

Automatic Infiltration Meter

Product Overview

The Automatic Infiltration Meter (AIM) is an automated solution for the measurement of infiltration rate in soils. The AIM is a convenient solution for infiltration measurements that saves researchers time. The AIM relieves researchers of the need to manually monitor their infiltrometer with a stop-watch and notepad.

The AIM automatically calculates cumulative infiltration (cm) as a function of time. Converted and unconverted data is stored within the AIM and can be downloaded as a csv file for further data manipulation and analysis.

The AIM can support up to 2 x Tension Infiltrometers or your own infiltrometer/permeameter with installation advice from ICT International.

The AIM is a fully self-contained unit with 2GB data logging capacity and an internal battery that will last several days' field work. The battery is easily recharged with a 12V power supply (CH7). Communication is via a USB port or wireless connectivity. The AIM is IP-68 rated and has a Windows driven GUI interface.

Applications

- Unsaturated and saturated hydraulic conductivity
- Hydrological modelling
- Run-off and groundwater recharge estimation
- Irrigation practices
- Waste water and mine site management

Features

- Stand-alone, wireless data logging
- Automatic conversion of pressure transducer measurements to cumulative infiltration
- Up to 4 x pressure transducers per AIM
- Low power requirement in the field, recharge battery at night
- IP-68 weather proof rated

The AIM is ideally used in combination with the volumetric moisture content instrument, the MPKit. For longer term monitoring the Soil Tension Meter (soil water potential) and Soil Moisture Meter (soil water content) are available.



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Automatic Infiltration Meter

How It Works

- A tension infiltrometer is installed in the field and made ready for measurements as per the recommended methodology.
- One to two pressure transducers (ICTGT3-1, -7 to +7 kPa measurement range) are installed on the infiltrometer in specialised locations. **Figure 1** is an example transducer installation for the tension infiltrometer.
- The pressure transducers are connected to the Automatic Infiltration Meter (AIM). At the start of the infiltration measurement the pressure transducer will read a value close to -7kPa (depending on the height of the water column in the infiltrometer or permeameter). As water infiltrates into the soil pressure readings tend towards 0kPa. The pressure reading is linearly related to a metric reading and the AIM automatically makes the conversion from kPa to centimetres.
- The researcher assigns a logging interval in the AIM. For sandy soils logging intervals can be measured in seconds. For clay soils logging intervals can be measured in minutes.
- **Figure 2** is an example output data for unconverted kPa values versus time from a tension infiltrometer.
- **Figure 3** is the data from Figure 2 converted to cumulative infiltration and presented as a function of the square root of time. Output files can record kPa data, cumulative infiltration data, or both.

