



Gaotiejian

GTJ-EV2-W Plate Bearing Test Set

Operation Manual

Beijing Gaotiejian Technology Development Co.,Ltd.

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Chapter One functions and operating instructions

1 Standards

《Railway Engineering Civil Test Regulations》 (TB10202-2010)

《Railway Subgrade Engineering Construction Acceptance Criteria》 (TB10414-2003)

2 Functions of the instrument

GTJ-EV2-W strain modulus test instrument, Used to test the settlement value of subgrade under static load, to assess the bearing capacity and deformation of the subgrade. It is suitable for engineering quality test of Railways, highways, airports, city transportation, ports, industrial and civil buildings. Especially for detection of narrow areas. For example, road and bridge transition section and road shoulder detection, existing line base, etc.

Based function

Test

Show 17 test values, calculate the deformation modulus Ev1, Ev2 and Ev2/Ev1 automatically

Save

Test results and analyse results, could save 400 sets Ev2 test results

Printing

Print test data, test curve, etc. on the Bluetooth micro printer.

System settings

Modify the current time and date

3 Parameter

Name		Technical index
Model		GTJ-Ev2-W
Application Range	Applicable Soil type	Various types of soil and earth-rock mixed fillers with a particle size not greater than 1/4 of the load plate diameter
	Test affect depth (mm)	0~500mm
	Working environments	Temperature-10°C - 40°C humidity<90%HR
	Data transmission type	Data wire
	Power supply	lithium battery
Printing type		Wireless blue tooth printing

Name		Technical index
Sensor	Pressure sensor range	100kN25mm
	Displacement sensor range	resolution ratio 0.01mm
Data collect device	Load plate	Diameter (mm) : 300mm Thickness: 25mm Weight: 17.5kg
	Load device	Hydraulic pump: pressure100kN Pressure cylinder (Max pressure 100KN, Stroke: 150mm) High pressure soft tube : Length 2m Pluggable Pressure cylinder extension bar(1×40mm,1×90mm , 1×120mm , 1×160mm, 2×60mm) Magnetic ball joints
	Displacement testing device	Three points support frame (With retractable lever arm, adjustable base Size: 2320×570×420mm(Length×Width×Height) Weight: 12.5Kg Displacement sensor : Range25mm, resolution ratio 0.01mm , Protection grade IP 42
	Pressure test device	100KNpressure sensor、 Pressure parts and connecting devices

4 System instructure

GTJ-Ev2-W strain modulus test instrument is mainly composed of four parts of mobile phone, micro printer, loading device and displacement test device. As shown in Figure 1

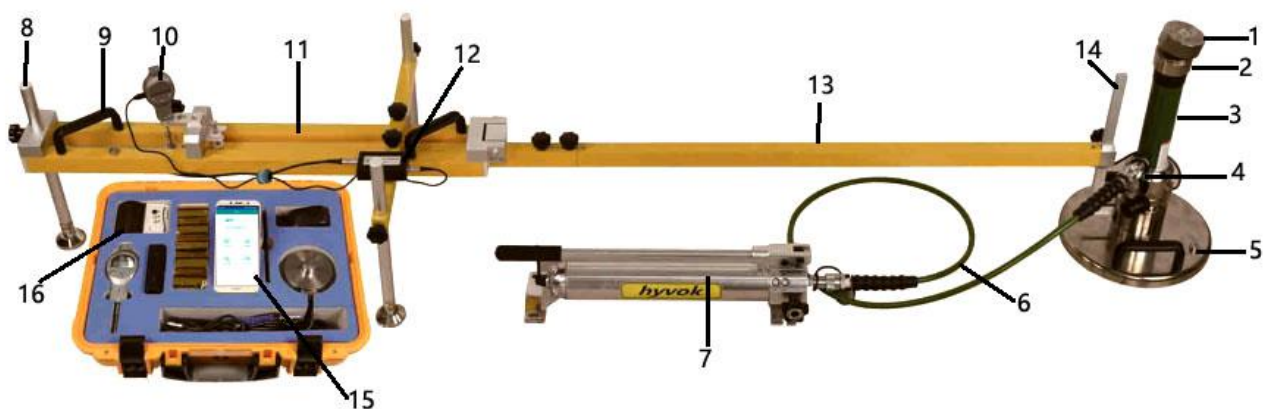


Figure 1

5 test preparation

Carrying device installation (see figure 1)

- (1) Place the load plate on the test point, and the opening serves as a guide for connecting L-shaped accessories.
- (2) Place the pressure sensor on the load plate, and then place the pressure cylinder on the pressure sensor.
- (3) Pull the magnetic ball joint on the loading motor vehicle.
- (4) Adjust the height with the Pluggable Pressure cylinder extension bar
- (5) Connect the pressure cylinder and pressure pump with oil tube

Installation of three-point support frame (see picture 1)

- (1) Install the support beam on the based measuring frame, and then install the three support feet on the standard based measuring frame.
- (2) Take out the L-shaped accessories and install them on the measuring arm
- (3) Connect the measuring arm to the based measuring frame and fix it with two bolts.
- (4) Insert the circular contact of the L-shaped fitting into the center of the carrier board, that is, the notch of the L-shaped fitting is aligned with the edge of the round hole, and the entire three-point support frame is adjusted horizontally by means of a horizontal bubble.
- (5) Install the displacement sensor at the measurement position on the based measurement frame and fix it.

