



INSTRUCTIONAL MANUAL

VW Data Recorder [Model ACE-1000]

INSTRUMENT

ACE

Geotechnical & Mining Instrumentations

Civil Engineering

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Railway
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1-1 Introduction

Model ACE-1000 is a VW data recorder, designed to measure a VW sensor, which generates a frequency with designed as a 4.8VDC low current charging circuit.

The ACE-1000 can store up to 4,000 measurement values for up to 64 data sets, and this data can be transmitted to the computer via RS-232 communication, so it is useful in a large field and the software has data sorting function. It is possible to sort by sensor ID, date, and time.

The ACE-1000 adopts 256 × 128 graphic large LCD to increase the visibility, it displays the measurement related information at the same time and it is easy to use, and the backlight function is installed so that it can be easily measured at night on the spot. On the large LCD, the basic unit of the vibration sensor and the selected sweep band are displayed by default, and the selected units (10^3Hz^2 , 4 types of strain, μsec) under Hz unit with displaying the thermistor RTD temperature sensor selected from thermistor also the power, current time are displayed simultaneously.

Among the six keys, the display unit and frequency band can be selected by the menu key. If you select the frequency band, you can increase the resolution of the output device and perform precise measurement.

Function to automatically shut off the power by user selection up to 60 minutes in 10 minutes to efficiently extend the battery life and the usage period, and it can measure 30 hours continuously with the Ni-MH rechargeable battery. You can use 10 years without replacement. Another key feature is the ability to adjust the LCD resolution so that it can be accurately measured in cold or hot areas.

Impact resistant ABS Injection molding case is used for waterproof and damp proofing, and it can be used in any bad condition. It is a high reliability product with advanced electronic technology. It has better performance and function than any existing product.

1-2 Feature & Advantages

Model ACE-1000 has features as following:

- Waterproof, damp-proof, portable structure
- High accuracy and resolution
- Adoption of Ni-MH rechargeable battery
- Usable in low temperature
- With Back Light function, possible to measure at night
- LCD brightness function
- Auto power off function
- Display battery lamp (Charge mark: LED)

1-3 Main function

[ON]	Turn on the power.
[OFF]	Turn off the power.
[MENU]	Choose the level of Sweep or Unit, Contrast and temperature sensor.
[ENTER]	It is for changing the sweep or unit, temperature sensor and contrast.
[▲/LIGHT]	It is for changing the sweep or unit, temperature sensor and contrast, and for turning on and off the backlight.
[▼/SAVE]	It is for changing the sweep or unit, temperature sensor and contrast, and for saving data.

1-4 Name & Explanation for each part



LCD Display	① It shows date of measurement, measurement mode (Sweep, Unit), measured data and temperature, remained battery, and saved ID.
Membrane Button	② - [ON] : Turn on the power - [OFF] : Turn off the power. - [MENU] : Useful to set a readout unit and measuring mode. - [ENTER] : Choose and set measurement modes (Sweep, Temperature sensor, Measurement unit, Data saving, Contrast, automatic power) and move onto the next stage. - [▲/LIGHT] : Useful to turn on/off the Backlight and to change options in Setting mode of MENU Button. - [▼/SAVE] : Useful to save data and to Data and to change options in Setting mode of MENU Button.
[Transducer] Connector	③ Connect to a jumper cable to measure the frequency.
[RS-232] Connector	④ It is useful to download or delete the saved data from the computer, or to set the readout unit.
[Charger] Connector	⑤ Useful to charge the built-in battery. If it is fully charged, the lamp is off, while it is off during recharging. (It takes about 4 hours to charge the battery.)
Jumper Cable	A VW type sensor is used to connect with a clip. (In the above figure it connects to Transducer Connector, No. ③)
RS-232 Cable	It is to connect a VW readout unit to the computer. (In the above figure it connects with RS-232 Connector, No. ④)
Charging Adaptor	It is to charge the battery, which is installed in the VW readout unit. (In the above figure it should be connected to charger connector, No. ⑤)

2. Specifications

Model	ACE-1000
Applied sensor	VW type sensor
Frequency range	450~6,000 Hz
Displayed units	Hz, 10 ³ Hz ² , μsec, °C, με0.3911, με0.7756, με3.304, με4.062
Resolution	0.01% FSR (0.1Hz)
Accuracy	0.02% FSR (0.1Hz)
Operating temperature	-20~50 °C
Communication port	RS-232 Port
Temperature sensor	Thermistor(3kΩ), RTD(2kΩ)
Temperature resolution	±0.1 °C
Display	256×128 Graphic LCD
Keyboard	Membrane key & 6 Function keys pad
Data capacity	4,000 Data points distributed in maximum of 64 data sets
Power	4.8VDC / Rechargeable Ni-MH Battery
Battery life	30 Hours continuous
Dimension	234×197×114 mm
Weight	1.5 kg
Material of case	ABS Plastic case
Accessories	① Jumper cable ② Rechargeable adaptor ③ RS-232 cable

3-1 Detail description for the function

[MENU], [ENTER]
[▲/LIGHT]

■ Setting the Sweep and Measuring Unit

Like the below table it is recommendable to change them by using [MENU], [ENTER] and [▲/LIGHT] buttons, depending on the situations on the site.

