



# instruNet Series Direct Sensor to Data Acquisition



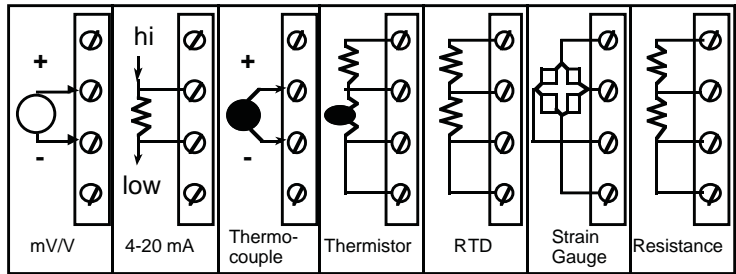
iNET-100

iNET-100B



**\$1480**  
Basic System  
With Software

- ✓ High Accuracy Data Acquisition for Windows 95/NT & Macintosh Computers
- ✓ 16 Single-Ended/ 8 Differential 14 Bit Analog Inputs, 8 Analog Outputs and 8 Digital I/O
- ✓ Controller Card Includes 10 Counter/Timer Channels
- ✓ Direct Connect to RTD, Thermocouple, Voltage, Thermistor, Bridge and Strain Gage Sensors
- ✓ 166 Ks/sec Throughput to RAM or Disk
- ✓ Each Channel has Independently Programmable Analog



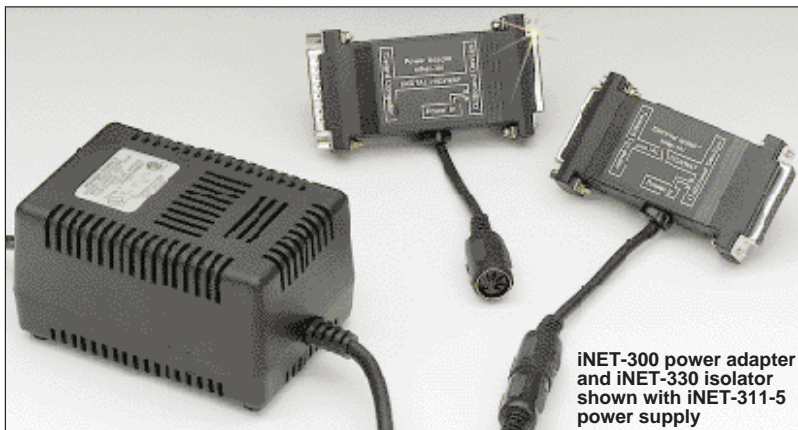
## Filters, Integration Time, Voltage Range and Sample Rate

- ✓ Programmable Digital Filters on All Channels
- ✓ Includes Strip/Chart Software and Drivers for C, Visual Basic, HPVEE, and TestPoint
- Optional LabVIEW Drivers are available.

instruNet provides ten's of microvolts of absolute accuracy instead of ten's of millivolts, at the same cost and at the same throughput rates as typical general purpose data acquisition boards. It does this with a completely different topology where the analog electronics are close to the sensor in electrically quiet boxes outside your PC, and noisy digital electronics are left inside the computer. The external boxes contain signal conditioning amplifiers for each channel and can directly attach to sensors such as thermocouples,

thermistors, RTD's, strain gages, resistance sources, current sources and voltage sources. The box returns engineering units to your PC (e.g. °C, Volts, Amps).

At the heart of the real-time system is a PCI or PC-card controller board that plugs into a Windows 95/NTx86 or Macintosh computer. Each controller contains a 32 bit microprocessor with 256KB of RAM that manages the external "network" of devices. All real-time tasks are off-loaded to this processor, therefore the host computer is not burdened with real-time issues. Each instruNet iNET-100 box provides, 16 single-ended/8 differential analog inputs, 8 analog outputs and 8 digital I/O lines. The iNET-100 includes 44 screw terminals. The iNET-100B version adds 16 BNCs for analog inputs. The controller's themselves provide 10 counter/timer channels each of which can function as a digital input bit, a digital output bit, a clock output channel or a period measurement input channel.