Sensor connection (see picture 1)

Insert the connecting wires of pressure sensor and displacement sensor into the test box.

Host connection

The host computer and the wireless collection box are connected by Bluetooth, and the mobile phone will automatically search for and connect to the wireless collection box every time it is turned on.

Note:The pressure and displacement sensors must be connected at the same time before the test

Chapter Two Mobile phone APP operation guide

1 Log in

The initial login password of the APP on the mobile of this instrument is the password generated by the unique code of the device that carries the APP

After logging in for the first time, it will enter home page automatically when the next time you use it. No need logging in repeatedly.

2 Main menu interface

Log in to the home page, the software is divided into four modules: "Start detection", "Data management", "System settings", "About us" as shown in Figure 2-1. If a Bluetooth device is bound, the system will automatically connect to Bluetooth.



Figure 2-1

3 Start detection

Click "Start Test" on the homepage to enter the test interface as shown in Figure 2-2. You need to set and read some test parameters, such as: engineering information, test point number, coordinate information, and test time. In this interface, you can click the box under the "photo" to take a photo of the test site, you can take multiple photos, you can delete the photo (only a single deletion), click "OK" to save the measurement point information and picture information as shown in Figure 2-3.

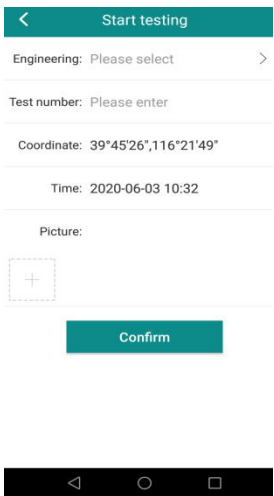


Figure2-2

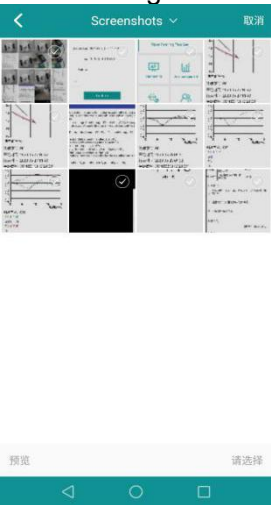


Figure 2-3

Click "Project Information" to enter the "Project List" page, and then click "+" in the upper right corner to enter the "New Project Information" interface and create a project drawing, as shown in 2-4

On the "Project List" page, select the project and back to the "Start Test" page. The number of the test point defaults to the last measurement point of the current project information +1. If the number of the test point has not been established, "0001" is displayed on the mobile. When a mobile phone card is inserted and internet data is turned on, the software will automatically interpret the coordinate information coordinates, as shown in Figure 2-5.

< New project information

Project name: Please enter

Construction unit: Please enter

Packing type: Please enter

Device number: 0001

Inspector: Please enter

Save



Figure 2-4

< Project list +

gtj

Construction unit: gtj

Packing type: 1

Device number: 0001

Inspector: 22



Figure 2-5

Click "OK" to enter the test interface, the system will remind "please pre-load" Figure 2-6, then to start the test, please complete the test in turn.

Click "Return" during the test, the system will prompt "Whether to exit the test", and click "OK" to return to the previous page.

< Start testing

Test number: 002

Upper number: Preload --

Real-time data: 0.454/MPa 0.00/mm

Prompt: Please pre-load, and load to 0.010MPa.



Figure 2-6

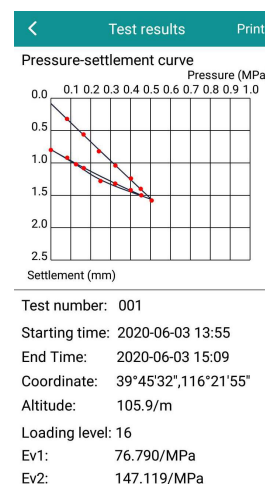


Figure 2-7

After the test is completed, the system will calculate the values of "Ev1", "Ev2" and "Ev2 / Ev1" according to the test data, and then turn to the detection result page as shown in Figure 2-7.

4.Data management interface

Click "Data Management" on the homepage to enter the "Data Management" page. The page will display the project names of all the project information created by the current mobile phone sorted by time. Figure 2-8.

