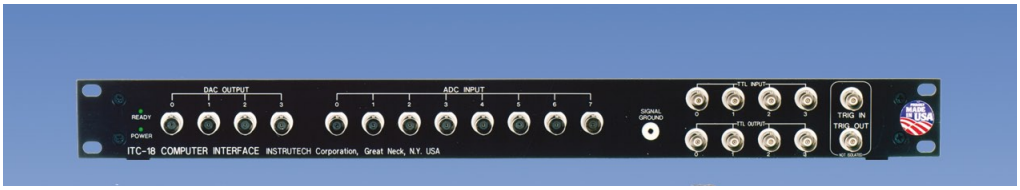
InstruTECH ITC-18

16-bit Multi-Channel Data Acquisition Interface



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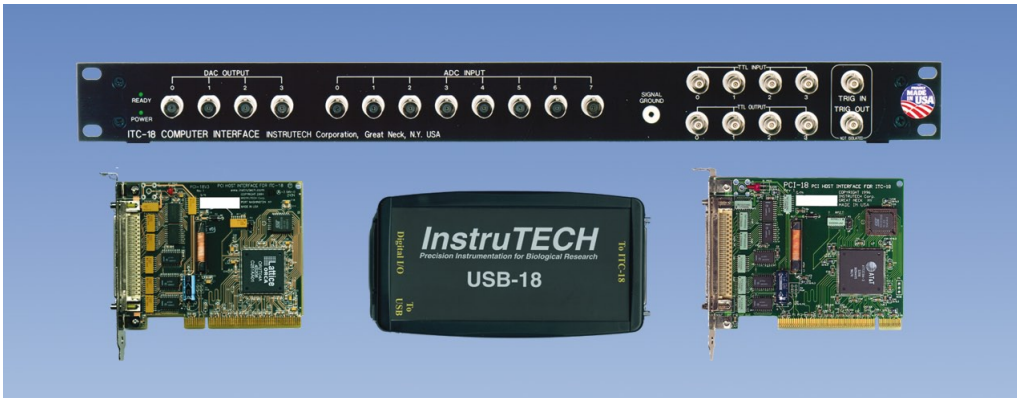

Introduction

ITC-18, the second generation low-noise 16-bit data acquisition interface designed by InstruTECH. The ITC-18 offers unsurpassed capability while retaining all of the exceptional features of its predecessor, the ITC-16. The ITC-18 provides a major improvement in the quality of acquired data making measurements that would otherwise not be possible.

Main Features

- All synchronous analog and digital channels are optically isolated
- Eight differential simultaneously sampling analog input channels
- Eight 18-bit 200kHz A/D converters
- 200 kHz to 12 Hz sampling in 1.25 µs steps (200 kHz max aggregate)
- Programmable input gain: ±1, 2, 5 or 10 Volts
- Analog input / output range: ± 10.24 Volts
- Four pseudo-differential analog output channels
- Four 18-bit instrumentation grade D/A converters
- Sixteen synchronous digital input channels
- Thirty-two synchronous digital output channels, fourteen with current sink
- Sixteen asynchronous digital output channels
- Large 1024 Kilosample FIFO
- PCI and USB 2.0 host interfaces available
- Compatible with Windows (2000, XP, Vista), Mac OS X (PPC and Intel), LabVIEW for Windows, MATLAB and Linux

Hardware Configuration

The ITC-18 is an external rack-mountable data acquisition unit that is attached to the computer using a dedicated host interface. This configuration offers major advantages over traditional data acquisition designs in regard to lower noise performance.

Another advantage is the capability to use the analog front end (ITC-18 rack unit) with a variety of host interfaces. Moving the ITC-18 from one computer platform to another is a simple matter of using the appropriate host interface and installing compatible software. Utilizing the same data acquisition hardware provides a cost effective upgrade path to newer technologies without sacrificing the initial investment.