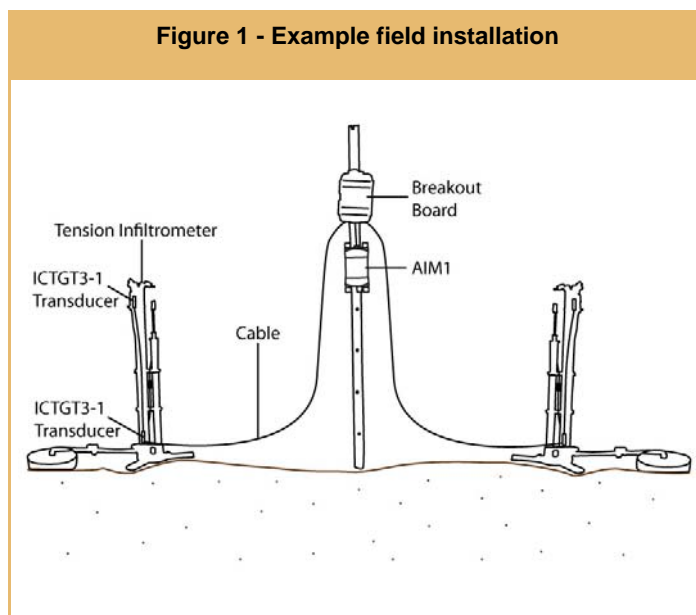


Figure 2 - Example data from pressure transducers

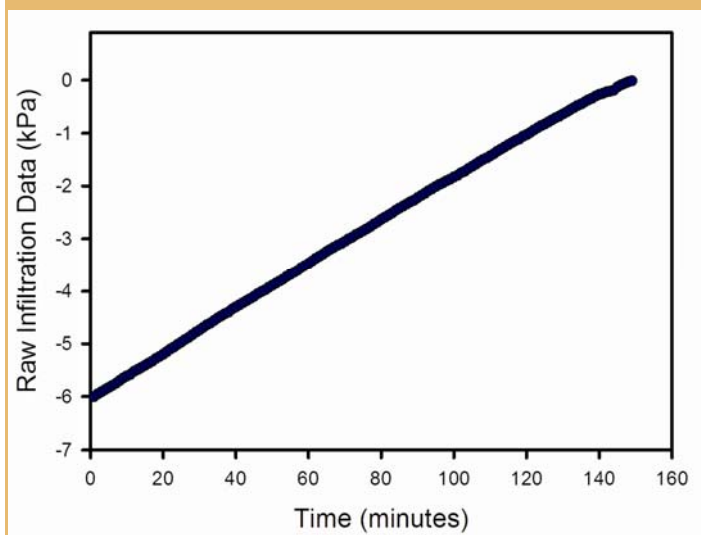
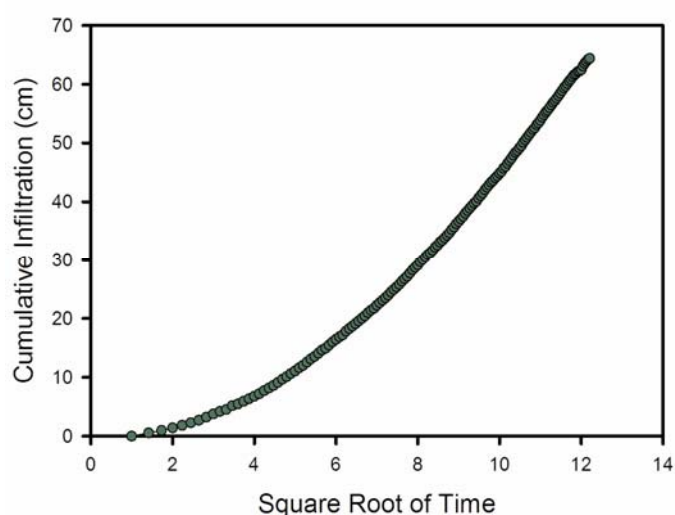


Figure 3 - Converted data as a function of square root of time



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More Details

- The AIM is a stand-alone instrument and does not need extensive cables and power requirements. All data is stored within the unit on a removable SD card.
- Communication with the AIM is made either with a USB or wireless connection. Wireless is compatible up to 250m distance.
- The AIM has an internal lithium-polymer battery for several days field work. Batteries can be charged overnight with a CH7 power supply.
- In conjunction with an ICT web-based controller, the AIM and/or individual sensors can be controlled remotely. Real-time, live measurements can be made remotely from any location with internet access. Data can be logged directly onto a remote computer or stored in the field on an ICT log server which can then be accessed via the internet.
- The AIM has a Windows configuration software. The software is GUI based and extremely user-friendly. Custom calibration equations or data can be entered and edited via the software. Real-time measurements, diagnostics and sensor configuration can easily be made.
- The AIM has 2 wire, non-polarized bus for power input. There is no chance of incorrect wiring of positive and negative voltage because the AIM is non - polarized.
- The AIM is IP68 rated and has been demonstrated to operate in extreme environmental conditions. Units are being used in diverse environments from hot Australian deserts, tropical Amazon rainforests, temperate German forests, Indian agricultural fields and North American Arctic cold.

Automatic Infiltration Meter measuring the infiltration rate in soils



Automatic Infiltration Meter power supply



AIM - Compatible Sensors

Tension Infiltrometer

- Unsaturated hydraulic properties of soils
- Measurements not affected by macropores
- A measurement of infiltration into the true soil matrix
- 20cm or 8cm models
- Length of Water reservoir: 81cm
- Bubbling Pressure Membrane: 30cm H₂O



Pressure Transducer

ICTGT3-1 Specifications:

- Measurement range: ± 7 kPa
- Accuracy: $\pm 1\%$
- Resolution: 0.01kPa

The AIM can be connected to any infiltrometer or permeameter with the appropriate installation of pressure transducers. Contact ICT International for further information and a solution on your specific application.



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Software & Communication

Software

Overview

ICT International instruments have customised software support. The software acts as an interface between the user, instrument and sensors. Each instrument has software pre-configured for the sensors it supports.

Look up Table

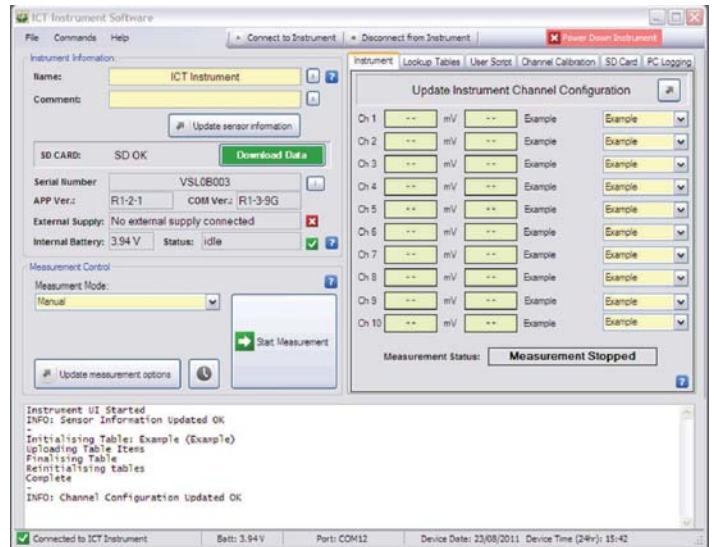
A look-up table is a linear conversion from a mV output from the sensor into any conversion units. A minimum of two values are needed: the lowest mV output and the highest mV output.