4.1 Data viewing

Select the project to be viewed on the data management interface, click the project name to view all the information of the project, and click the serial number of the measuring point to view the test data of this measuring point as shown in Figure 2-9

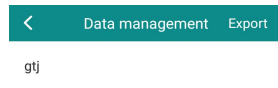


Figure 2-8

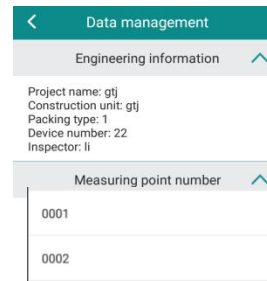


Figure 2-9

4.2 Data export

In the data management interface, click "Export" in the upper right corner to enter the "Data Export" list page, select the project name to be exported (multiple project data export is not supported), and export the data to the local storage of the mobile phone as shown in Figure 2-10.

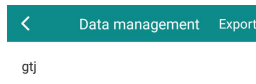


Figure 2-10

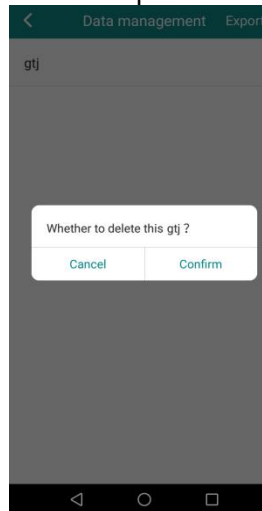


Figure 2-11

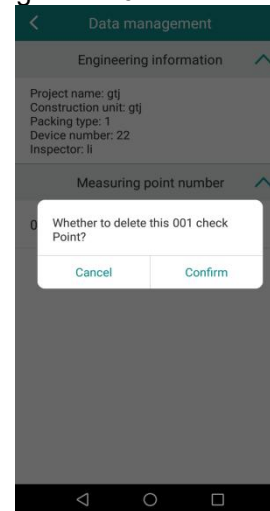


Figure 2-12

4.3 Data deletion

Delete project: In the data management interface, long press the project name in the list the system will prompt the project to be deleted, click "OK" button to delete the project as shown in Figure 2-11.

Delete measuring point: In the data project management interface, long press the name of the measuring point in the list the system will prompt the measuring point to be deleted, click "OK" button to delete the measuring point as shown in Figure 2-12

5.Data printing

On the test result page, click "Print" in the upper right corner (make sure that the Bluetooth function of the mobile phone is turned on before printing, and the printer and the mobile phone have been paired with Bluetooth) to print as shown in Figure 2-13.

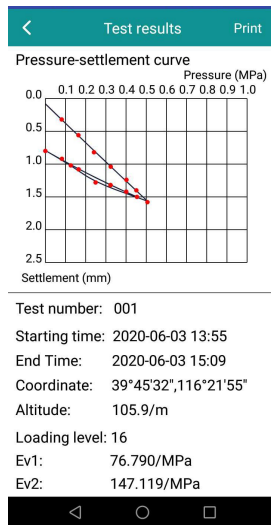


Figure2-13

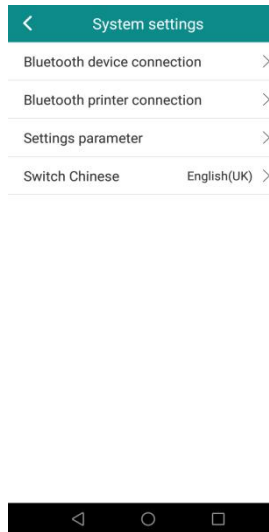


Figure2-14

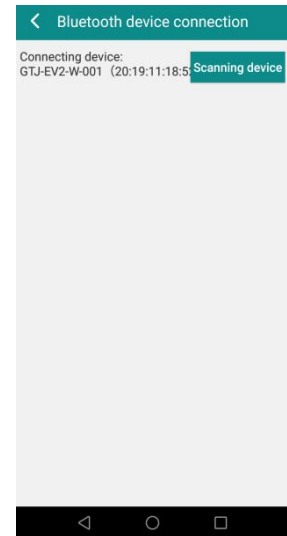


Figure2-15

The default value of the Mac address of the printer can be set in "System Settings"- "Bluetooth Printer Connection". It can support printing in both Chinese and English. The default language is Simplified Chinese for printing in Chinese and English for printing in English.

6. System setting interface

In the system setting interface, you can set the various parameters of the system as shown in Figure 2-14

6.1 blue tooth connection

We can connect the app and plate load in this interface, and it will connect automatically after starting. As shown in Figure 2-15

6.2 setting of blue tooth device

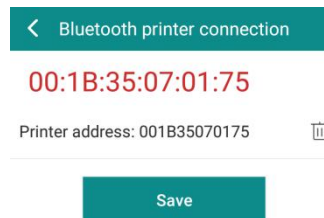


Figure2-16

6.3 Parameter setting

The value on this interface is the corresponding parameter value of the instrument, please do not modify it by yourself.

