深圳市英威腾电气股份有限公司
SHENZHEN INVT ELECTRIC CO., LTD.

INVT Studio V1.0

INVT Industrial Control System

2013-09-04

I. General

The manual describes the operation procedure of INVT Studio monitor system which is used to configure and monitor INVT low, medium and high voltage series inverters.
Currently, all of INVT inverters support serial Modbus protocol and some of models support Ethernet UDP protocol. Operation control and parameter modification via upper computer is intuitive and easy-to-use.
INVT Studio software supports:
★All models of INVT inverters;
★Serial and Ethernet communication;
★Monitoring multiple and various inverters: One computer monitors multiple and various inverters at the same time;
★Uploading and downloading parameters, importing and exporting parameter files;
★Modifying and viewing parameters;
★Bit monitoring, read and write for status word and control word of function codes;
★Inverter parameter oscillography;
★Fault diagnosis and cause prompt;
★Inverter start/stop, FWD/REV running control and fault reset;
★Parameter online help;
★Flexible configuration of function codes: With strong generality, the software is compatible with the function codes of standard and non-standard software.

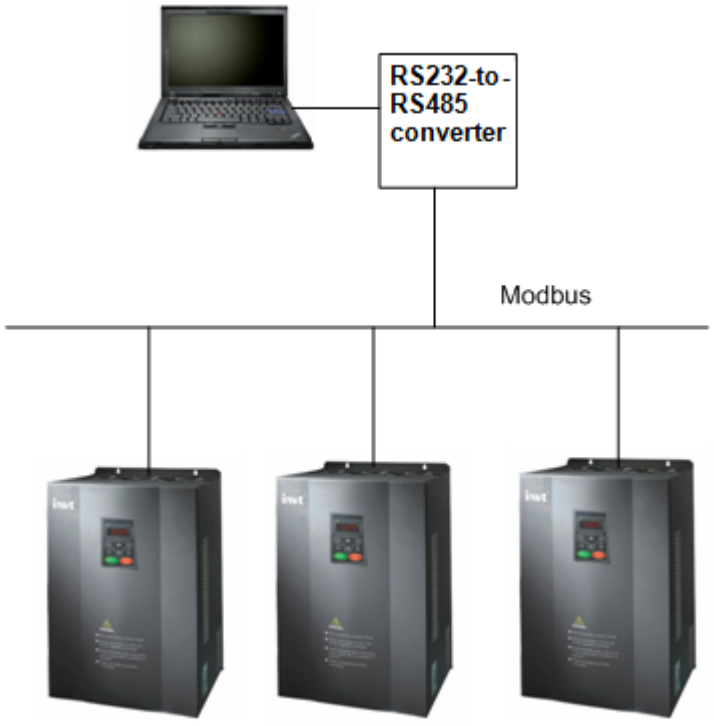
II. Use of Studio

2.1 Hardware connection

1. Serial communication: The inverters are equipped with RS485 interface while PCs are generally equipped with RS232 interface. So a RS232-to-RS485 converter (HEXIN converter is recommended.) must be connected at the PC side. Then, connect via twisted pair (0-5kM). The interface connection mode is as shown in the table below:

Interface of the RS232-to-RS485 converter	Interface of the inverter	Interface of the RS232-to-RS485 converter	Interface of the inverter
T/R-	485-	T/R+	485+

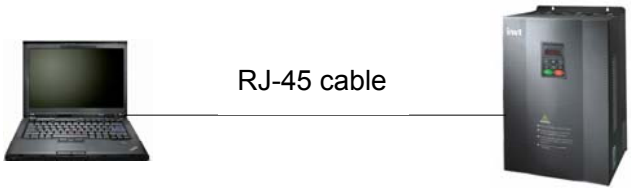
The structure diagram of system connection is shown below:



