Programmable DC Electronic Load

AEL-8310

User's Manual

SAFETY GUIDE

This manual co ntains the pr ecautions n ecessary to ensure your personal safety as well as for p rotection for th e products and the connec ted equipment. These precautions are highlighted with a triangle "**WARNING**" symbol in this manual and are marked according to the danger levels as follows:

Danger:

It indi cates th at if appropr iate pr ecautions ar e no t tak en, s erious incidents of p ersonal injur ies and deat hs or significant damages or losses to the properties will be caused.

Caution:

It indicates that if appropriate precautions are not taken, injuries or losses of properties will take place.

Note:

Remind you to pay particular attention to the important information related to the products, disposal of products or the specific part of documents.

Warning:

Only qualified personnel are allowed to debug and operate this equipment. The qualified personnel are specified as those personn el who carry out commissioning, grounding and apply the volume identification to the circuits, equipment and systems according to the available safety practices and standards.

Note:

Only when this product is tran sported, stor ed assembled and installed in a proper way and operated and maintained according to the recommendations, can it implement the functions properly and reliably.

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. The manufacturer assumes no liability for the customer's failure to comply with these requirements.

⚠ **Attention**

I. Safety

1. Users should operate according to this manual.

2. There is high voltage inside the instrument, please avoid touching it directly.

3. Please read the user manual carefully before you use the instrument to assure your safety.

4. Ground the Instrument

This product is provided with a protective earth terminal. To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the AC power supply mains through a three-conductor power cable, with the third wire firmly connected to an electrical ground (safety ground) at the power outlet.

5.Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service person. Do not split the components when power cable connected.

Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

6.Do Not Substitute Parts or Modify Instrument

Because of the danger of introducing additional hzards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a qualified dealer for service and repair to ensure that safety features are maintained.

II. Connecting the power line

1. Inspect the power selection switch on the back panel, to assure if the selected voltage is the same as environment power voltage. If not, please refer to the notice around the power plug.

2. Before connecting the power supply, please be sure that the switch on the front panel should be in the off position.

3. Connect the power cable to the AC in the power supply and the 3 connector plug. Please be sure that the AC power supply is grounded.

4. Press the switch on the front panel to switch on the instrument and you can start to use it.

III. Fuse

1. The fuse is at the position of power input part on the back panel, for the purpose of avoiding failure brought by using wrong voltage. Please pay attention to the following items when you change the voltage input and the fuse.

2. Before changing the voltage and fuse, please be sure that the AC power is switching off, and be sure that there is no other equipment connected to this instrument.

3. Put a screwdriver into the fuse mounting, press it and the fuse mounting will pop up.

4. Pull out the fuse, change it according to the label beside the power input plug.

Warning: To avoid damaging the instrument, please be sure to change a suitable type fuse.

Programmable DC Electronic Load

Table of Contents

Chapter 1 General Introduction

1.1 General Introduction

  A EL-8310 electronic load is a single input programmable DC electronic load. It provides a convenient way to test DC power supplies and batteriesIt offers constant current mode, onstant resistance mode and constant power mode. Program operation and control by PC is also available. The backlight LCD, numerical keypad and rotary knob make it much easier to use. It is an essetial instrument for designing,testing and manufacturing of many suitable products.

1.2 Specifications

Number of Input	1
Input Voltage	0~360V
Input Power	0~150W
Input Current	0~30A
Voltage Accuracy	0.000-3.999V: ± 0.2%+3mV 4.00-35.999V ± 0.2%+30mV 36.0-360.0V: ±0.2%+300mV
Current Accuracy	0.000-2.999A: ±0.2%+3mA 3.00-30.00: ±0.2%+30mA
Max Resolution	Voltage: 1mV Current: 1mA
Minimum Conductive Resistance	< 0.08 Ω
Ripple	< 10mVpp
Communication Interface	RS232/RS485 /USB*
Software	Free application software ElectonicLoad, ActiveX control support VC++ / VB / DELPHI / LABVIEW
Program Memory	9 programs, 10 steps each
Protective Mode	Over voltage/over currnt/over power/over heat/polarity-reverse
AC Input	110/220V AC switch able (60/50HZ)
Weight	5.0kg
Accessories	Software, users manual, AC power cable, handlebars

1.3 Features

       1. LCD display with backlight.

       2. High resolution measurement.

       3. CC/CP/CR mode.

       4. Number keypad and rotary knob.

       5. Multifunction menu.

       6. Over voltage / over current / over power / over temperature / polarity reversion protection.

       7. 10 steps program.

       8. Compact and light-weight.

       9. Can be used in parallel connection.

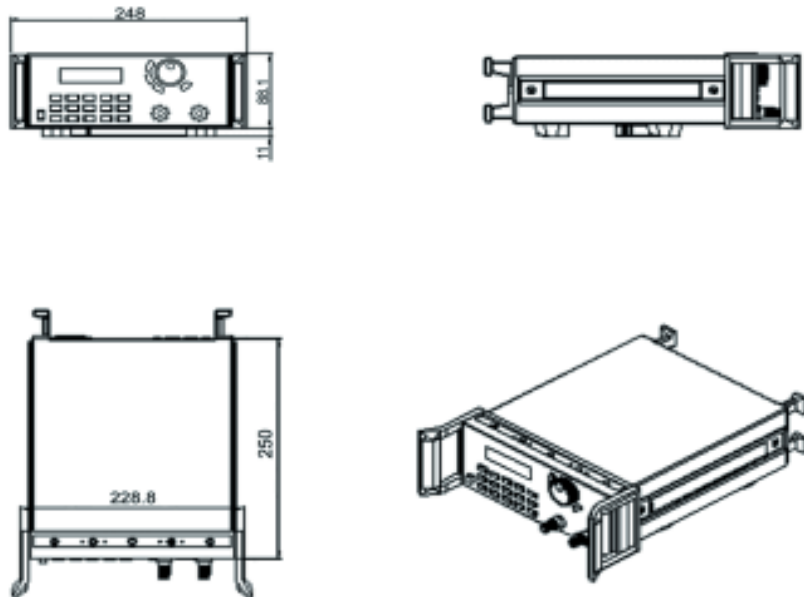   10. Can be controlled by PC.