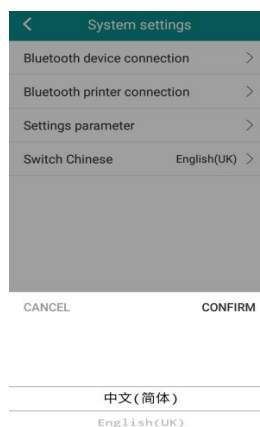


Figure2-17

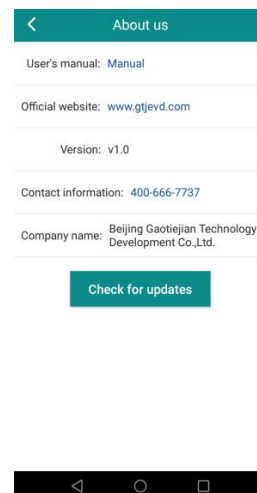


Figure2-18

6.4 Switch between Chinese and English

Click Chinese or English to switch button will enter the switch language window to switch languages as shown in Figure 2-17.

7. About us

The interface includes "User Operation Manual", "Official Website", "Version Information", "Contact Information", "Company Name", click "User Operation Manual" to view the operation manual as shown in Figure 2-18.

Chapter Three Operational points of EV2 testing in industry standards

1 Test environment :

- 1) For medium coarse sand with fast water evaporation, surface disturbance soil caused by surface hardened shell, softened or other factors, The deformation modulus test should be conducted under its influence, and the digging concentration should not be greater than the diameter of the load plate.
- 2) For fine-grained homogenizers, testing should start within 2-4H after compaction.
- 3) The test surface should be horizontal without pits. The uneven surface caused by the filling of the mixture should be laid dry-work medium sand or gypsum putty with thickness about 2-3mm under the load board.
- 4) The test point should be far away from the source during the test
- 5) The test should stop if Rainy days or weather with a wind force greater than 6
- 6) The settlement of the load plate shall be measured at the center single point.

2 Test point:

1. The test ground should be smooth, and move the dust with brush. When the test surface is on a slope, The supporting surface of the load plate should be made horizontal.
2. The placement of test equipment shall meet the following requirements:
 - 1) Place the load plate on the test point, make sure that the load plate is completely in contact with the ground. If necessary, lay a thin layer of dry sand (2-3mm) or gypsum putty. At the same time make the frame level with the level bubble or level instrument. Before lay the gypsum putty under the load plate, An oil film should be applied on the bottom surface of the load plate. Then we put the load plate on the gypsum putty layer. Turn the load plate to left or right, and beat the top lightly, make it completely touch to the ground. The extruded gypsum putty should be moved before it setting. We can start test after the gypsum putty is setting.
 - 2) Put the reaction force device up of the load plate and fixed. The distance between the load plate and and reaction force device supporting point should no less than 0.75m.
 - 3) Put the jack on the center of the load plate and keep it vertically. Use the extension rod and the adjusting screw to make the top of the jack ball hinge closely contact with the reaction force device.
 - 4) When installing the measuring bridge, the contact of the settlement measuring device should be freely placed in the center of the measuring hole on the bearing plate. The settlement gauge must be perpendicular to the test surface. The distance between the bridge support base and the support point of the reaction force device shall not be less than 1.25m.
 - 5) During the test, the support bridge and the reaction force device shall not sway.
3. If the load greater than the predetermined load during the test, the load shall be maintained and recorded in the test record table.
4. When the platel is severely tilted during the test, so that the water level bubble on the carrier plate cannot coincide with the circle mark, or the carrier plate excessively sinks and the data is abnormal, should find out the problem, and choose another test point, and marked at the test record.

Chapter Four Ev2 Operating procedures

Follow the voice prompts

Pre-press to 0.01MPa. When the data is stable, the indicator adjusted to "zeroed" into the first level of loading.

1. Close tightly of the oil valve. Start add press. When the press reach to 0.08Mpa, keep two minutes. Save.

2. Add press to 0.16Mpa, keep about two minutes. Save.

3. Add press to 0.24Mpa, keep about two minutes. Save.

4. Add press to 0.32Mpa, keep about two minutes. Save.

5. Add press to 0.40Mpa, keep about two minutes. Save.

6. Add press to 0.45Mpa, keep about two minutes. Save.

7. Add press to 0.50Mpa, keep about two minutes. Save.

8. Then start release the pressure, Open the oil valve slowly. Reduce the pressure to 0.25Mpa. Save.

9. Keep reducing pressure to 0.125Mpa. Save.

10. Keep reducing pressure, open the oil valve totally. Save (11-16 steps will be finished within one minute).

11. Close the oil valve, start add pressure. Add the pressure to 0.08Mpa keep about two minutes. Save.

12. Add press to 0.16Mpa, keep about two minutes. Save.

13. Add press to 0.24Mpa, keep about two minutes. Save.

14. Add press to 0.32Mpa, keep about two minutes. Save.

15. Add press to 0.40Mpa, keep about two minutes. Save.

16. Add press to 0.45Mpa, keep about two minutes. Save.

Press "ok" to finish the test

Note: When the oil pressure is not enough, you need to pressurize to maintain the required pressure, and if the pressure is too high, you need to release the oil.