INVT inverter INVT inverter INVT inverter

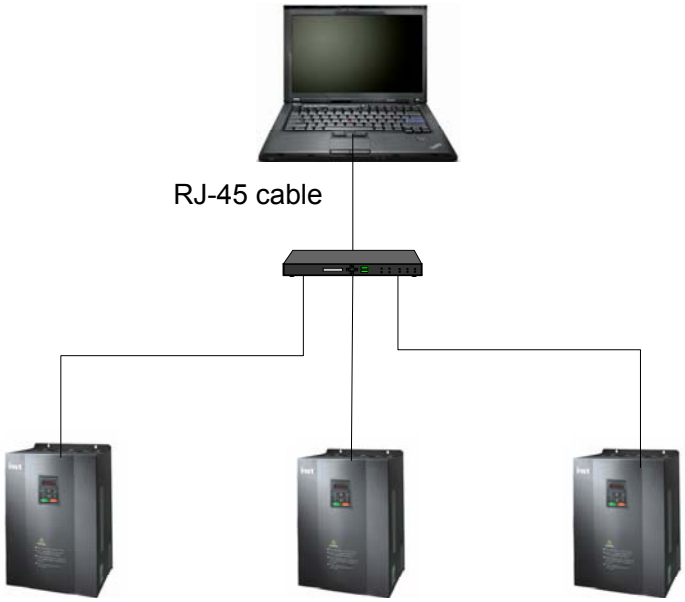
2. Ethernet communication: The inverters are connected to the computer by cables. To monitor multiple inverters at the same time, the converter is necessary for networking. Three connection ways are:

(1)One-to-one topology: The RJ-45 cable is used to connect PC and the inverter directly, which is suitable for monitoring only one inverter.



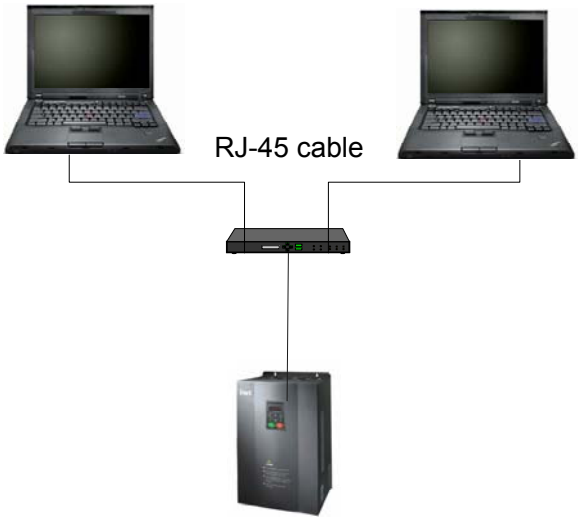
INVT inverter

(2)One-to-more topology: The RJ-45 cables are used between the converter and PC, the converter and inverters, which is suitable for monitoring multiple inverters.



INVT inverter INVT inverter INVT inverter

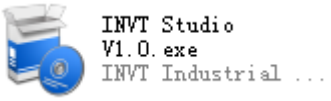
(3)More-to-one topology: The RJ-45 cables are used between the switch and PCs, the switch and inverter, which is suitable for one inverter monitored by multiple PCs.