[MENU]	[ENTER]	[▲/LIGHT]	Indication of LCD Display
-	-	1 Click	Main screen Backlight ON
-	-	2 Click	Main screen Backlight OFF
1 Click	-	-	Sweep Mode A / 0.45 kHz~1.2 kHz
-	-	1 Click	Sweep Mode B / 0.8 kHz ~2.0 kHz
-	-	2 Click	Sweep Mode C / 1.4 kHz ~ 3.5 kHz
-	-	3 Click	Sweep Mode D / 2.4 kHz ~ 6.0 kHz
-	1 Click	-	Temperature Sensor Type / RTD
-	-	1 Click	Temperature Sensor Type / NTC
-	1 Click	-	Display Mode 1 / Period(μs)
-	-	1 Click	Display Mode 2 / 10 ³ Hz ²
-	-	2 Click	Display Mode 3 / με0.391
-	-	3 Click	Display Mode 4 / με0.7756
-	-	4 Click	Display Mode 5 / με3.304
-	-	5 Click	Display Mode 6 / με4.062
-	1 Click	-	LCD Contrast 10 (LCD Brightness adjustment)
-	2 Click	-	POWER OFF TIMER(10min interval)
-	3 Click	-	Battery status Display Version Information

Reference

(1) Temperature sensor

[RTD] indicates the resistance temperature device when the temperature sensor type is specified. The resistance value changes according to the temperature change is positive (+), [NTC] indicates the thermistor, and the resistance value change according to the temperature change is negative (-).

(2) LCD Contrast

When the brightness of the LCD changes according to the weather, use the arrow keys to adjust the brightness appropriately.

(3) POWER OFF TIMER

Use the arrow keys to turn off the auto power off and set it in every 10-minutes.

[MENU], [ENTER]
[▲/LIGHT], [▼/SAVE]

■ Saving Measurement

Like the below table it is useful to save the values in the VW data recorder by using [MENU], [ENTER], [▲/LIGHT] and [▼/SAVE].

[MENU]	[ENTER]	[▲/LIGHT]	[▼/SAVE]	Indication of LCD Display
-	-	-	-	Indication of measured data
-	-	-	1 Click	ID setting screen
-	-	Click	-	Change ID (increase)
-	-	-	Click	ID change(decrease)
-	1 Click	-	-	Saving measured data
1 Click				Return to main display

Reference

Used while the measured value is on the screen.

Transducer Connector
& 10pin Jumper Cable

Connect 10Pin Connector with the Jumper Cable, connect a VW type sensor and measure it as below table.

Function	Jumper Cable Color	Jumper Cable Clip Color	VW sensor Cable Color
Measuring Frequency	RED	RED	RED
	BLACK	RED	BLACK
Measuring Temperature	GREEN	BLACK	GREEN
	WHITE	BLACK	WHITE
SHIELD	YELLOW	BLACK	Silver(no sheath)

3-2 MENU Description (Applying display units by changes in Mode)

LCD light contrast	In principle LCD adjust the contrast. When a product is shipped, LCD contrast is set at "10" (25 as a standard). If the area is hot or it is summer time, set at "5~7"(about 30~35℃). If it is cold or winter time, set at "12~15"(about 0~15℃). The contrast can be adjusted from 1 to 20.
Change of Sweep mode	Adjust the frequency range of the unit to come into the Sweep Mode, and change the sweep mode.
Applying display unit by Changes in Mode	As the below table, apply the measuring unit, depending on the change in the Display Mode. VW ACE-1000 readout unit shows frequency (Hz) always, and simultaneously the chosen display unit is shown as below.

MODE	Measuring Unit	Main display	Applying sensors
Mode 1	Period(μsec)	μs	All VW Sensors
Mode 2	10 ³ Hz ²	10 ³ Hz ²	VW Load Cells
Mode 3	Strain(με0.391)	0.391	VW Spot-weldable Strain Gage
Mode 4	Strain(με0.7756)	0.7756	VW Shotcrete Strain Gage
Mode 5	Strain(με3.304)	3.304	VW Embedment Strain Gage
Mode 6	Strain(με4.062)	4.062	VW Weldable Strain Gage

Reference

As A1000Pro saves only frequency (Hz), the saved data should be converted by it if you use other units.

3-3 How to use ACE-1000

Model ACE-1000 is effectively used as following.