Pay attention to protect the displacement instrument (it is easy to damage, install it last when installing, and remove it first when removing the instrument).

Chapter Five app introduction

Gaotiejian wireless static modulus analysis software is created by Beijing Gaotiejian Test Instrument Co.,Ltd used for GTJ-Ev2-W static modulus instrument data analysis process. It could be used on the computer which in staled Windows system.

The processing object of this software is data of "GTJ-Ev2-W static modulus instrument". The software could save and display the data of static modulus instrument. And could print analytical results. The printed test results could be used as user report.

1App installation

The App in similar to the normal used app on the Windows. Open the CD together with the instrument. Select:"Ev2UpperSoft.exe"And install it according the prompt.

2 App introduction

2.1 App interface introduction

The operation method and interface of Wireless static modulus test instrument total match the Windows, User familiar with the Windows will learn the App quickly.

The software interface is mainly composed of four parts: Heading column, Menu column, tool column, and main window, as shown in Figure 5-1.

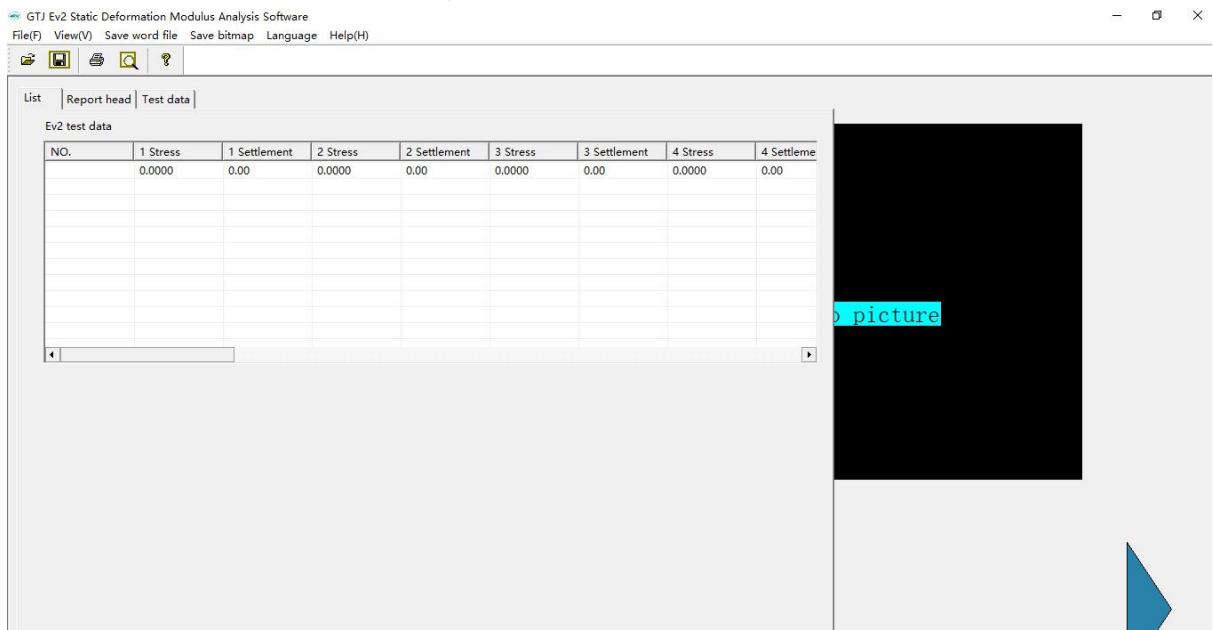


Figure 5-1

- **Heading column**
It will show app icon, app name, document name we are dealing with
- **Menu column**

It consists of 3 drop-down menu items (as shown in Figure 5-2). Clicking on each menu item will bring up a drop-down menu, each corresponding to a set of functions. The submenu items of these 3 menu items contain all the functions of this software. When some menu items are in grey color, this function is invalid in the current state.

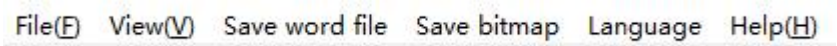


Figure 5-2

- **tool column**

Composed of a series of buttons (as shown in Figure 5-3), each button can achieve a common function. Hold the mouse on a button for a while, and the function of the button will be automatically displayed on the screen.

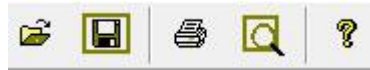


Figure 5-3

- **Main Window**

Including list, Ev2 report title, Ev2 test data four windows, the main Window used to show the test results, input the project information, following are the main parts we will introduce it as key point.

2.2 Main Window

2.2.1 list Window

Click the list on the main Window, the software will change to the list window interface, its function is to show all the test date in the order of the test point all showing in the list box.