INVT inverter

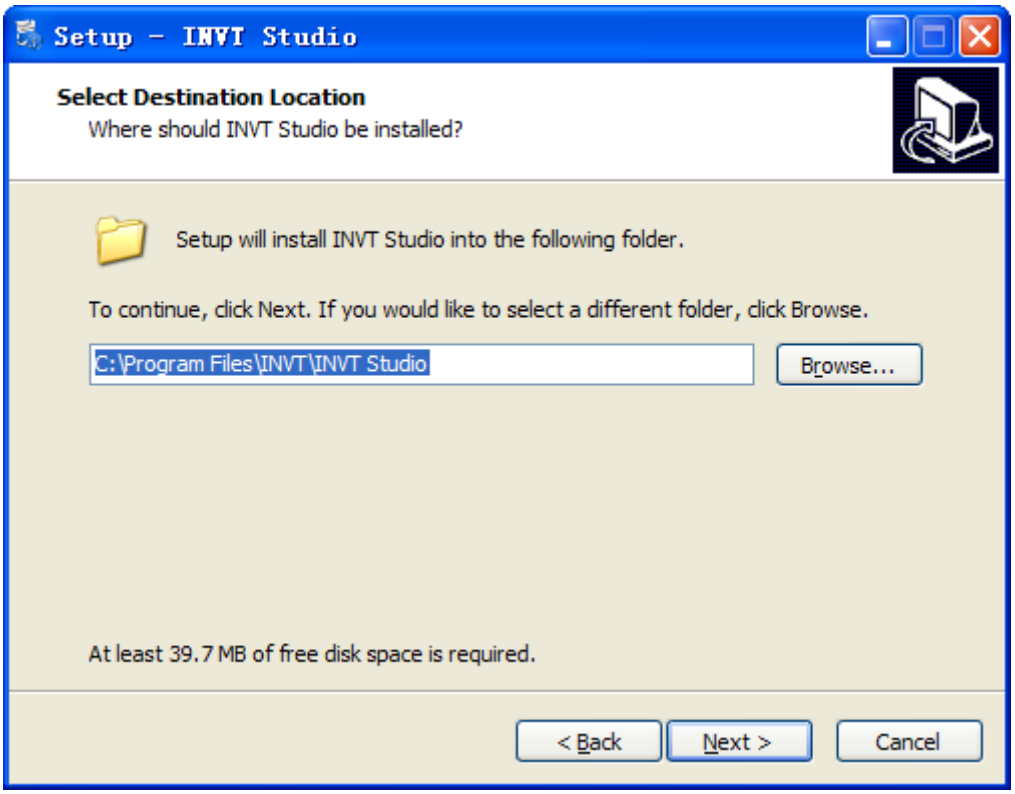
2.2 Software installation

1. Run INVT Studio Setup.exe

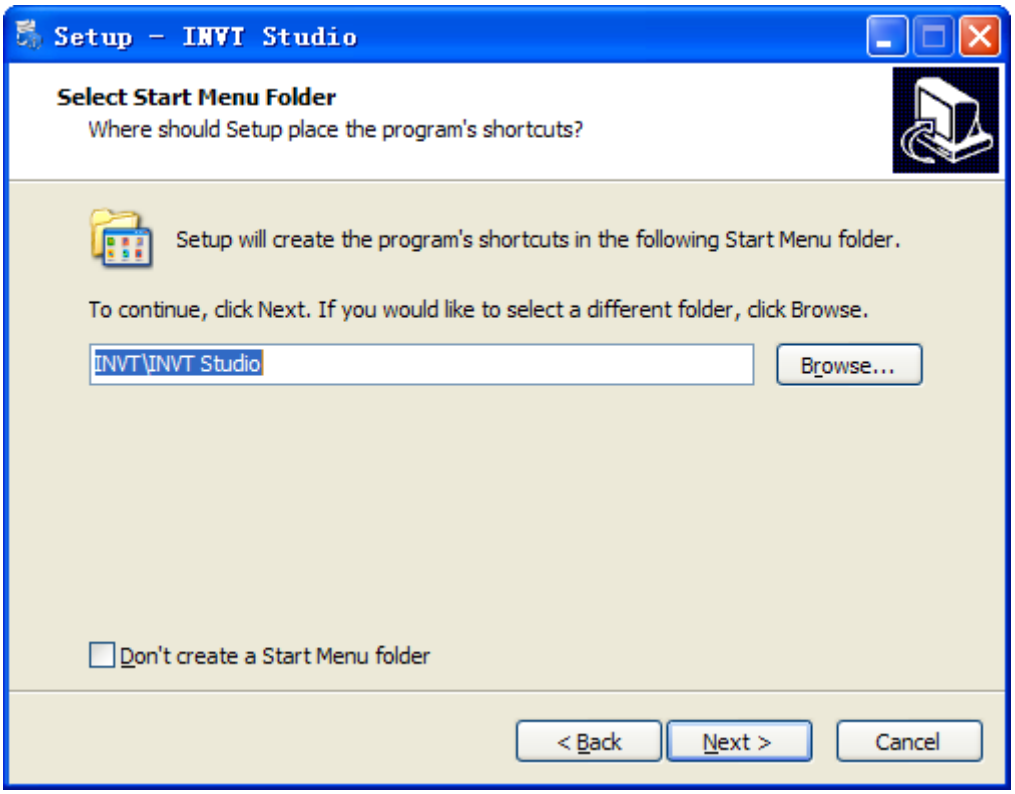


Pop up the setup wizard.