**INET-300 power adapter and INET-330 isolator shown with INET-311-5 power supply**

### Distributed and Expandable

The instruNet system is ideally suited for distributed measurement and control systems. The network cable can extend up to 1000 feet. Each controller card in the PC can connect to up to 16 instruNet boxes for a total number of 256 analog inputs, 128 analog outputs and 128 digital I/O. For additional inputs, multiple controller cards can be placed in one computer with the maximum number of controller cards limited only by the number of available slots in the computer. Since each controller card has its own microprocessor, multiple cards do not place any additional burden on the computer. It should be noted that multiple instruNet boxes on a single network may degrade the maximum system throughput of 166Ks/sec.

### Performance

The instruNet system supports the digitizing of multiple channels at a maximum aggregate sample rate of 166Ks/sec, where each channel can be digitized at its own rate. This maximum rate decreases when: the total cable length increases, optical isolation is used, digital filtering or plotting is enabled, more boxes are added, more channels are digitized, amplifier gain is increased, or spooling to disk is added. Each channel can be independently digitally filtered with low-pass, high-pass, band-stop and band-pass filters; where the filter specification for each channel is independently set in software.

Each channel provides a programmable analog low pass filter with programmable A/D measurement integration time. The network can be hundreds of feet long and can support multiple hardware devices connected together in a daisy-chain configuration. The start of digitizing can be triggered from any channel. There are no jumpers or pots; the system automatically self-calibrates on power-up. Since instruNet is modular, it can easily be expanded as needs evolve. One can easily move the system hardware from one computer family to another, since the various controllers are functionally identical.

### High Current Version (HC)

The INET-100 and INET-100B devices only support 4 mA of excitation current. Certain sensors such as strain gages and other bridge transducers require greater excitation current. The INET-100HC provides up to 15 mA of excitation current. Since the HC version has a greater power demand, an external power supply must be used. The INET-311-2, should be used for one INET-100HC and INET-311-5 can be used to power up to three INET-100HC boxes.

### Software

"instruNet World", is a FREE application program. It manages, monitors and operates the instruNet system. It digitizes long continuous waveforms, spools them to disk, views incoming waveforms in real-time and then allows post acquisition viewing-much like an oscilloscope or strip chart recorder.

instruNet World provides a spreadsheet-like environment where one can set and view channel parameters such as sensor type, integration time, analog filter, and digital filter. Each channel has its own row in the spreadsheet, with the various options in the columns.

instruNet is also compatible with a variety of off-the-shelf software products including TEST Point, HPVee, SuperScope II Macintosh; Microsoft Excel 8 for Windows, DasyLab and Labtech Notebook (consult the factory for the availability of DasyLab and Labtech drivers).

For users writing their own programs, instruNet includes drivers callable from any 32 bit C compiler, and Visual Basic (v4.0 or greater). The driver includes a main routine, called "iNet()", that reads or writes any of the options or channels on the system. Optional drivers are also available for LabVIEW software.

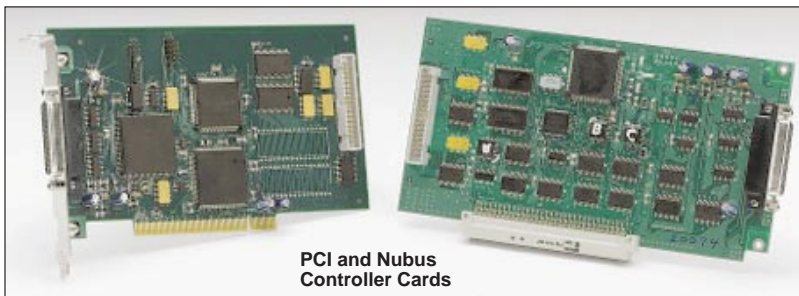
### instruNet BASIC

The iNet-350 accessory adds optional software support for instruNET BASIC. This software enables users to automate the setting up of channels, digitizing, viewing results, and saving to disk. It is predicated on the BASIC programming language and features many additional commands that facilitate working with instruNet hardware. instruNet BASIC builds on the instruNet World strip chart recorder by automating common tasks done at experiment time.