As shown in the figure of 5-4

NO.	1 Stress	1 Settlement	2 Stress	2 Settlement	3 Stress	3 Settlement	4 Stress	4 Settlement
1	0.0010	0.06	0.0800	2.64	65.5350	3.90	0.2410	5.26
2	0.0010	0.00	0.0800	0.32	0.1600	0.56	0.2400	0.82

Figure 5-4

Note: only after opening file or receiving the data, it will appear in the list, or the list will empty.

2.2.2 Ev2 Report title Window

When finish open the data, and select the the test point name we are going to analysis, click the Ev2 report title enter the report title Window, We can see the content shown as Figure 5-5. It has shown the number of this test point, number of the instrument, start time, finishing time. The Gearing value of GTJ-Ev2-W wireless static deformation modulus test instrument supplied by our company is 2. So this box is in gray stage, can't be changed.

GTJ Ev2 Static Deformation Modulus Analysis Software
File(F) View(V) Save word file Save bitmap Language Help(H)

List Report head Test data

Ev2 report header

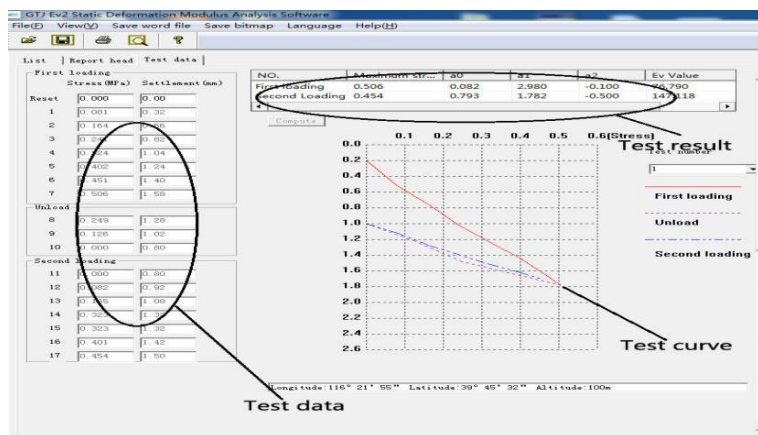
Project name		Test number	
Entrusted company		Address	Tel
Construction		Address	Tel
Filling material		Filling thickness	Test mileage
Weather		Leverage ratio	Required Ev2
Required Ev2/Ev1 <		Test elevation	
Temperature		Bearing plate diameter	Start time
Calibration Date		Instrument number	End time
Testing location		Instrument name	
Remark 1		Tester	
Remark 2		Date	
Remark 3			

Figure 5-5

2.2.3 Ev2 Test data Window

Click the Ev2 test date on the Main Window, the software will change to test data window. It including three areas, test data area, test result area, and pressure-settlement value curve value.

Finish opening or receiving the data, clip the drop down menu select the name of the test point, it will show the pressure and settlement value of this data group. In the list of the test results area, it will calculate the a_0 , a_1 , a_2 , Ev_1 , Ev_2 , and Ev_2/Ev_1 . and drawing the value in the pressure-settlement curve area.



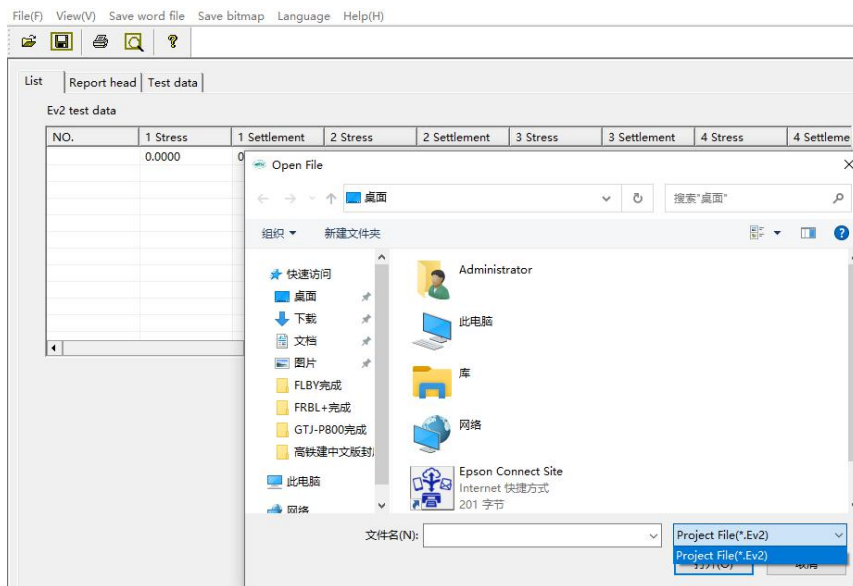


Figure 5-7

After opening the data, we can start process and print.

3.2 Save the data

Save project program

There are maybe lots of data in the test project in the GTJ-Ev2-W wireless static deformation modulus test instrument, If want to save a project separately, after receving the data, click save as in the document menu. And save the project document, then there will be a dialog box shown as 5-8 to select the test point.