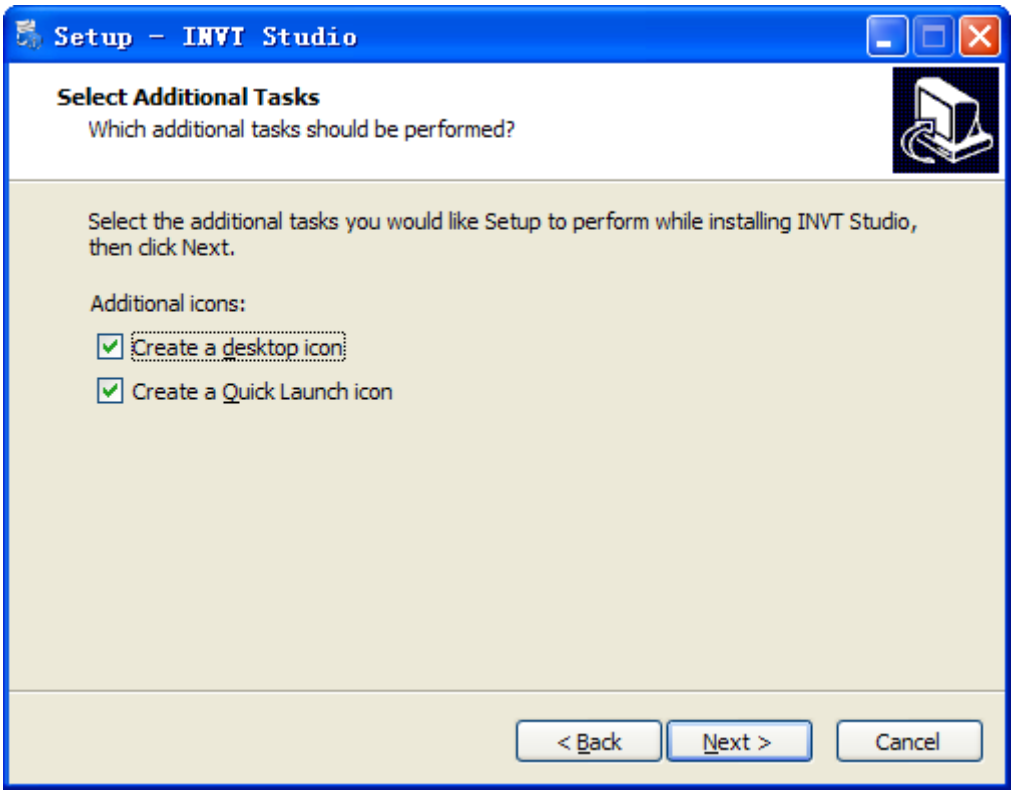
2. Click Next to enter the page of Select Destination Location. INVT Studio will be installed by default in the directory C:\Program Files\INVT\INVT Studio.



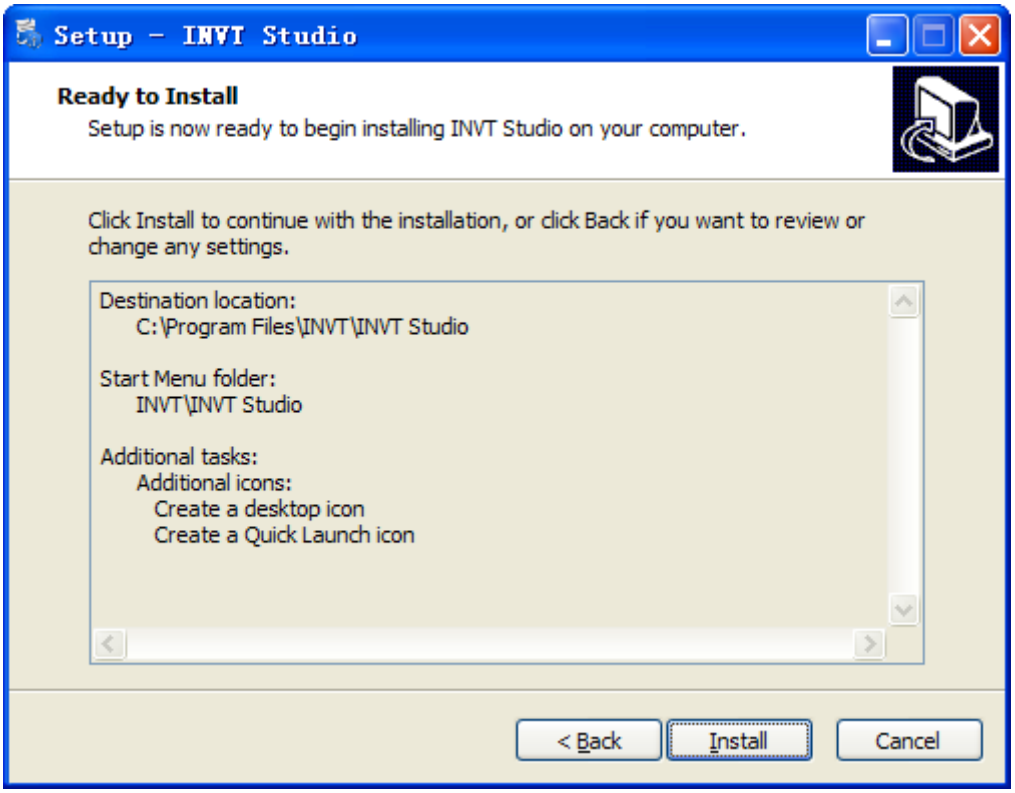
3. Click Next to enter the page of Select Start Menu Folder and specify the path.