Optical Isolation

The analog electronics of the ITC-18 are optically isolated from the digital circuitry of the computer. This provides complete electrical isolation between the computer and the measuring equipment. The ITC-18 has a completely separate analog ground that is isolated from the computer ground.

The optical isolation of the ITC-18 brings with it another benefit that simplifies complex measurement systems. Since the analog inputs and outputs of the ITC-18 float with respect to power ground, the ITC-18 and the computer are not a source of ground loop problems.

Analog I/O

A unique design characteristic of the ITC-18 is the synchronization of all analog and digital signals. All inputs and outputs are updated simultaneously. Most data acquisition devices on the market do not do this. They sample multiple channels by using a multiplexer. This means that there is a time delay between the samples from each channel. This makes timing correlation measurements difficult.

The ITC-18 provides eight analog input channels. Each input channel uses an 18-bit A/D converter preceded by a programmable gain stage. Each A/D input can be programmed with a full scale range of ±1, ±2, ±5, or ±10 Volts. This gain stage reduces the need for external signal amplifiers before the ITC-18. Using separate A/D converters for each analog input channel also has the advantage of no measurable cross talk between channels.

The ITC-18 provides four 18-bit instrumentation grade D/A converters featuring high accuracy with less than 1 bit (~300 µV) of noise. This extremely low noise allows for the observation of least significant bit transitions. The D/A circuitry used in the ITC-18 is temperature stabilized and "De-glitched" for ideal performance.

This architecture makes the ITC-18 particularly important when making measurements using high-frequency signal sources, multiple signal sources with large differences in amplitude between them or when analyzing multiple signals for timing correlation.

Digital I/O

The ITC-18 provides sixteen digital inputs, thirty-two digital outputs, seven sequence RAM trigger outputs and fourteen asynchronous non-isolated digital outputs. The digital input channels feature level sensitive or latched modes. For maximum versatility the inputs can be inverted allowing rising or falling edge triggering. Thirty-two digital output channels in two banks of sixteen, with fourteen channels paralleled with current sink circuitry, for driving perfusion valves or other devices directly.

FIFO Memory

The ITC-18 is supplied with a large 1024 Kilosample FIFO memory for input and output data. A large FIFO memory allows uninterrupted continuous hi-speed acquisition with today's multitasking operating systems.

Specialized Applications

The ITC-18 uses programmable gate arrays that allow the internal hardware to be altered for specialized applications. One available application is the *Artificial Synapse Dynamic Clamp*.

Software Control

** All drivers are available for download.*

Mac OS X (PPC & Intel)*
- Driver and Framework Library
- WaveMetrics IGOR Pro XOPs
- PATCHMASTER, CHARTMASTER
- AxoGraphX
- InstruTECH AcquireT

2000, XP, Vista*
- Kernel Driver and DLL Library
- WaveMetrics IGOR Pro XOPs
- National Instruments LabVIEW
- Patchmaster, Chartmaster, Pulse, X-chart, Tida
- InstruTECH AcquireT and Ecell
- Strathclyde WinWCP
- AxoGraphX

Linux*
- Driver and C/C++ Library

Host Interfaces

USB-18	USB v2.0 high-speed (480 Mbps) interface
PCI-18	short, 32-bit, 33 MHz, 5 Volt PCI bus mastering
PCI-18v3	short, 32-bit, 33 MHz, 3.3 Volt PCI bus mastering

A note about Power Mac G5 computers: Apple has once again changed the PCI expansion slots on their G5 desktop computers. The latest release, as of November 2005, has PCI Express bus architecture. This is also true for the Intel-based Mac Pro desktop computers. The PCI-18 and PCI-18V3 cards are NOT compatible with the PCI Express bus. For these new systems, the USB-18 host interface is available. Power Mac G5 computers before November 2005 used PCI-X expansion slots. These systems are compatible with either the PCI-18V3 or the USB-18 host interface.