- ① Connect a jumper cable to the connector.
- ② Press [ON] button.
(After popping up ACE's logo, it converts into the Main screen.)
- ③ Check out the sweep and unit, and press [MENU], [ENTER], [▲/LIGHT], [▼/SAVE] to set the basic menu.
(See [3-1] for detailed specifications and [3-2] for MENU)
- ④ Connect with a signal cable by the clip of the jumper cable.
(See [3-1] for detailed specifications)
- ⑤ Record or save the output frequency.
- ⑥ Get rid of the clip and turn off power.
- ⑦ Download the data by connecting RS-232 cable to the computer.

Description	The "A1000Pro" is only program for model ACE-1000 VW data recorder. This is program that you can check with download data in store data recorder and you can use with change data to operation program like MS Excel. Only Ace Instrument offers "A1000Pro".
Application description	The Application program belonging with our VW data recorder(ACE-1000) named "A1000pro.exe" can be also downloaded from our website as below : www.aceco.kr/download/software . This file is not Installation version. So, you use it with copy in hard disk of your computer.
Check the program	Please contact us if you have questions or problems with the A1000Pro program.

4-1 Connect ACE-1000 to computer

RS-232 Cable Connection | Connect the 10Pin male connector of the RS-232 cable included with the ACE-1000 and connect the other 9pin female connector to the serial port of the computer with the A1000Pro program.

4-2 A1000Pro (Connect)

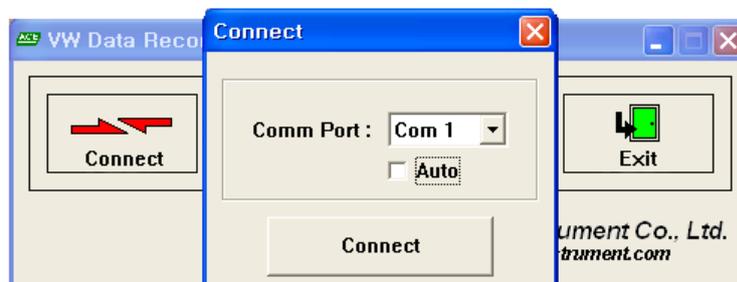
A1000Pro launch | Operate the program of "A1000Pro" like the shape of follow.



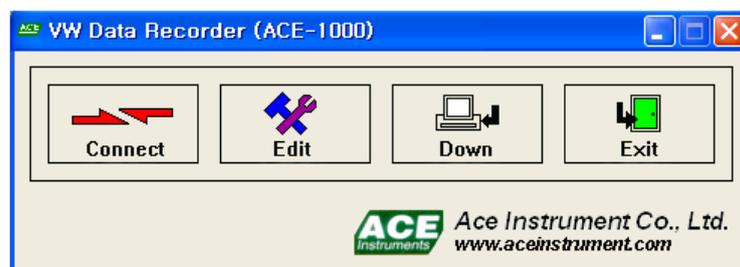
ACE-1000 Connect | If operate the program, display main screen as follows.
Icon of [Edit] and [Down] is not activated, because this is not connect.



For connect of VW data recorder, turn on the power of data recorder and click [Connect] icon with RS-232 Cable is a connective state. Then, the connecting window display as the below and you must assign the communication port. (If you click 'Auto', search for 'Com. Port' automatically and connect.)

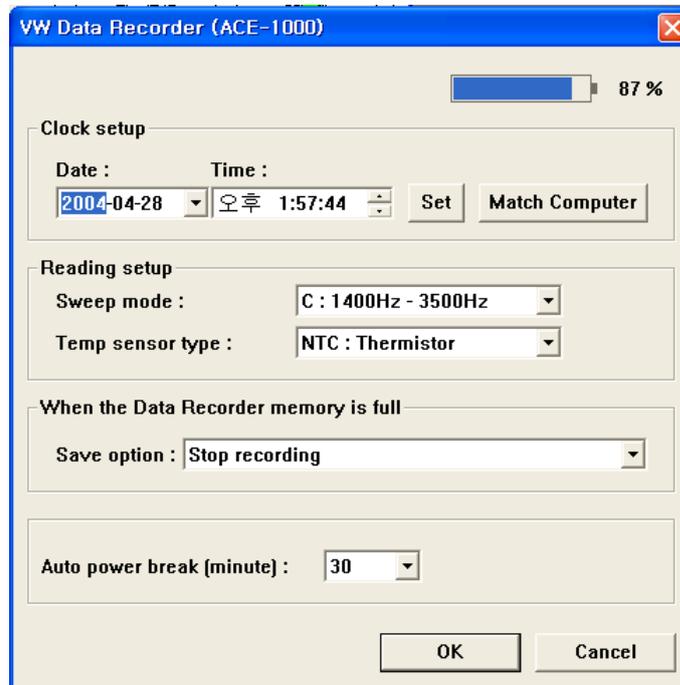


If connect the program and data recorder, icons in whole of main screen is activating as follows