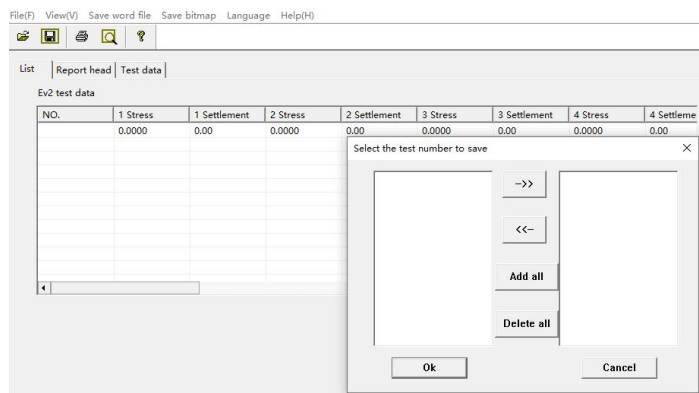


图 5-8

The left list on this dialog box displays the names of all test points of the currently open file, and the list on the right shows the names of test points to be stored. The user selects the name of the test point to be saved in the list on the left, and then clicks the->> button, then the test point is selected in the list box on the right; similarly, in the list on the left of the dialog box Test point name, and then click the <<-button, the test point will be selected from the test points in the right column to the left list, and click the delete all button, the right list will be cleared. Clicking the Select All button will select all test points to the right list

Select the test point to be saved, and then click the “ok” button in the dialog box in Figure 5-8. The Save Project File dialog box shown in Figure 5-9 will appear. Select the save way and enter the file name (the default suffix is .Ev2), And then click the Save button to save the project file.



Figure 5-9

3.3 Change the test point name

The name of the test point of the original data in the test instrument is named after the test number. Click the file menu, and then click the Ev2 test point under the Change test point name column of the data menu. There will be a dialog of change the test point name shown as 5-10

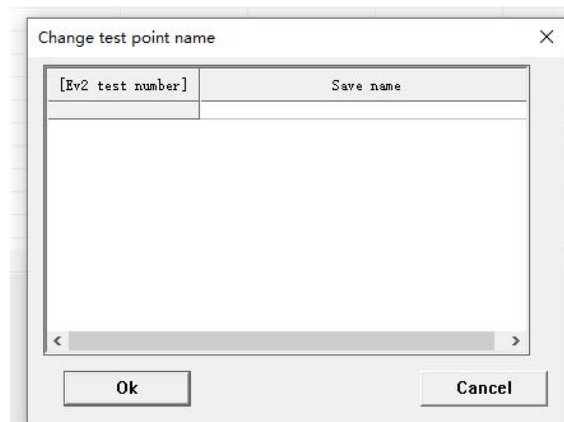


Figure5-10

In the change test point name column , double-click the mouse to rename the test point. As in this example, change 1 to "Railway 1" and click OK to change the test point name.

note:

Note:

1. After changing the name of the test point, it must be saved as a project file to save this change;

2. You must open the data or receive the data before you change the test point name.

Otherwise, the following dialog box will appear.

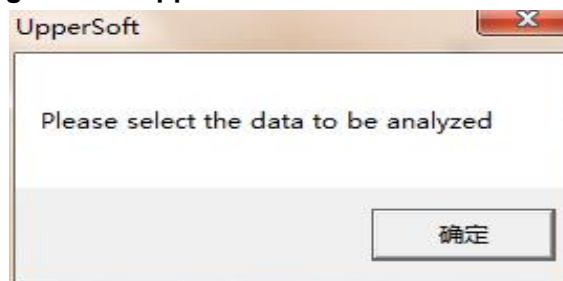


Figure 5-11

2. Enter data manually

For the convenience of users, this software provides the function of manually inputting data and calculating. Click the File menu bar, and then click Manually enter data in the Data menu. The dialog box for entering test point data shown in Figure 5-12 appears.

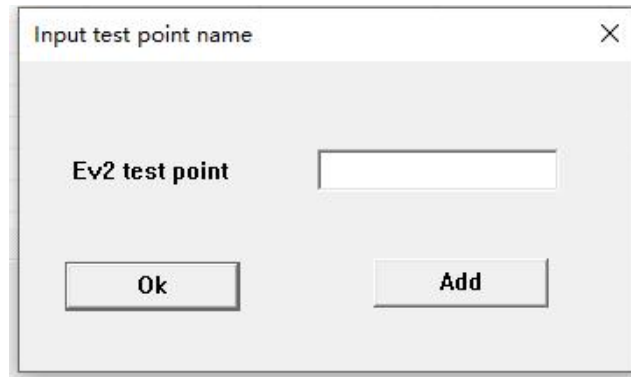


Figure 5-12

Fill in the name of the test point, click to add the main window will automatically change the test data window shown in Figure 5-13, at this time the calculation button changes from gray stage to usable stage, The edit column for the pressure and settlement value of 1-17 is also editable, and the font inside becomes red. Enter the pressure and settlement data in the red font edit field and click the calculation button, it will display the Ev value of the input data. And will drawing pressure- settlement curve of the input data in the stress-settlement area. Click the save project file submenu in the save menu to save the input data this time.