1.4 Dimensions and Structure

1.4.1 Dimensions (unit: mm)

Fig.1-1 Dimension of Programmable DC electronic load

1.4.2 Structure

1.4.2.1 Front view

Front panel is for users to operate, and there is one LCD display, one number keypad and one rotary knob. Please see the following pictures.
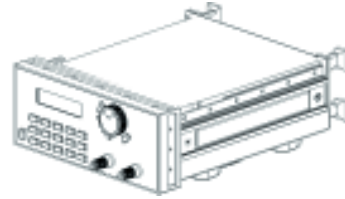

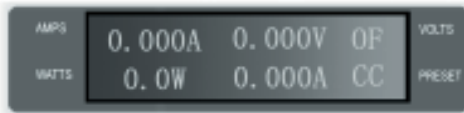Fig.1-2 Front view of DC electronic load

1. LCD display

Fig.1-3 LCD Display of electronic load

The 1st line:

Current, voltage, On/Off state

The 2nd line:

Power, load setting value, working mode.

CC, CP, CR represent constant current, constant power, constant resistance mode.

2. Arrangement of the Keyboard

In general, the keyboard will perform the function of the black words 1st. But in the 2nd mode, it will perform the function of the words in blue.
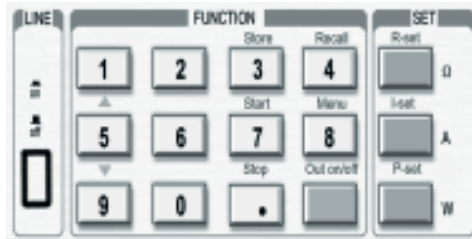

Fig.1-4 Keyboard of DC electronic load

0~9: The number keys

Load on/off: Load ON/OFF switch

R-set: Setting resistance value

I-set: Setting current value

P-set: Setting power value

Store: Store current program

Recall: Recall a saved program

Start: Start a program

Stop: Stop running program

Menu: Menu function operation

▲: The up moving key

▼: The down moving key

3. Rotary knob and function keys

◀ : The left moving key

▶ : The right moving key

ESC: Escape key

OK: Confirmation key

Rotary knob: The rotation dial

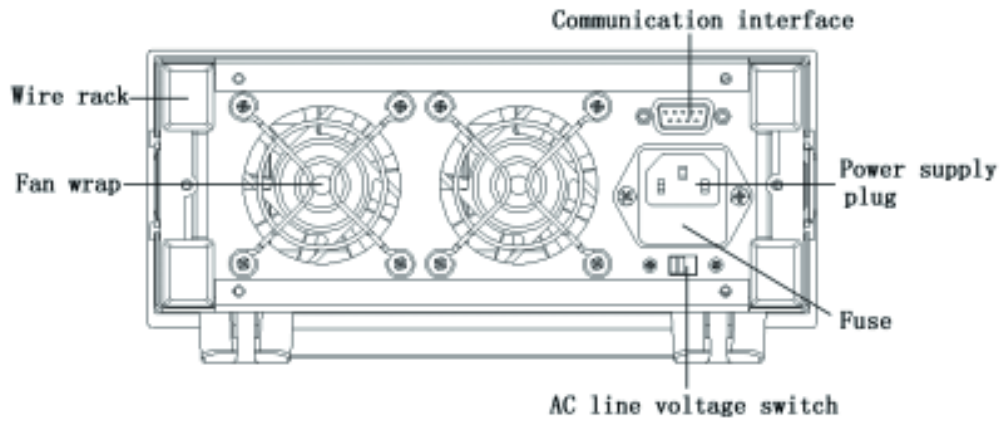Fig.1-5 Rotary knob and function keys

1.4.2.2 Back view

Fig.1-6 Back view

The fuse can be changed easily by using a small flat screw driver. Please use a fuse within the range of 0.3-0.5A.

Chapter 2 Operation

2.1 Connect the power supply to the electronic load

Fig.2-1 Connect the power supply to the electronic load

2.2 Main functions

1. Constant current mode

2. Constant power mode

3. Constant resistance mode

4. Store a program

5. Recall a program

6. Start a program

7. Stop a program

8. Load On/Off

2.2.1 Constant Current Mode

In constant current mode, the electronic load will sink a constant current in accordance with the set value regardless of input voltage. The current value can be set with the keyboard and/or rotary knob. Please see the following operation procedure:

Constant current setting procedure:

Procedure	Operation details	LCD display
Step 1	Press "I-set"	Input Password
Step 2	Enter the password (if the keyboard isn't locked, please go to step4)	Input Password ****
Step 3	Press the "OK" button, the original set value will be displayed on the LCD. (It will return to step 2 if your password is wrong)	Set Curr = 2.00A New=
Step 4	Enter the new current value with the number keypad or rotate the dial to adjust the value	Set Curr = 2.00A New= 3.00
Step 5	Press "I-set" button for confirmation	Set Curr =3.00A New= 3.00
Step 6	Press ESC to go back to the main menu	
You can exit the current set operation at any point by pressing the ESC key		