4. Click Next to enter the page of Select Additional Tasks and decide whether to create shortcuts as needed.



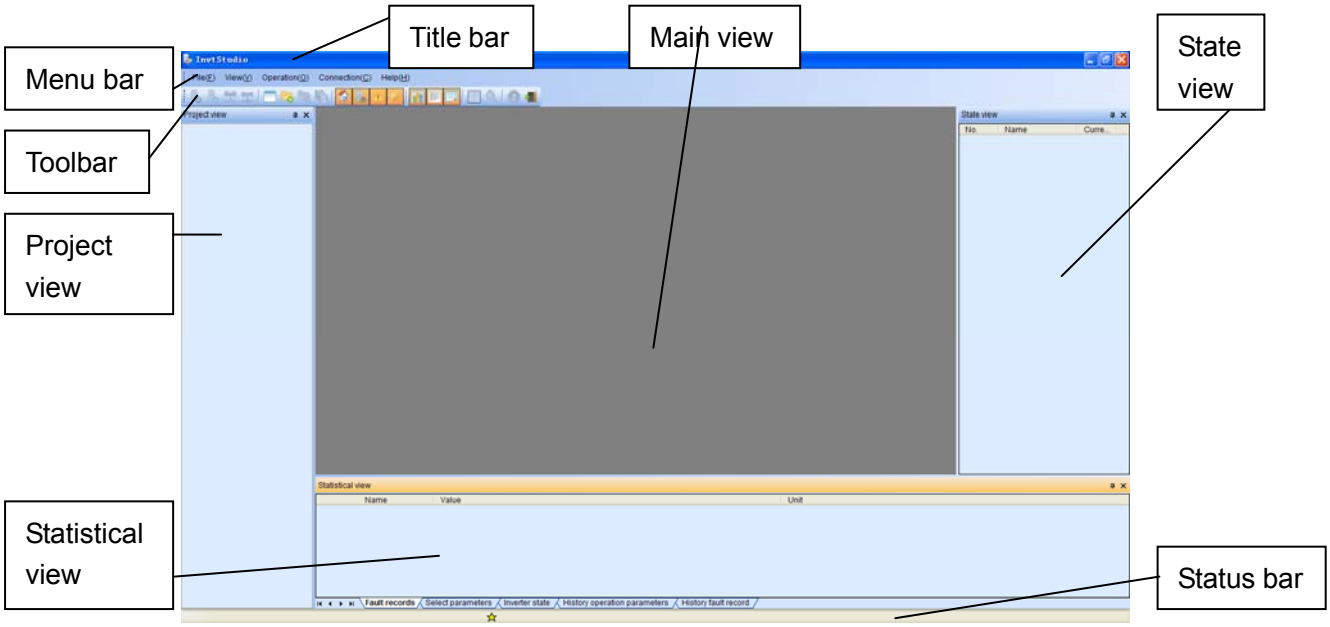
5. Click Next to enter the page of Ready to Install.



6. Click Install. The setup wizard will prompt Finish after software installation is completed.

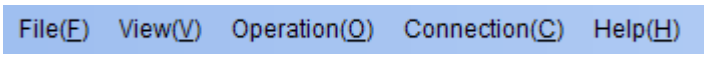
7. After installation, a quick launch icon of INVT Studio will be created on the desktop and simultaneously in start menu.