Script

For more complex conversions, such as exponential, logistic or polynomial equations, users can enter a script.

Self Calibration

Individual sensors can be calibrated using the ICT International software. A minimum three point calibration curve is required. Statistical analysis of calibrated data is automatically performed. Calibration curves can be saved, retained and modified. Calibration of individual sensors allows absolute precision data collection.



Software Overview

The screenshot shows an example output file with the following data:

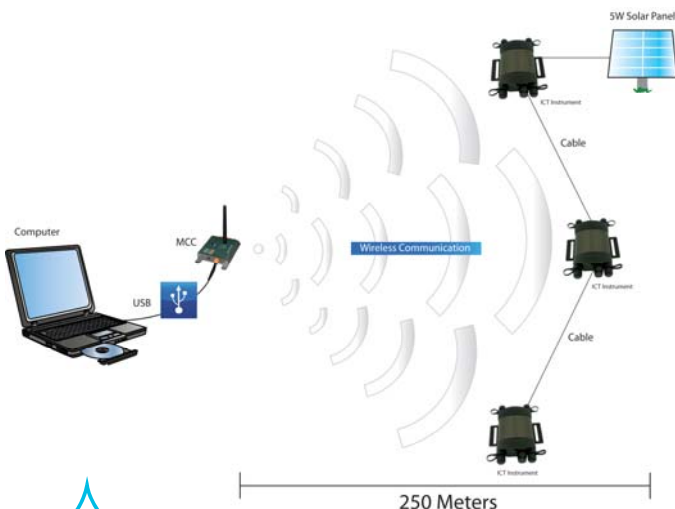
Serial Number	EXAMPLE						
APP Serial #	4000162						
APP Ver:	R1-2-4						
COM Ver:	R1-3-9G						
Instrument Name:	ICT International Example						
Comment:	Example						
Channel	Slope	Intercept					
Chan1	1	0					
Chan2	1	0					
Chan3	1	0					
Chan4	1	0					
Chan5	1	0					
Date:	Time	Chan1 (Example)	Chan2 (Example)	Chan3 (Example)	Chan4 (Example)	Chan5 (Example)	Internal Battery Voltage
30/07/2011	10:04:14	0	0	0	0	0	4.06
30/07/2011	10:15:53	0.03	0	0	0	0	4.09
30/07/2011	10:20:14	3.65	0	0	0	0	4.1
30/07/2011	10:40:14	274.84	294.48	291.45	329.22	0	4.09
30/07/2011	11:00:14	930.62	960.07	905.89	881.37	0	4.09
30/07/2011	11:20:15	413.49	409.63	332.88	251.18	0	4.08
30/07/2011	11:40:14	889.5	1024.53	990.23	1012.92	0	4.08

Example Output File

Communication

MCC

- Wireless communication with any ICT International instrument within 250m.
- Portable, easy to use via ICT International software interface.
- Connects directly into any Windows based computer via USB cable.
- Multiple channel ports, such as SDI-12, RS232, RS485, SI8, ICT-BUS & ICT Wireless Protocols, for highly flexible interfacing between ICT International instruments and third party devices.



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AIM Specifications

AIM Logging	
Analogue Channels	4 Channels
Resolution	0.00001V-24-Bit
Accuracy	0.001V
Minimum Logging Interval	1 second
Delayed Start	Suspend Logging, Customised Intervals
Sampling Frequency	10Hz
Data	
Communications:	USB, Wireless Radio Frequency 2.4 GHz
Data Storage	MicroSD Card, SD, SDHC & SDXC Compatible (FAT 32 Format)
Software Compatibility	Windows XP, Vista and Windows 7
Data File Format	Comma Separated Values (CSV) format for compatibility with all software programs
Memory Capacity	2GB expandable to 64GB
Operating Conditions	
Temperature Range	-40 ° C to +80 ° C
R/H Range	0 -100%
Upgradable	User upgradeable firmware using USB boot strap loader function
Power	
Power supply	12V DC 2-wire non polarized bus
Power Consumption	20 mA
Internal Battery Monitoring	Logging internal battery voltage & charging current
Charging Rate	Automatic variable rate of charging to maximise solar panel charging current on full sun days and or under low light cloudy conditions. Variable current 10 mA to 200 mA

Features
Power Management <ul style="list-style-type: none"> • Internal Lithium-Polymer Battery • Power On/Off Switch • Internal Voltage Regulation • Optical Isolation Lightning Protection
Logging <ul style="list-style-type: none"> • Stand-Alone Logging • 24-Bit Resolution • MicroSD Expandable Memory • USB Connectivity • Wireless Data Transfer • IP68 Water Proof Rating • Free Windows Utility Configuration Software
Accessories
<ul style="list-style-type: none"> • MCC • Quad Band GPRS, GSM, 3-G CDMA Modem



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