4-3 A1000Pro (Edit)

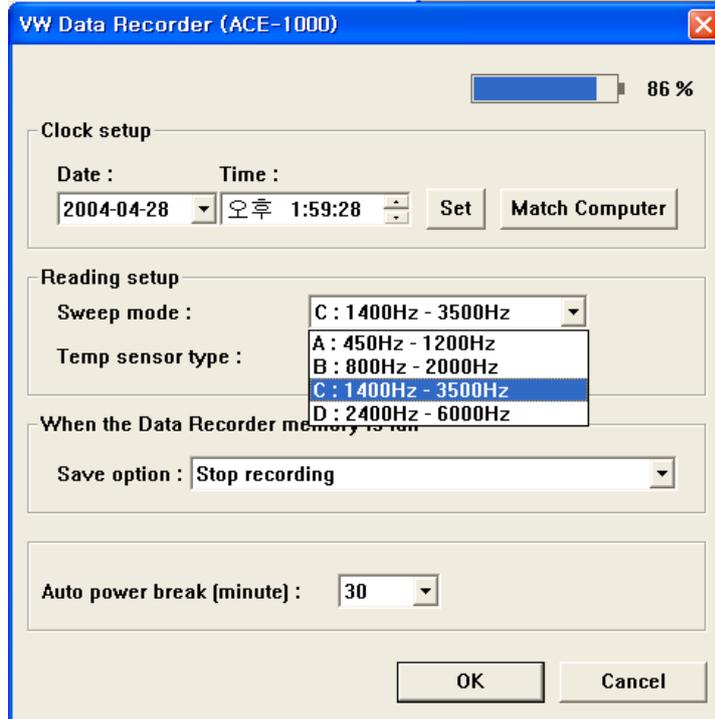
- A1000Pro Edit | In the screen with connect; click the [Edit] icon. Then, display window that able to check for battery of data recorder and set an option of Clock setup, Reading setup, Save option, Auto power break.
- Clock setup | The first, you must set time of computer and VW data recorder. You can hand-operated assign Date: and Time: by [Set] button. Also, you can set the same time that you are in use computer.



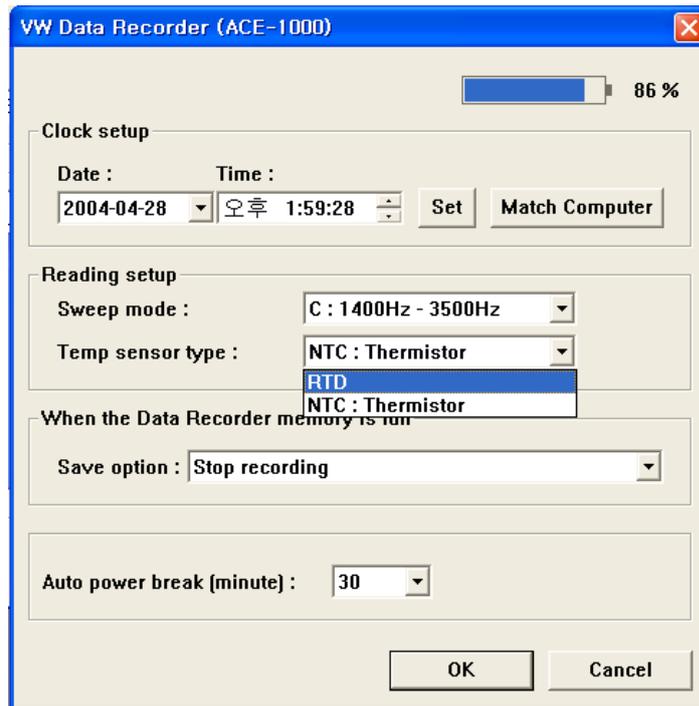
4. Program usage

Reading setup

Reading setup menu can be remote control the Sweep mode and Temperature sensor type



[ACE-1000 Sweep mode change]

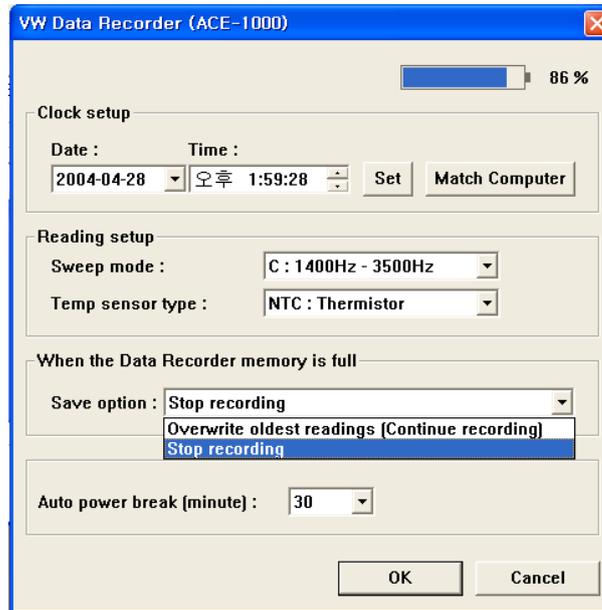


[ACE-1000 Temp, Sensor Type change]

Save option

The save option is two ways as the below picture.