For example, set constant current to 3.12A

1. Setting by number keyboard

Step1. Press " I-set " button,

Step2. Enter the password by using the number keyboard (if the keyboard isn't locked, please go to step4),

Step3. Press " OK " button (if the password is wrong, please go to step2 for reentering),

Step4. Press " 3 ", " **.** ", " 1 " and " 2 " button to enter the current value,

Step5. Press " I-set " button to confirm the current value.

```
0.000A  0.000V  OF

0.0W   3.12A  CC
```
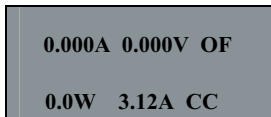
2. Setting by Rotary Knob

   (1) If the keyboard isn't locked, press "I-set" button, then directly rotate the "Rotary knob", the current value will be continually changed from the previous value according to the rotation. At the beginning, the cursor will be shown on the last number of the value which is indicated on the LCD, you can move the cursor to the first number, second number etc by using " ◀ " and" ▶ " buttons, and then rotate to change each number, and let it stay at 3.12 A.

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(2) If the keyboard is locked

Step1. Press " I-set " button,

Step2. Enter the password by using the number keyboard,

Step3. Press OK button (if the password is wrong, please go to step2 for reentering),

Step4. Rotate the Rotary to change the value，the operation is the same as item (1)

Step5. Press " I-set " button to confirm the current value.

2.2.2 Constant Power Mode

In constant power mode, the load's current will increase automatically if the input voltage is decreased or vice versa, so that the electronic load will sink a constant power in accordance with the set value. The power value can be set with the keyboard and/or rotary knob. Please see the following operation procedure:

Constant power setting procedure:

Procedure	Operation details	LCD display
Step 1	Press "P-set"	Input Password
Step 2	Enter the password (if the keyboard isn't locked, please go to step4)	Input Password ****
Step 3	Press the "OK " button, the original set value will be displayed on the LCD. (It will return to step 2 if your password is wrong)	Set Power = 20.0W New=
Step 4	Enter the new power value with the number keypad or rotate the dial to adjust the value	Set Power = 20.0W New= 30.0
Step 5	Press "P-set" button for confirmation	Set Power = 30.0W New= 30.0
Step 6	Press ESC to go back to the main menu	
You can exit the power set operation at any point by pressing the ESC key		

2.2.3 Constant Resistance Mode

In constant resistance mode, the electronic load will sink a current linearly proportional to the input voltage in accordance with the set value. The resistance value can be set with the keyboard and/or rotary knob. Please see the following operation procedure:

Constant resistance setting procedure:

Procedure	Operation details	LCD display
Step 1	Press "R-set" button	Input Password
Step 2	Enter the password (if the keyboard isn't locked, please go to step4)	Input Password ****
Step 3	Press the "OK " button, the original set value will be displayed on the LCD. (It will return to step 2 if your password is wrong)	Set Resis = 200.0 Ω New=
Step 4	Enter the new resistance value with the number keypad or rotate the dial to adjust the value	Set Resis = 200.0 Ω New= 50.00
Step 5	Press "R-set" button for confirmation	Set Resis = 50.00 Ω New= 50.00
Step 6	Press ESC to go back to the main menu	
You can exit the resistance set operation at any point by pressing the ESC key		

2.2.4 Store a program

The ADG-8310 electronic load provides a program mode for dynamic testing. The user can program the ADG-8310 electronic load and define the load values (current, power, resistance) and duration of every step. For more details about the programming operation, please refer to 2.3.7.

User's program may be stored in nonvolatile memory for later use. Up to 9 programs can be stored in ADG-8310. To store a program, please follow this operation procedure:

Proced ure	Operation details	LCD display
Step1	Press " Store " button	SAVE 1
Step 2	Enter the program number (1 to 9) by using the number key or the rotary knob	SAVE *
Step 3	Press the " OK " button for confirmation. It will return to Step 2 if the number is out of the range.	
You can exit the store operation at any point by pressing the ESC key		

2.2.5 Recall a program

To recall a program stored in the ADG-8310, please follow this operation procedure:

Procedure	Operation details	LCD display
Step1	Press " Recall " button	RECALL 1
Step 2	Enter the program number (1 to 9) by using the number key or the rotary knob	RECALL *
Step 3	Press the " OK " button for confirmation. It will return to Step 2 if the number is out of the range.	
You can exit the recall operation at any point by pressing the ESC key		

2.2.6 Start a program

Press "Start" button to run the current program.

2.2.7 Stop a program

Press "Stop" button to stop the running program.

2.2.8 Load On/Off

The load's input can be toggled on/off through the Load On/Off key.

2.3 Menu operation

The Menu operation offers some setting and adjusting functions. The operation and functions are as following.

Procedure	Operation details	LCD display
Step1	Press " Menu " button	
Step 2	The LCD displays the menu functions. Use the UP and DOWN keys to select a function, then press " OK " for confirmation	Maximum Current Maximum Power Min Input Volt Band Rate Address Knob Enable Program Save Option Key Lock Load Default Exit
You can exit the menu operation at any point by pressing the ESC key		

2.3.1 Setting the maximum current

When you select the Maximum Current function, the LCD will display:

Max Curr=**A** **New=**	Set the maximum current value by using the number keyboard or the rotary knob, then press "OK" for confirmation.

2.3.2 Setting the maximum power

When you select the Maximum Power function, the LCD will display:

Max Power=**W** **New=**	Set the maximum power value by using the number keyboard or the rotary knob, then press "OK" for confirmation.

