ Gain ≤ 10, decreasing to 25 @ Gain 100	kHz
Noise floor (@ 1 kHz bandwidth)		
Input impedance	200	kΩ
Gain accuracy	10	ppm
Digitizer resolution	18	bit
Max sample rate	500	kS/s
Nonlinearity: Single Tone	-105	dBc
Nonlinearity: Dual Tone	-95	dB

INTEGRATOR

Timer resolution	12.5	ns
Time base stability over temperature	±0.075 (0 to 60° C)	ppm
Time base stability over time	$< 5 \times 10^{-4}$ (30 s) ± 0.7 (1 year)	ppm
Drift	10^{-5}	FS / min (1)
Drift variation	typical < Noise Floor ÷ 5	Vs / s

COMMON

Trigger sources		External, timer, encoder, software, multichannel	
Trigger rate		0.02 to 500k	Hz
Encoder input:			
	Voltage	3.3 or 5	V
	Current protection	750 (Hold), 1500 (Trip)	mA
	Signal type	Single-ended or differential	
	Index type	None, or 90° – 270°	
Memory capacity		1M	PI (2)

SYSTEM

Industrial computer	Intel x86 architecture, Windows OS, 16 GB RAM, 32 GB Flash drive, Ethernet, USB 2.0 (3)	
Number of channels	1 – 3	
Ethernet interface	VXI-11 (IEEE 488.2), SCPI compliant	
Max transfer rate (Ethernet)	1000 (3)	PI / s (2)
RS-232 Interface	PDI5025 compatibility mode	
Power requirements	100 – 240 V, 50 – 60 Hz, 80 A inrush current max	
Operating temperature	0 – 40	°C
Size and weight	445 x 130 x 245 mm (19" x 3U), 7.2 kg max	
Mounting	Horizontal or vertical, optional rack-mount kit	
Recommended calibration interval	12	months

(1) FS = Full Scale.
(2) PI = Partial Integral, including timestamp.
(3) Subject to change; contact Metrolab for exact specifications.

For detailed specifications,
please see http://www.metrolab.com.

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