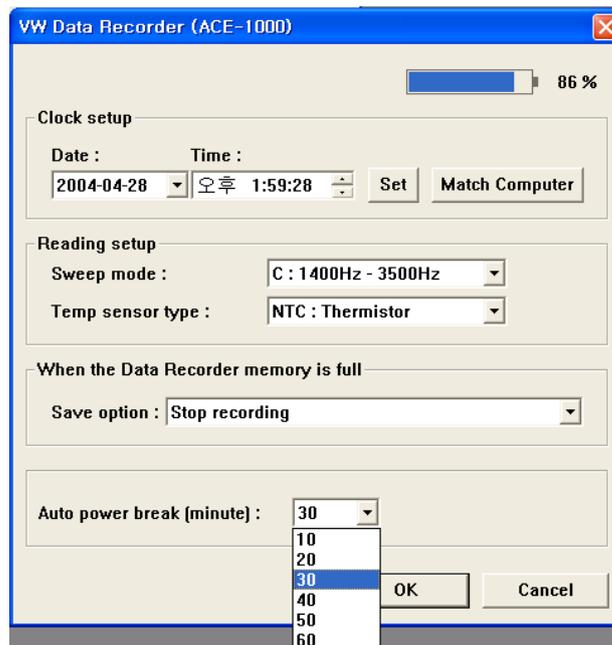
If you choose "Overwrite oldest readings [Continue recording]" mode, the oldest data is deleted and the latest data is saved when the save capacity is full. If you choose "Stop recording" mode, subsequent data is not save when the save capacity is full.



Auto power break (minute)

The Auto power break (minute) is function as auto power off.

This function can be set up to 60 minutes in every 10 minutes.



4-4 A1000Pro (Down)

A1000Pro Down

If click the [Down] icon in the connected screen, display the screen that arranged all saved data in VW data recorder as follows.

No	ID	Recording time	Reading (Hz)	Temp
1	003	2004/04/28 14:04:46	2168.3	20.4
2	003	2004/04/28 14:04:55	2168.4	20.4
3	003	2004/04/28 14:04:59	2168.3	20.4
4	003	2004/04/28 14:05:06	2168.4	20.4
5	003	2004/04/28 14:05:10	2168.4	20.4
6	002	2004/04/28 14:05:14	2168.4	20.4
7	002	2004/04/28 14:05:21	2168.4	20.4
8	002	2004/04/28 14:05:25	2168.3	20.4
9	001	2004/04/28 14:05:25	2168.3	20.4
10	001	2004/04/28 14:05:36	2168.4	20.4
11	001	2004/04/28 14:05:41	2168.4	20.4
12	001	2004/04/28 14:05:48	2168.4	20.4
13	002	2004/04/28 14:05:52	2168.4	20.4
14	002	2004/04/28 14:05:57	2168.3	20.4
15	002	2004/04/28 14:06:02	2168.4	20.4
16	002	2004/04/28 14:06:07	2168.4	20.4

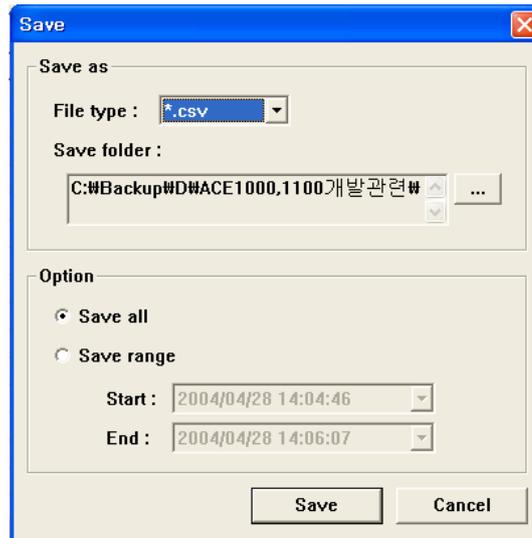
When a screen listing all saved data appears, click [ID:] option item to sort by all data values or ID order.