2.3.3 Setting Minimum Input Voltage

This function is used to set the minimum input voltage, when the input voltage is lower than this value, ADG-8310 electronic load will automatically stop. This function is used to discharge batteries. When the battery's voltage drops down to the set value, the load switches off automatically, keeping the battery from over-discharge. When you select Min Input Volt function, the LCD will display:

Min Volt=**V** **New=**	Set the minimum input voltage by using the number keyboard or the rotary knob, then press "OK" for confirmation.

2.3.4 Setting Baud Rate

This function is used to set the communication baud rate.

When you select the Baud Rate function, the LCD will display:

4800 bps **9600 bps** **19200 bps** **38400 bps Def***	Select the Baud Rate by using the UP and DOWN keys or the rotary knob, then press "OK" for confirmation.

2.3.5 Setting Address (0~254)

This function is used to set the address of the load. To communicate with the computer or other equipment, ADG-8310 load must be assigned an address.

When you select Address set function, the LCD will display:

Set Address=* **New=**	Set the address by using the number keyboard or the rotary knob, and then press "OK" for confirmation. The valid address range is from 0 to 254.

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2.3.6 Enable/disable the Rotary knob

This function is to enable or disable the rotary knob.

Enable Def. *

Disable
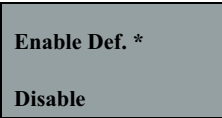
Use the UP and DOWN keys or rotary knob to select, and press "OK" to confirm.

2.3.7 Program

ADG-8310 electronic load provides a program mode for dynamic testing. The user can program the ADG-8310 electronic load and define the load values (current, power, resistance) and duration of each program step. To program the ADG-8310, please follow these 4 steps:

1、 Select one working mode: constant current, constant power, constant resistance;

2、 Set the length of the program;

3、 Set the load value (current, power, or resistance value) and duration time of each step;

4、 Select program running mode: one time or repeat.

For example, you need to set the following program:

Constant Current mode:

Step1   1A for 2 seconds

Step2   2A for 5 seconds

Step3   3A for 10 seconds

Repeat running step1 to step3.

Programming procedure is showed below:

1、 Select Program Set from menu operation, the LCD will display:

Constant Curr

Constant Power

Constant Resis
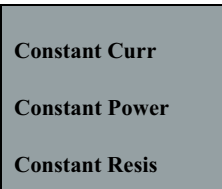
Use the UP and DOWN keys or rotary knob to select Constant Current mode, and press "OK" to confirm.

2、 LCD will display:

Step Number=*

New=
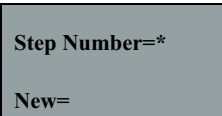
Input the program length "3" and press "OK" to confirm.

3、 LCD will display:

Step1 Set=0.00

New=
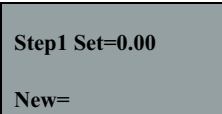
Input the current value "1" A, then press "OK" to confirm.

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4、 LCD will display:

```
Step Time=1s

New=
```
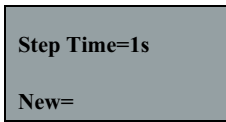
Input the time value "2"s, then press "OK" to confirm.

5、 LCD will display:

```
Step 2 Set=0.00

New=
```
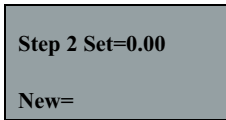
Input the current value "2" A, then press "OK" to confirm.

6、 LCD will display:

```
Step Time=1s

New=
```
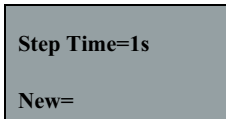
Input the time value "5"s, then press "OK" to confirm.

7、 LCD will display:

```
Step 3 Set=0.00

New=
```
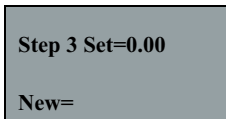
Input the current value "3" A, then press "OK" to confirm

8、 LCD will display:

```
Step Time=1s

New=
```
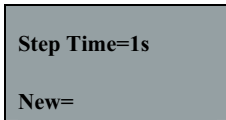
Input the time value "10"s, then press "OK" to confirm.

9、 LCD will display:

```
One Time

Repeat
```
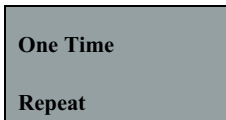
Select Repeat, then press "OK" to confirm.

The programming process is completed. Press "ESC" to return to the main menu, press "Start" to run the program. If you want to store this program for later use, please see 2.2.4

2.3.8 Save Option

This function is used to save the last load setting (current, power and resistance) before switching off ADG-8310. When this option has been set, every time the user switches on ADG-8310, the previous load setting will be restored automatically.

Select the Save Option function, the LCD will display:

```
Save I,P,R

Don't Save Def*
```
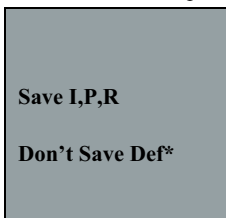
Use the UP and DOWN keys or the rotary knob to change the selection, then press "OK" to confirm. Select Save I, P, R, and load setting will be saved before the unit is switched off, and will be restored automatically when switched on the next time. Select Don't Save def* represent not to save current load setting.

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2.3.9 Lock the keyboard

This function is used to lock the keyboard, keep the load setting from unauthorized change. Only the person with correct password is allowed to operate.

Select the Key Lock function, the LCD will display:

Set Password

Enter a 4 numbers password, then press "OK " to confirm.

2.3.10 Load Default

This function is used to restore all the parameters to the factory setting.