### Power Requirements

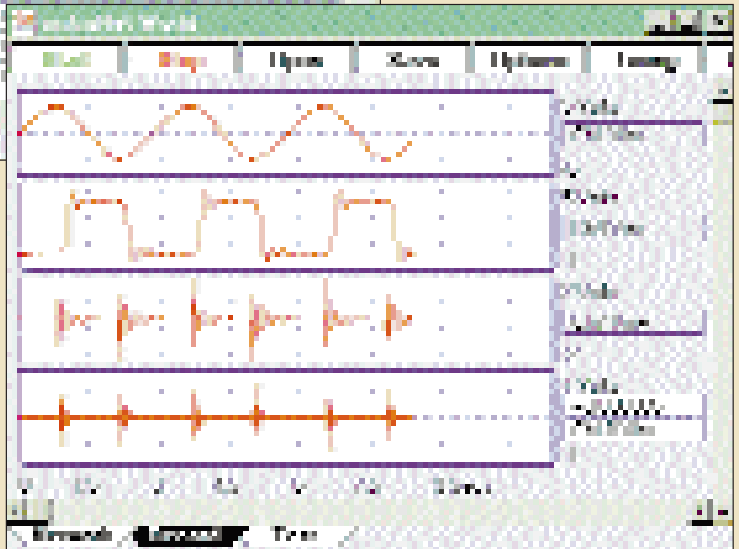
Since instruNet is powered directly from the iNET-200/2200 controller card, it is possible to exceed the power capacity of the controller card if multiple instruNet iNET-100 boxes are attached to a network. For systems with more than 3 (1 in the case of the PC-card controller) instruNet boxes on a network, external power is required. Two power adapters are available, the iNET-300 power adapter and the iNET-330 adapter/isolator. Both devices connect in line with the instruNet communications cable, the iNET-300 provides power only, the iNET-330 provides power and electrical isolation between the iNET-100 boxes and the computer. Isolation is useful in eliminating ground loop problems. Both the iNET-300 and iNET-330 require either the iNET-311-2 or iNET-311-5 power supply. The INET-311-2 can power three INET-100/100B or one INET-100HC. The INET-311-5 can power 5 INET-100/100B or three INET-100HC.

The iNET-230 controller card does not provide power, the iNET-311 or iNET-312 power supply must be used with this card.



**PCI and Nubus Controller Cards**

Function	Status	Input	Wave	Data	Manual	Address
1 Channel	Valid	16-bit Input	1-bit	20 MHz	Remote	
1.01 Chan	12/07	-0.000000	50%	1%	Follow	
1.02 Chan	12/07	-0.000000	50%	1%	Follow	
1.03 Chan	12/07	-0.000000	50%	1%	Follow	
1.04 Chan	12/07	-0.000000	50%	1%	Follow	
1.05 Chan	12/07	-0.000000	50%	1%	Follow	
1.06 Chan	12/07	-0.000000	50%	1%	Follow	
1.07 Chan	12/07	-0.000000	50%	1%	Follow	
1.08 Chan	12/07	-0.000000	50%	1%	Follow	
1.09 Chan	12/07	-0.000000	50%	1%	Follow	
1.10 Chan	12/07	-0.000000	50%	1%	Follow	
1.11 Chan	12/07	-0.000000	50%	1%	Follow	



instruNet World Data Acquisition Software included with the instruNet System

### Thermocouple Ranges/Accuracy

Thermocouple	Range	Accuracy
<b>J</b>	-210 to -100°C -100 to 1200°C	±0.8°C ±0.5°C
<b>K</b>	-200 to -50°C -50 to 1360°C	±0.8°C ±0.6°C
<b>T</b>	-200 to -100°C -100 to 400°C	±0.8°C ±0.5°C
<b>E</b>	-200 to -60°C -60 to 1000°C	±0.7°C ±0.5°C
<b>R</b>	-50 to 70°C 70 to 1768°C	±3.5°C ±2.0°C
<b>S</b>	-50 to 150°C 150 to 1768°C	±2.8°C ±1.8°C
<b>B</b>	250 to 600°C 600 to 1300°C	±3.8°C ±2.0°C
<b>N</b>	-200 to -110°C -110 to 1260°C	±1.3°C ±0.8°C

Accuracy includes cold junction compensation, voltage measurement and linearization errors.