No	ID	Recording time	Reading (Hz)	Temp
1	003	2004/04/28 14:04:46	2168.3	20.4
2	003	2004/04/28 14:04:55	2168.4	20.4
3	003	2004/04/28 14:04:59	2168.3	20.4
4	003	2004/04/28 14:05:06	2168.4	20.4
5	003	2004/04/28 14:05:10	2168.4	20.4
6	002	2004/04/28 14:05:14	2168.4	20.4
7	002	2004/04/28 14:05:21	2168.4	20.4
8	002	2004/04/28 14:05:25	2168.3	20.4
9	001	2004/04/28 14:05:25	2168.3	20.4
10	001	2004/04/28 14:05:36	2168.4	20.4
11	001	2004/04/28 14:05:41	2168.4	20.4
12	001	2004/04/28 14:05:48	2168.4	20.4
13	002	2004/04/28 14:05:52	2168.4	20.4
14	002	2004/04/28 14:05:57	2168.3	20.4
15	002	2004/04/28 14:06:02	2168.4	20.4
16	002	2004/04/28 14:06:07	2168.4	20.4

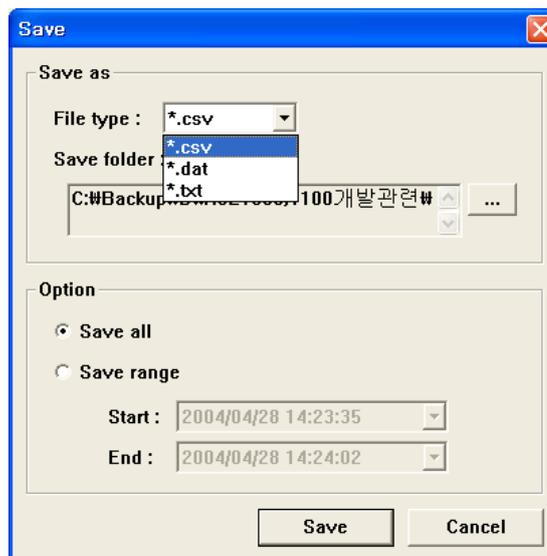
No	ID	Recording time	Reading (Hz)	Temp
1	002	2004/04/28 14:05:14	2168.4	20.4
2	002	2004/04/28 14:05:21	2168.4	20.4
3	002	2004/04/28 14:05:25	2168.3	20.4
4	002	2004/04/28 14:05:52	2168.4	20.4
5	002	2004/04/28 14:05:57	2168.3	20.4
6	002	2004/04/28 14:06:02	2168.4	20.4
7	002	2004/04/28 14:06:07	2168.4	20.4

Save data

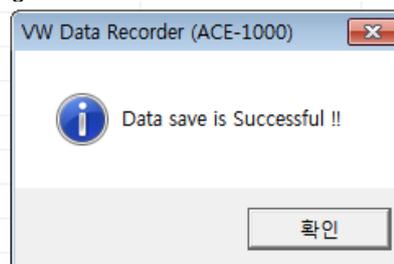
In the case of save data in down screen, click the [Save] button. Then, display the save option window as the below picture.



File type option has function that able to choose extension of saved data. This make use of extension of *.csv and *.dat for using in operation program like MS Excel. And this make use of extension of *.txt for checking in text file program like WordPad. After choose the txt file, save it. Then WordPad program is operating by itself and is showing the data. At the Save folder option, you can choose and save that you want to folder.