Select Load Default function, LCD will display:

Don't Load
Load Default
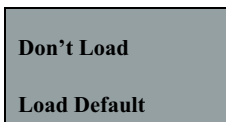
Select Load Default, and press "OK" to restore to the factory setting.

2.3.11 Exit

Select "Exit" to exit the menu operation.

ElectronicLoad   Software

ElectronicLoad is a free software which allow the user to monitor and control the ADG-8310 electronic load.

Chapter 1 Software Installation

1.1 Connect the electronic load to PC

With the optional communication adapter, you can connect ADG-8310 load to your computer through RS-232, USB or RS-485 port. Connect ADG-8310 to a RS-232 port with adapter, to a USB port, to a RS-485. If your computer doesn't have an RS-485 port, you may choose RS-232=>RS-485 adapter.

Fig.1-1 Connect the electronic load to PC

1.2 Installation

1.2.1 Insert software CD into the CD-ROM drive, double-click My Computer => CD => Eload => Setup.exe to start the installation, the Fig. 1-2 will be displayed.
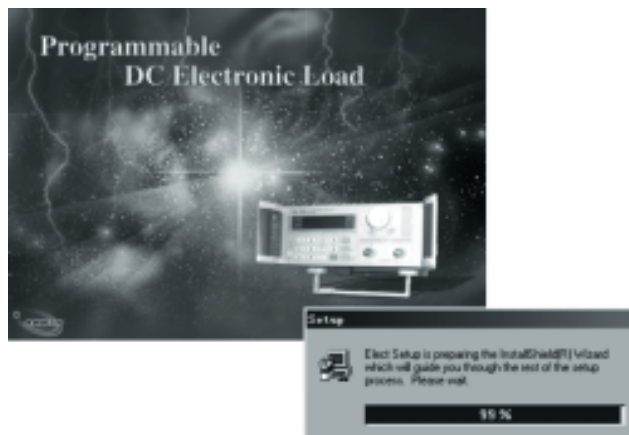
Fig.1-2 The Initialization of the Installation

1.2.2 The Welcome dialog box displays, press " NEXT " to continue
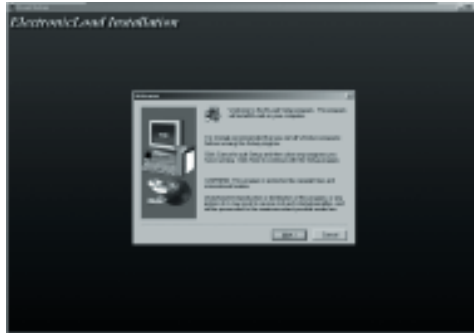
Fig.1-3 The Welcome dialog box

1.2.3 The License Agreement dialog box displays. Click Yes to accept the License Agreement and proceed with the installation process.

Note: If you do not want to accept the License Agreement, click No to abort the installation process.
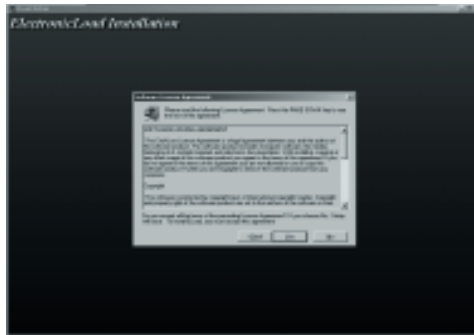
Fig.1-4 The License Agreement dialog box

1.2.4 The User Information dialog box displays, Enter your name and your company's name, then click Next.

Fig.1-5 The User Information dialog box

1.2.5 The destination folder dialog box displays. The default folder is " C:\Program Files\ELoad ". You may click "Browse" to select other installation path.
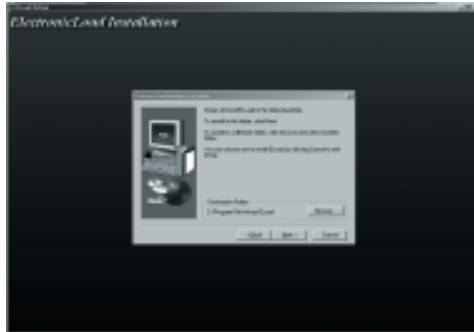
Fig.1-6 The destination folder dialog box

1.2.6 The installation option dialog box displays. Select "Typical" to install all components or select "Custom" to select installation components.
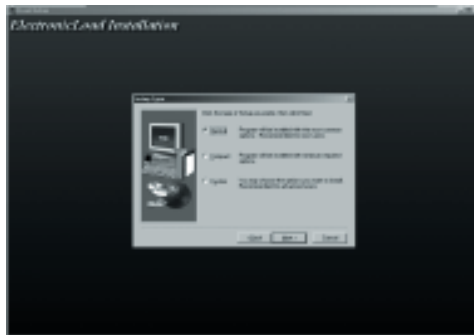
Fig.1-7 The installation option dialog box

1.2.7 The Select Program Folder dialog box displays. Specify a program folder (or leave the default folder), then click Next.

Fig.1-8 The Select Program Folder dialog box

1.2.8 Copy the files to your hard disk.
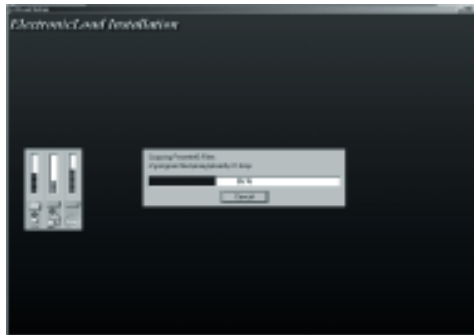
Fig.1-9 Copy Files

Software installation is complete when finished.