### Voltage Range/Accuracy

Voltage Range	Integration (Seconds)	Accuracy
±5 V	1 ms none	±700µV ±1500µV
±0.6 V	1 ms none	±75µV ±150µV
±80 mV*	1 ms none	±15µV ±45µV
±10 mV*	1 ms none	±10µV ±30µV

\*±80 mV and ±10 mV are nominal ranges, the actual ranges may be as low as ±78 mV and ±8 mV respectively

### RTD Accuracy Ranges

RTDs with  $\alpha = 0.00385$  and  $0.00392$  supported. One user supplied shunt resistor per RTD channel is required.

RTD	Range	Shunt	Accuracy
100Ω	0 to 200°C	1KΩ	±0.37°C
100Ω	0 to 850°C	2KΩ	±1.0°C
500Ω	0 to 200°C	4.7KΩ	±0.38°C
500Ω	0 to 850°C	10KΩ	±0.9°C
1000Ω	0 to 200°C	10KΩ	±0.36°C
1000Ω	0 to 850°C	20KΩ	±0.85°C

**Specifications**

**Analog Inputs**

**Number:** 16 single-ended/8 differential

**Resolution:** 14 bit

**System Throughput:**

166K samples/sec

**Signal To Noise Ratio:** 78 dB

**Linearity:** Differential  $\pm 1.5$  LSB;

Integral  $\pm 2$  LSB

**Input Overvoltage Protection:**  $\pm 15$ V

**Input Impedance:**  $>22$ M $\Omega$ , 3pf

**Common Mode Voltage:**

$\pm 5$ V min (CMR  $\pm 80$  dB)

**Gain and Offset Drift:**  $\pm 5$  ppm/ $^{\circ}$ C of 5V

FSR; offset self calcd to 0

**Thermistor Accuracy/Ranges**

All OMEGA 44xxx series thermistors supported. (Contact factory for other thermistors.) One user supplied shunt resistor per thermistor channel is required.

Range	Shunt	Accuracy
-80 to 40 $^{\circ}$ C	47K $\Omega$	$\pm 0.2^{\circ}$ C
0 to 70 $^{\circ}$ C	4.7K $\Omega$	$\pm 0.1^{\circ}$ C
0 to 200 $^{\circ}$ C	200 $\Omega$	$\pm 0.4^{\circ}$ C

**Analog Outputs**

**Number:** 8

**Resolution:** 8 bit

**Output Range:**

$\pm 5$ V @ 5 mA for iNET-100/100B, 15 mA for iNET100HC

**Output Protection:**

Short-to-ground continuous

**Output Settling Time:**

4 $\mu$ s (to  $\pm 1/2$  LSB,  $\pm 5$  V step)

**Analog Output Accuracy:**  $\pm 0.4\%$

**Digital Coupling:**  $\pm 20$  mV

**Gain and Offset Drift:**  $\pm 10$  ppm/ $^{\circ}$ C of 5 V FSR; and  $\pm 5\mu$ V/ $^{\circ}$ C offset drift

**Digital I/O**

**Number:** 8 non-latching inputs and 8 latching outputs at 8 bi-directional screw terminals

**Input Levels:**

$V_{IH} = 3.2$  Vmin to 12 Vmax;

$V_{IL} = 1.0$  Vmax to -12 Vmin

$I_{IH} = -200$   $\mu$ A,  $V_i = 3.2$  V;

$I_{IL} = -0.5$  mA max.