III. Software interface

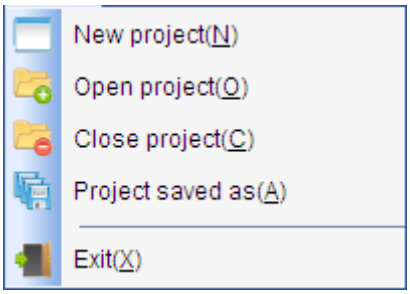


Name	Function
Title bar	Display the name of software
Menu bar	Provide the menu options for each operation
Toolbar	Place the commonly used menus for ease of operation
Status bar	Prompt inverter connection states, read and write errors of function parameters, etc.
Main view	Oscillograph, function codes, control panel
Project view	Display and manage the inverter
State view	Display running parameters of the inverter
Statistical view	Display fault records, select parameters, inverter states, history records

3.1 Menu bar

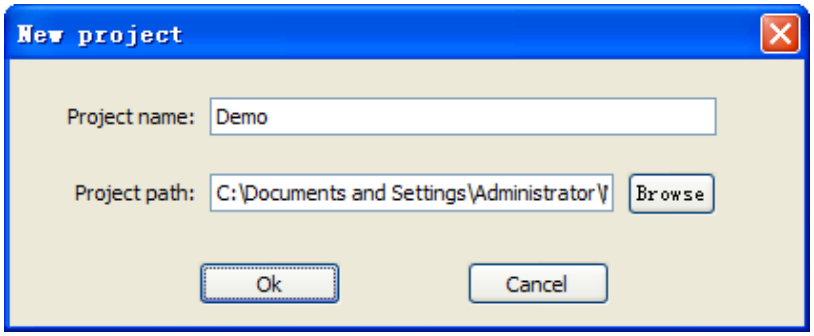