Chapter 2 Introduction

2.1 Running the program

2.1.1 To run the ElectronicLoad program, select "Start=>Program=>Eload" and click "E3710A" or

E3711A" to run the program.
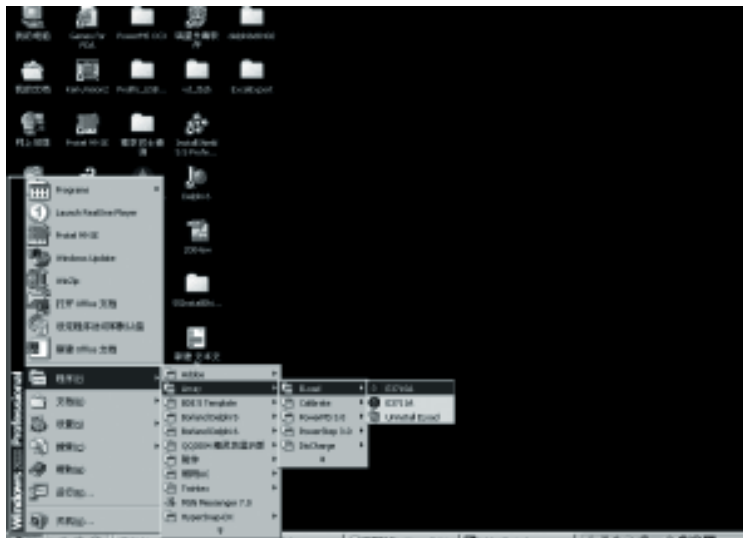
Fig.2-1 Start the program

2.1.3 The ElectronicLoad Main Window
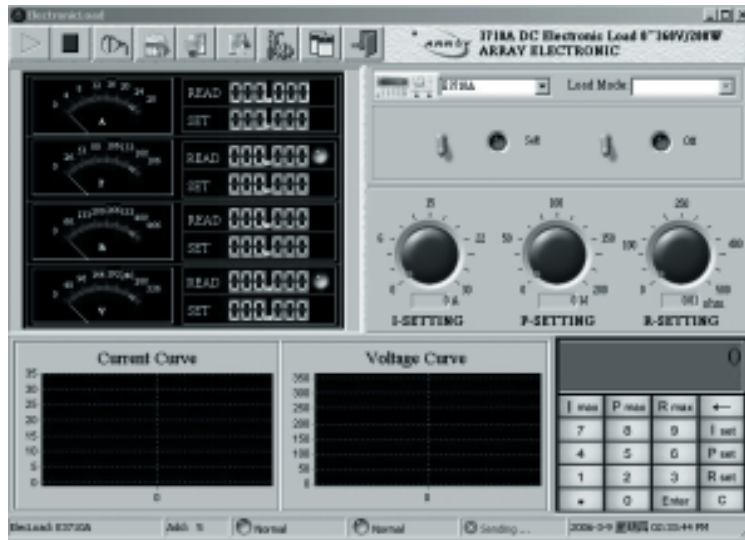
Fig.2-3 The ElectronicLoad Main Window

2.2 The ELoad List

The Eload list lists all registered electronic load on the computer. To make the ElectronicLoad control your load, choose the load you want to use from the Eload list.
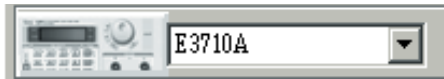
Fig.2-4 The Eload List

2.3 The Load Mode List

From the Load Mode list, you can select Load Mode: Constant Current, Constant Power, Constant Resistance.

Fig.2-5 The Load Mode List

2.4 Control Switch

The Load On/Off switch is to turn on/off the electronic load; the Self/PC Control switch is to set who control the electronic load: the PC or the load itself.

Fig.2-6 Control switch

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2.5 The Tool Buttons

On the top left of the main window, there are 9 tool buttons:

"Start": Start communication

"Stop": Stop communication

"Setting": setting COM Port and recording interval

"Program": Setting a Program

"Run Program": Run a Program

"Stop Program": Stop Running Program

"Eload Setting": Setting load parameters

"Report": Data report

"Quit": Quit the ElectronicLoad program

2.6 Keypad and Rotary dial:

Fig.2-7 Current, Power, Resistance setting dial

To quickly modify a parameter (Current, Power, Resistance), put the mouse on the red point of the dial and rotate.

To accurately set a parameter, use the keypad.
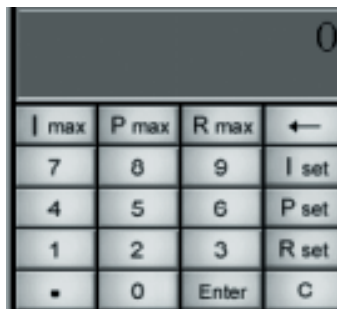
Fig.2-8 Keypad

Set Current: Press "I set", input the current value (0~30A), press "ENTER" to confirm.

Set Power: Press "P set", input the power value (3710A: 0~150W¸3711A: 0~300W), press "ENTER" to confirm.

Set Resistance: Press "R set", input the resistance value (0~500Ω), press "ENTER" to confirm.

I Max, P Max, R Max: show the max value of each parameter.

2.7 The Amp, Power, Resistance, Voltage Meter

The Amp, Power, Resistance, Voltage Meter show the setting and read back value of current, power, resistance and voltage.