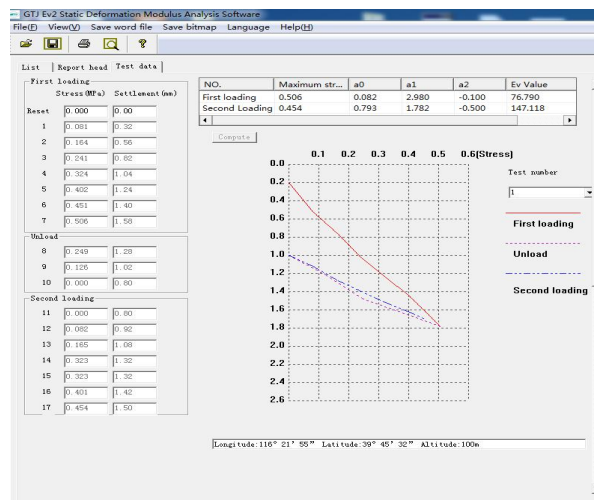


Figure 5-13

Note: The data entered manually cannot be saved as the original file. At this time, the menu column for saving the original file is in gray stage.

3.4 Printing and printing preview

Click the print button in the file menu column or tool column, could print the test repot.

Click printing preview, could printing preview. The printed paper type is A4 paper.

There will be a dialog box to select the print type shown as 5-14, when we click printing or preview printing. Three selections in the picture, Choose to print the current data,it will select the test point value of current interface, pressure-settlement test curve and result. Select print all data button, it will all the value of all the test points of this file. Pressure-settlement curve and test result. Select print list, will print the value of all the test point.

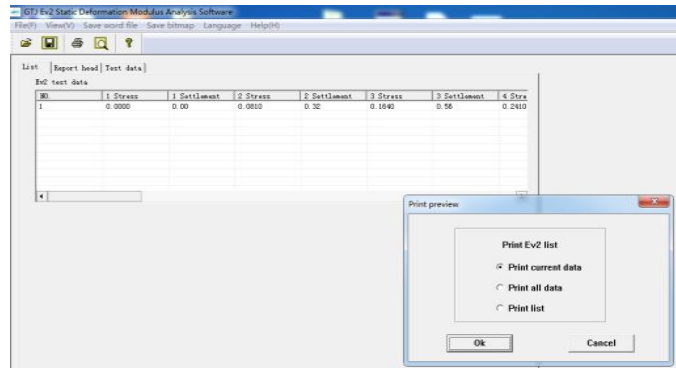
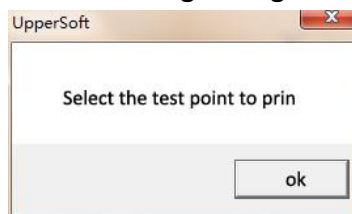


Figure 5-14

Note: When printing the current data, you must select the test points to be printed in the test data window to print, otherwise the following dialog box will pop up.

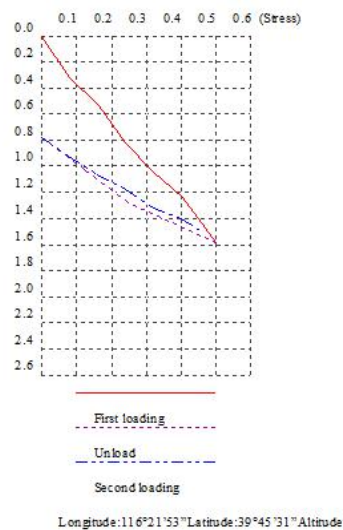


3.5 5Test case of Ev2

Ev2 Static Deformation Modulus Testing Report

Test date:	Tester:gg
Project name:ty	Instrument number:5
Construction company:tt	Instrument name:
Construction site:	Test number:1
Packing type:dd	Leverage ratio:2
Filling thickness:	Test elevation:
Test mileage:	Weather:

NO.	Stress (MPa)	Settlement (mm)
First loading		
0	0.000	0.00
1	0.080	0.32
2	0.164	0.54
3	0.242	0.82
4	0.321	1.04
5	0.406	1.24
6	0.452	1.40
7	0.502	1.58
Unload		
8	0.249	1.28
9	0.123	1.02
10	0.000	0.78
Second loading		
11	0.000	0.78
12	0.078	0.92
13	0.160	1.06
14	0.241	1.18
15	0.320	1.32
16	0.402	1.40
17	0.457	1.50



NO.	Maximum stress	a0	a1	a2	Ev1	Ev2/ Ev1
First loading	0.502	0.086	2.884	0.100	76.662	1.921
Second loading	0.457	0.780	1.832	-0.606	147.268	



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