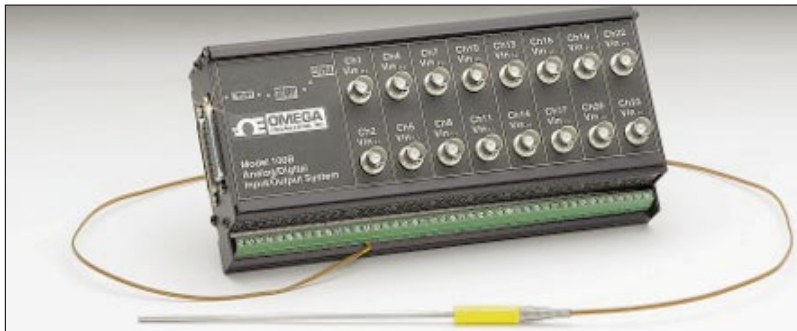
**Output Levels:**

$V_{OH} = 2$  V min to 5 V max;

$I_{OH} = -0.5$  mA max.

$I_{OL} = 500$  mA max,  $V_O = 1.7$  V;

$I_{OL} = 50$  mA max,  $V_O = 0.7$  V



To Order (Specify Model No.)

Model No.	Price	Description
iNET-100	\$890	instruNet external A/D box with screw terminal connections
iNET-100B	990	instruNet external A/D box with screw terminal and BNC connections
iNET-100HC	990	Same as iNET-100 with 15 mA excitation current.
iNET-200	590	PCI -Bus controller card for Windows 95/NT or Macintosh computers (controls up to 16 iNET-100's)
iNET-220	590	Nubus controller card for Macintosh computers (controls up to 16 iNET-100's)
iNET-230	590	PC-Card controller, type II (requires iNET-311 or iNET-312)

The iNET-2xx controllers include a complete user's manual, instruNet World data acquisition software, driver software and network terminator.

The iNET-100/100B includes a 10 ft. cable for connecting the iNET-100/100B to the controller card or other iNET-100/100Bs. iNET-100 can read 1 thermistor/RTD/strainage or loadcell max. iNET-100HC can use 8.

**Ordering Example:** iNET-100 external A/D box and iNET-200 controller card, \$890 + 590 = \$1480.

**Accessories**

Model No.	Price	Description
iNET-300	\$60	Power adapter, required if using more than 3 iNET-100 boxes with the PCI and NuBus controller card or if using more than 1 iNET-100 box with the PC card controller (no signal isolation, requires iNET-311 or iNET-312 power supply)
iNET-330	290	Optical isolator, isolates signal and power lines (replaces iNET-300, requires iNET-311 power supply)
iNET-311-2	60	Power supply, 110V to 5V/0.8A & $\pm 12$ V/0.24A, used with iNET-300/ 330/230 (powers 3 iNET-100/100B or 1 iNET-100HC)
iNET-311-5	130	Power supply, 110V to 5V/2A & $\pm 12$ V/0.5A, used with iNET-300/330/230 (Powers 5 iNET-100/100B or 2 iNET-100HC boxes)
iNET-322-5	130	Power supply, 220V to 5V/2A & $\pm 12$ V/0.5A, used with iNET-300/330/230 (Powers 5 iNET-100/100B or 2 iNET-100HC boxes)
iNET-340	50	DIN rail mounting brackets for one iNET-100
iNet-34S	75	34 pin screw terminal panel, breaks out digital I/O on iNET-2xx controller (requires iNET-34W3F cable)
iNET-34W3F	25	3 ft 34 wire ribbon cable to connect iNET-34S to iNET-2xx controller card
iNET-350	390	instruNet BASIC software option, includes disk, manual and software license
iNET-380	195	LabVIEW drivers for Mac and Windows 95
OMX-R(*)	10	Precision shunt resistor, insert resistance code.

\*Note: Insert resistance code in Ohms.

Available resistance codes are 200, 1K, 2K, 4.7K, 10K, 20K and 47K.

**Ordering Example:** OMX-R2K is a 2K\* precision shunt resistor, \$10.