Fig.2-9 The Amp, Power, Resistance, Voltage Meter

2.8 Dynamic Curve

These curve show the dynamic states of voltage and current.
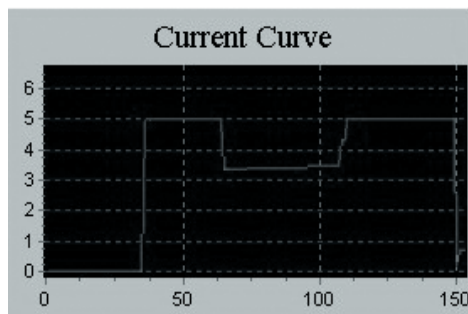
Fig.2-10 The Voltage Curve   Fig.2-11 The Current Curve
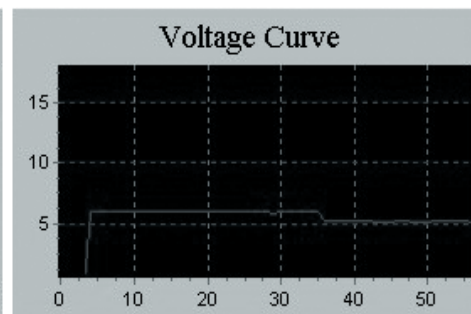
You may drag your mouse on the curve to zoom in/out.

2.9 Setting

2.9.1 Setting Com port and baud rate

Click the [icon] button, select the correct Com port and baud rate. The baud rate setting should be the same as the connected electronic load.
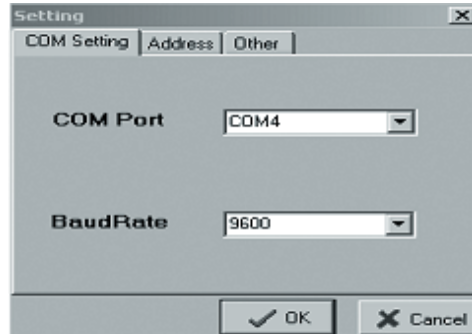
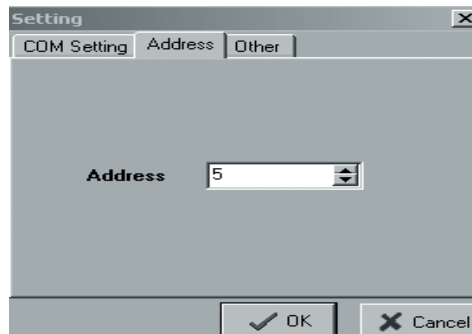Fig.2-12 Setting Window

2.9.2 Setting electronic load address

Fig.2-13 Address Setting window

Click "Address" to go to the Address setting window. Set an address that is the same as the connected electronic load. Press "OK" to confirm.
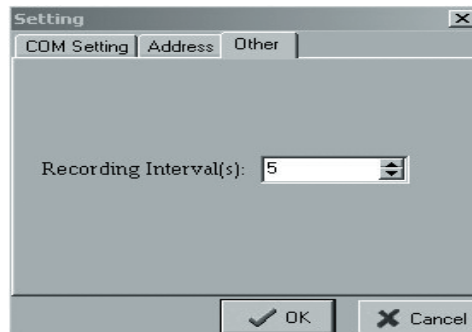
2.9.3 Setting Recording Interval

Fig.2-14 Setting Recording Interval window

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2.10 Programming Window:

ElectronicLoad allows user to make an own program to control ADG-8310 load. User can select the load mode, and define load value (current, power, resistance) and duration of each program step.

Click the [ ] button, the Program window will be displayed:

Fig.2-15 Programming window

Select an "Electronic Load Mode"; enter the load value and the duration of each program step.

The maximum program length is 10 steps. But user may decided only run part of them. Use the "Run Steps" push bar to decide how many steps you want to run.

Program State is used to define whether repeat to run this program.

When finishing, press "OK" to store the program and go back to the main window.

Press [ ] button to run the program; press [ ] button to stop the program.

2.11 Eload setting

Click the [ ] button, the Eload setting window will be displayed.

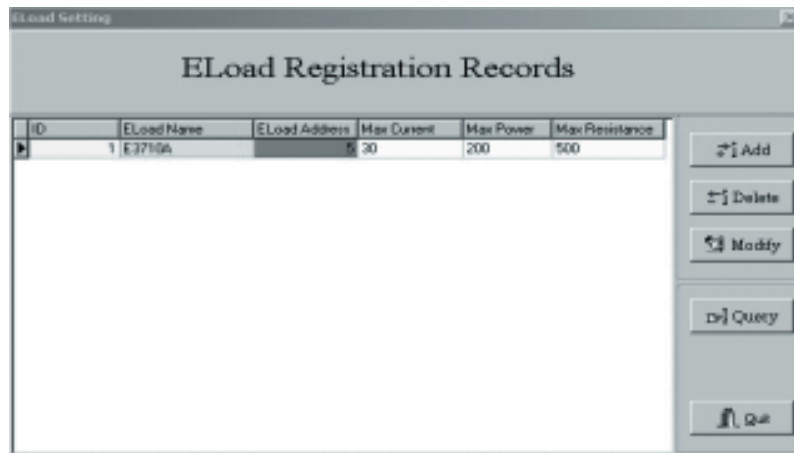Fig.2-16 The Eload Setting window

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The Eload Registration Records show the parameters of all registered load.