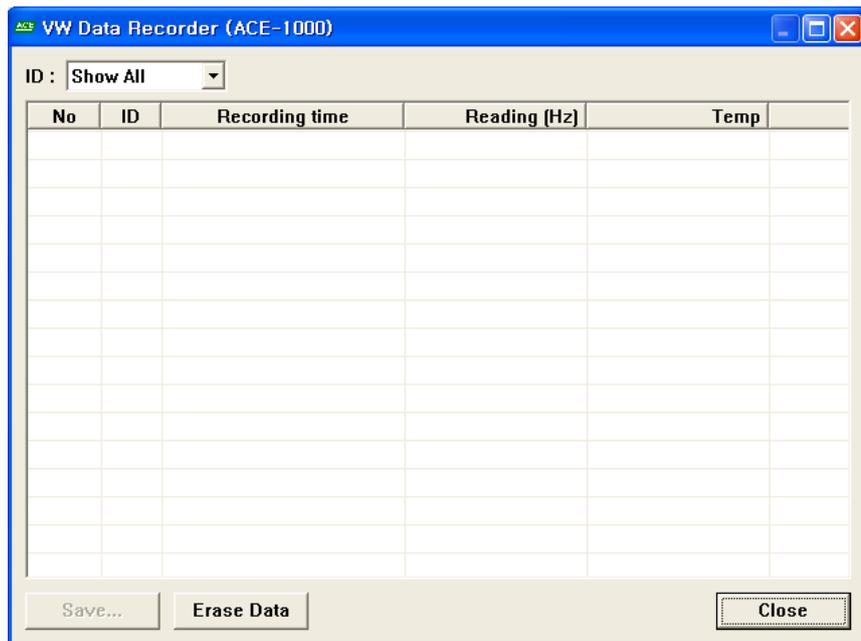
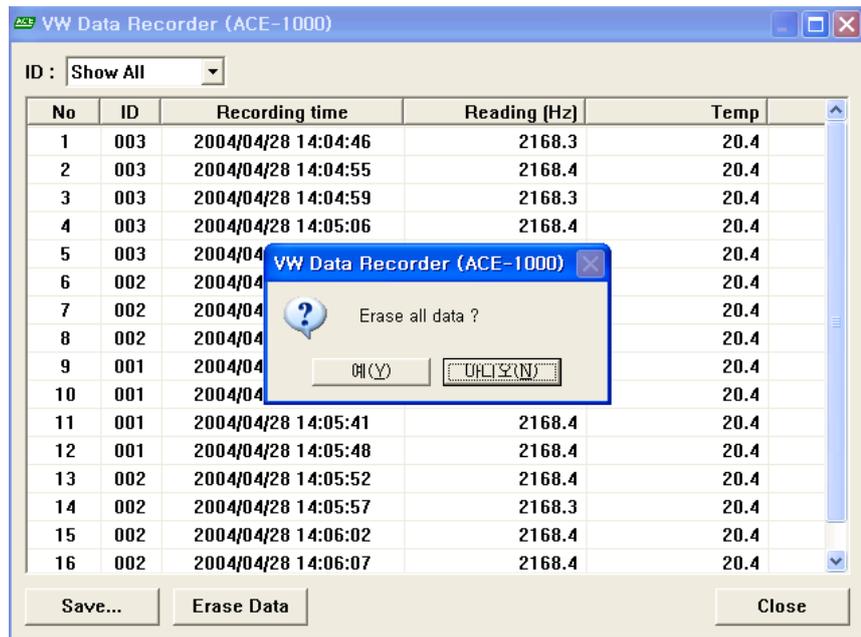


After completing the option check, click [OK] button to save the data and confirm when the save complete message is generated.



Data Delete

When the storage is completed, you should check the storage space and delete the data. If you click the [Erase] button on the [Down] screen, a question about full deletion will be displayed. After confirmation, all data will be deleted.



4-5 A1000Pro (Exit)

A1000Pro Exit | Close the program with click [Exit] icon of A1000pro main screen.

5-1 Maintenance

Keeping	Part from other goods or cover with attention sign not to be shocked or vibrated because ACE-1000 VW data recorder is a precise apparatus with built-in electronic circuit. Keep in well-ventilated room without direct light. Long exposure to direct light makes measuring malfunction due to extreme temperature change.
Carrying	Take great care not to make big measuring errors based on changing zero point due to heavy impact or vibration in carrying. Do not put any heavy things on it, settle down and take actions not to be shocked when carrying in vehicles.
Keeping jumper cable	Do not bend the jumper cable. Keep it carefully so that it will not be disconnection. When using it, do not pull it by pulling it hard or do not pull it with great force. When not using the jumper cable, put it in a bag or case and store it in a place where it will not be damaged.
Check battery voltage	Confirm the voltage of the built-in battery before or after using it. Too low voltage makes no signal of the measuring by the sensor.
Check measurement value	Please contact us if you think the measurement value is not correct when measuring the sensor.

5-2 Calibration & service

Calibration	Model ACE-1000 VW data recorder is revised and shipped with exact input / output specifications of the electric circuit by using each special rectifier. Therefore it allows for highly stable and reliable values in every VW sensor.
Service	For effectively using a VW data recorder without any trouble, it is strongly recommended to read the manual and to handle it consistently. We will check any defects or performances if there are any troubles. ACE INSTRUMENT A/S team Tel) +82-31-459-8753 Fax) +82-31-459-8758 acens@naver.com www.aceinstrument.com

6. Geotechnical Instruments Installation and Operation Tips

1. Handling caution

Engineering measuring instrument is precisely manufactured and sensitive. Don't drop it and don't allow it to be exposed to external shocks. In particular, the VW measuring instrument is likely to see its zero point changed due to shocks.

2. Caution for storing calibration report

Calibration report is provided with each sensor. Information at the moment of calibration includes barometric pressure, calibration temperature, and temperature sensor in use, calibration data, conversion ratio and classification of signal cable by color. Therefore, you should be careful with storing the information until all work is done. In case the report is lost, tracking data and product might be impossible.

3. Operation by an engineer

All the process should be operated by a skilled engineer to prevent inappropriate choices such as errors of instrument choice, installation and operation which make impossible near-permanent calculation.