Product Content

- One rack mounted ITC-18 interface unit
- One host interface (choice of PCI-18, PCI-18v3, USB-18)
- One printed manual
- Cables to connect the ITC-18 to the host interface and the PC and to the power line

Item No.:
- *ITC-18/PCI-18 (ITC-18 with PCI-18 for 5V PCI bus)*
- *ITC-18/PVI-18v3 (ITC-18 with PCI-18v3 for 3.3V PCI bus)*
- *ITC-18/USB-18 (ITC-18 with USB-18 for USB 2.0)*

Technical Specifications

Analog Input:

Number of channels	8, differential, optically isolated
Type of ADC	successive approximation
Input connector	BNC
Resolution	18-bit converter
16-bit data	(1 in 65536)
Acquisition rate	200 kHz aggregate
Input range	-10.24 to +10.239 Volts
Aperture delay	10 ns
Aperture jitter	50 ps rms
Conversion speed	software selectable, 5 µs min
Differential nonlinearity	±0.002% of FSR
Drift	±50 ppm/ °C
Input impedance	1 M_
Signal-to-noise ratio	+90 dB
Crosstalk	<1 LSB

Programmable Gain:

Gain	software selectable 1, 2, 5 or 10 V/V
Settling time	3.5 µs to 0.01% all gains
Nonlinearity	±0.0003% of FSR
Max. input voltage	±40 Volts
Input CMRR	100 dB

Digital Inputs:

Digital inputs	16, logic level, optically isolated
Input type	CMOS logic compatible
Operational mode	software selectable level sense / latching active high / active low
Minimum pulse width	150 ns
Input connectors	bits (0 to3) on front panel BNC 16 bits on rear panel connector
Max. input voltage	±40 Volts

Trigger Input:

Number	1, hardware selectable isolated / non-isolated
Input type	CMOS logic compatible
Operational mode	software selectable edge mode and invert sense
Minimum pulse width	150 ns
Input connector	BNC on front panel
Max. input voltage	±40 Volts

Analog Output:

Number of channels	4, pseudo-differential optically isolated
Type of DAC	double buffered, multiplying
Output connector	BNC
Resolution	18-bit converter 16-bit data (1 in 65536)
Output range	-10.24 to +10.239 Volts
Conversion speed	software selectable, 5µs max
Gain error	0.2% of FSR
Gain linearity	<2 dB
Gain drift	±25 ppm of FSR/ °C
Signal-to-noise ratio	116 dB

Output impedance	200 _ (for output overload pro tection)
Short circuit to ground	indefinite
Output load current	8 mA typical

Trigger Output:

Number	1, selectable isolated / non-isolated
Output driver	AC, HCT, ACT, HCT, VCT, or 8 TTL loads
Output connector	BNC on front panel
Max. output current	6 mA

Digital Outputs:

Standard

Number	32, optically isolated
Output driver	AC, HCT, ACT, HCT, VCT, or 8 TTL loads
Output connectors	bits (0 to 3) on front panel BNC 32 bits on dual 50 pin connector

High current drive

Number	14, optically isolated
Output driver	AC, HCT, ACT, HCT, VCT, or 8 TTL loads
Output connector	14 bits on DB-25 pin connector
Output sink current	350 mA maximum

Asynchronous outputs

Number	16, non-isolated
Output driver	HC logic compatible
Output connector	34 pin connector

Sequencer outputs

Number	7, optically isolated
Output driver	AC, HCT, ACT, HCT, VCT, or 8 TTL loads
Output connector	7 bits on dual 50 pin connector

FIFO Memory:

Standard	1024 kilo sample FIFO

Power Requirements:

Input Voltage	85-264 VAC
Input Frequency	47-440 Hz
Maximum Power	15 Watts

Dimensions:

Width	47.5 cm (19 inches)
Height	4.375 cm (1.75 inches)
Depth	26.25 cm (10.5 inches)
Weight	3.6 kg (8 pounds)

Warranty:

Duration	One year parts and labor

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