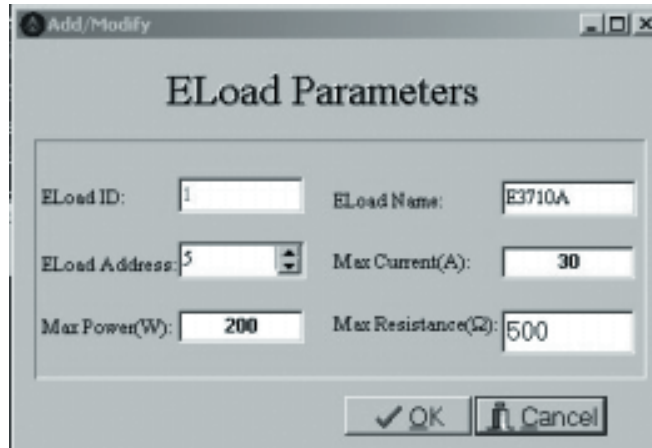To add a new load, click the [⁺↓Add] button.

Fig.2-17 Add new load window

Enter the Eload Name, Address and the maximum value of current, power, resistance, then press "OK" to confirm. Note: the Eload ID is assigned by the software.

The Parameter Explanation

Parameter	Explanation	Range
Eload ID	ID	
Eload Name	Name	ASCII
Eload Address	Address	0-254
Max Current	Maximum Current	0-30A
Max Power	Maximum Power	0-150W /300W
Max Resistance	Maximum Resistance	0-500 Ω

To delete a registered load, select the load from the Eload Registration Records, then click the [⁺↓Delete] button.

To modify a load's parameters, select the load from the Eload Registration Records, then click the [↻ Modify] button.

To query a load, click the [D↓Query] button, then enter the load name you want to query.

Attention: after the Add, Modify, Delete operation, the program must restart so that the modifications may take effect. The following dialog box will be shown, click "Yes" to close the program, then restart the program from the Start menu.
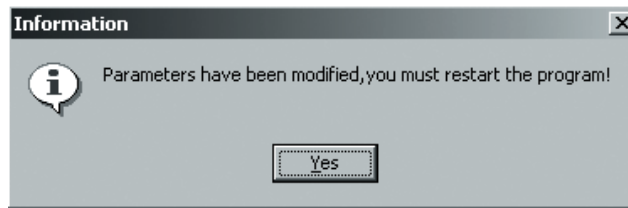
Fig2-18 After Add, Modify, Delete operation, the program must restart

2.12 Data Report

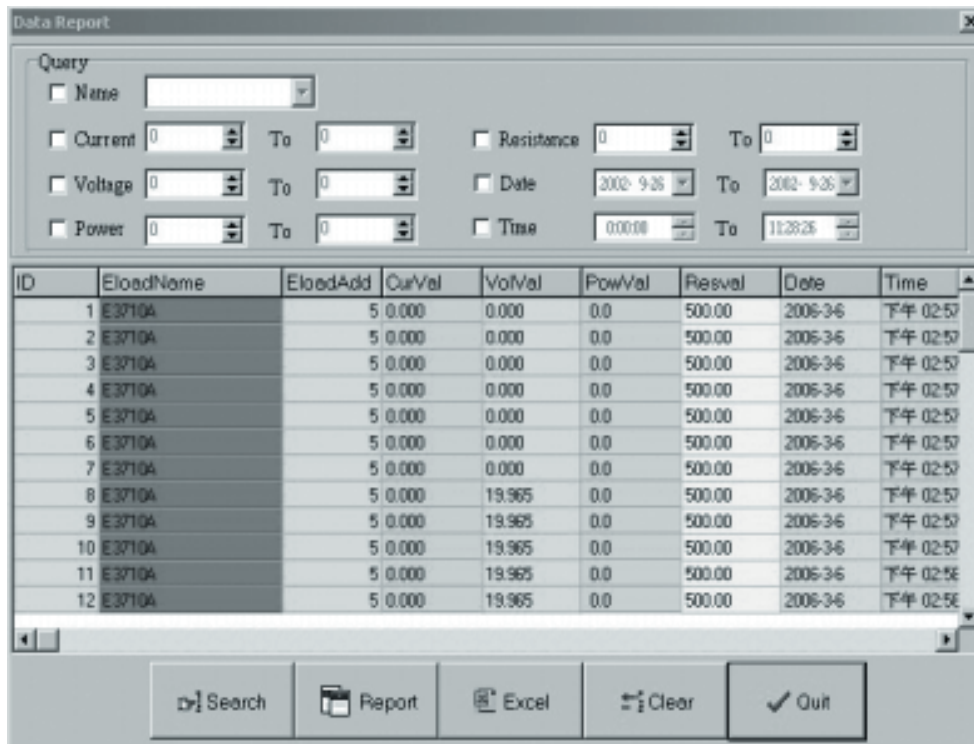Click the [   ] button, the data report window will be shown:

Fig2-19 The Data Report window

To search, set the query condition, and then click the "Search" button.

Click the "Report" button to watch the report.

Click the "Excel" button to export the report in Excel format.

To delete historic data, click the "Clear" button.

Quit: quit to the main window.

2.13 Use ElectronicLoad software control your load

Start the ElectronicLoad program, from the Eload List, select the load you want to use. If the desired load does not appear on the Eload List, use Eload Setting to add the desired load.

Click the [image] Setting button, ensure that the Com port, baud rate and address is the same as that of the load..

Click the [image] Start button to start communication. Using the Control Mode switch, set the load in PC control mode; You may now control the load from the computer.

Prior to quitting the ElectronicLoad program, do remember to return the setting of your load to the Self control mode, failing which, you will be unable to control your load using it's own keyboard.

In the event of communications failure, please check the Com port, baud rate and Address settings. Also ensure that the communication cable is firmly and correctly connected.

Chapter 3   Uninstall   ElectronicLoad Software

3.1 Uninstall the ElectronicLoad Software

From the Start Menu, select "Program=>Eload=>Uninstall Eload" to unstall the software. Remember to quit the program before uninstalling.