4. The need for shielding

It is common that sensor sends a weak electronic signal. And sensor is under the influence of electromagnetic induction, electrostatic induction static electricity electrification generated when other control machine is on. In particular, given that environmental condition of engineering work involving welding, generator, motor, antenna, and watery surface is poor, shielding and ground wire should be connected in the case of output device connection.

5. Caution for signal cable extension

There would be no problem that VW sensor outputting frequency signal is connected for extension. In the case that a sensor generating Voltage is connected for extension, electronic sensors are vulnerable to changes in resistance value. Therefore, the length of the cable plays a big influence. So, you should adjust resistance change value with adjustment value toward a sectional length of signal cable by manufacturers. Also, extension seam part should be finished up with Splice Kit (Epoxy).

6. The use of protection tube for signal cable

In the case of laying under the ground, dams, vulnerable foundation, concrete structures can have a big displacement, a source of signal cable disconnection. In the case of ground construction, given the construction condition, heavy equipment operation and frequent moving construction can be a source of disconnection or sensor damage. Therefore, caution should be taken for the protection of sensors and signal cables. And minimize the dangerous factors by using new construction pipe for drainage system.

7. Installation of Amplifier with sensors generating mV

Engineering measuring machine generating electronic signal has a 200-300 m transmission distance. In the case Junction Box and Terminal Box have a long distance from the measuring machine, an amplifier should be installed in proportion of measurement distance to prevent drop of voltage for sensor transmission.

8. Atmospheric pressure adjustment

When manometer is chosen as sensor, it is very sensitive to change in atmospheric pressure. Therefore, for precise measurement, places such as dams, valleys, the sea and reclaimed lands with high fluctuation of atmospheric pressure should adjust head height according to the difference of the pressure by using mercury barometer.

9. Lighting rod construction

In the case of large engineering work near water such as dams, lakes, the sea and large fields, valleys, lighting rods connecting each sensor individually should be constructed to protect sensors. Within the influence of over voltage, sensors are likely to function poorly.

10. Caution for filter use in pressure sensors

Pressure sensors such as negative pore water pressure have attached filters. Upon installation, make sure to let air out of the inside of the filter. Given that densities of air contraction and water are different, remained air might cause an error to measured value. Also, at places where unsaturated soil or negative pore water pressure are expected, it is recommended to use 1 μ m high-density ceramic filter.

11. Caution for bearing plate in use for load cell

For maintaining consistent measured value and high precision, the use of bearing plate is important, during installation of hard cell on Earth Anchor, heat processed steel materials should be manufactured with the enough thickness to endure unloading load and with the density of within 0.5 degree in top-down parallel lines. High quality products should be used for cone for spilt, cone-plate and mutual taper processed density.

12. Sensor temperature adjustment

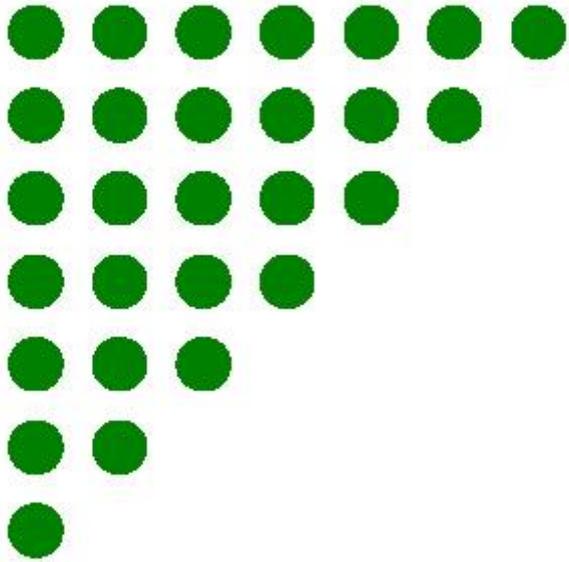
An element of VW sensors uses wire rod (used for piano string) so that coefficient of linear expansion metallic materials hold can cause errors of margin and sensors of electricity and electron hold an adjustment factor. For precise measurement, adjust the difference of temperature with a mercury thermometer.

13. Auto Data Acquisition System requires UPS

In South Korea, relatively temporary blackout (0.5 seconds) is frequent. So overloading owing to simultaneous uses of equipment and accumulated power cables on sites are likely to cause ordinary and temporary blackouts, leading to computer Down and errors of built-in software. Therefore, When Auto Data Acquisition System is operated; UPS(Uninterruptable Power Supply) must be used to minimize dangerous factors.

14. Caution for the choice of VW output unit

Manufactures of VW sensors and output units usually cover 600~3,200Hz (360~10,240 10³Hz² or 1666~312 μ sec) for possible measurement range. And they design sensors taking into consideration the purpose of sensors, durability, and precision. Therefore, when Mode for unit choice of output unit within this range is changed, you must select sophisticated output unit-making measurement possible



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