3.1.1 File

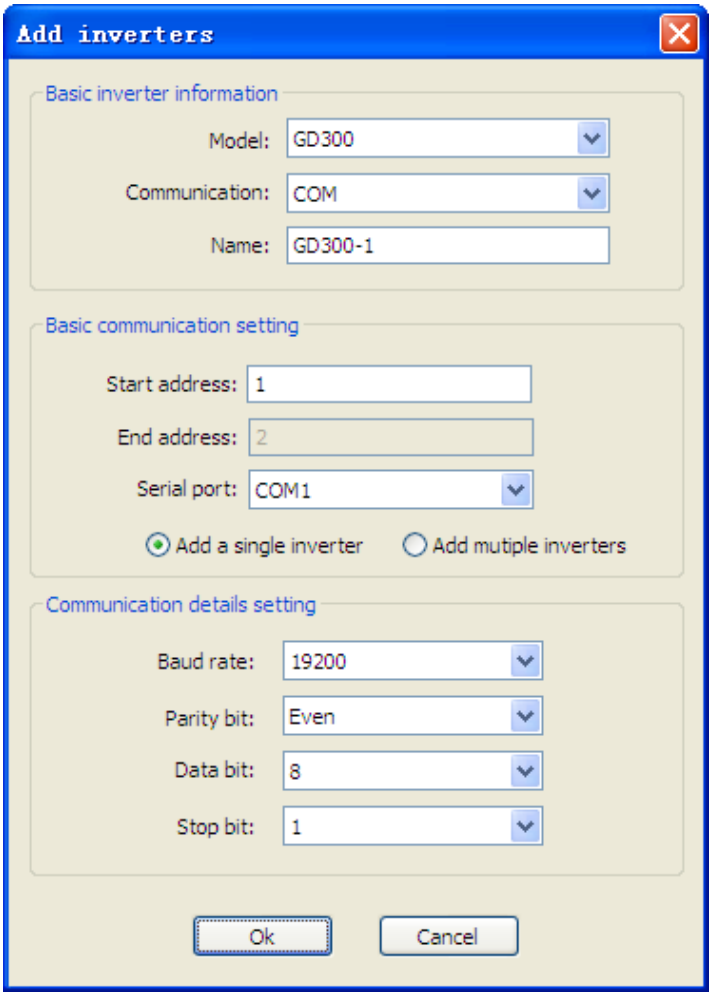


★New project

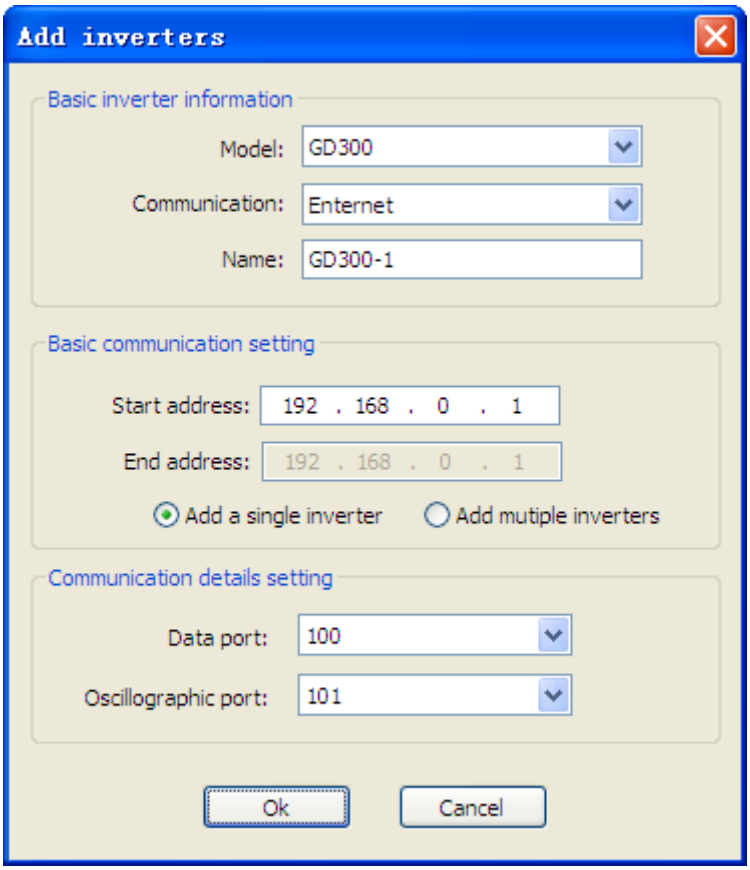
Step 1, input project name and project path.



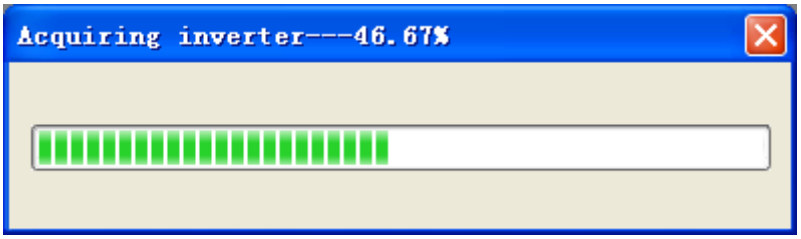
Step 2, add inverters: select inverter model and communication method. For serial communication, users need to confirm the slave address, serial port number, baud rate, check mode, data length, start and end bit, etc.

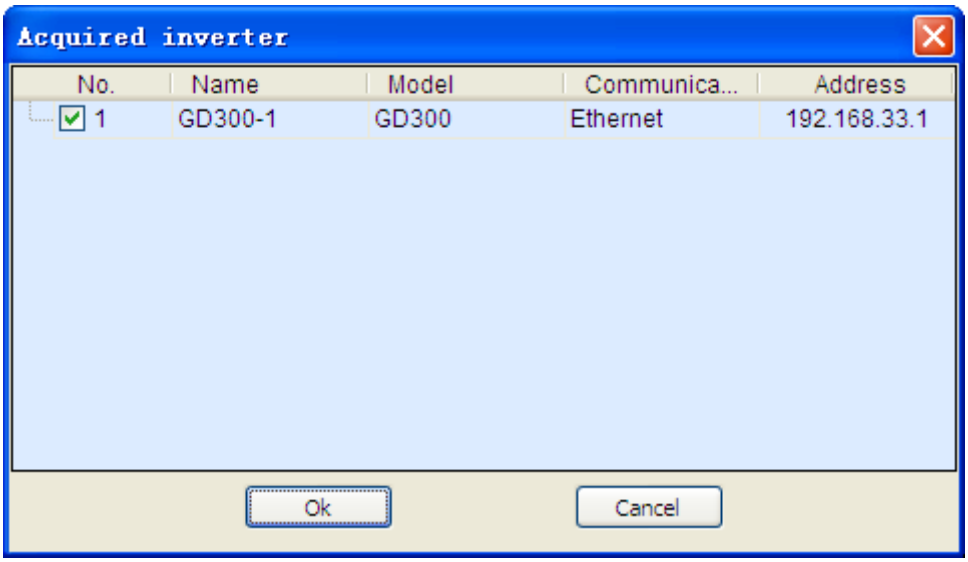


For Ethernet communication, users need to confirm IP address and port number. The software default network ports are 100 and 101. Only GD5000 is special, it's ports are 6000 and 6001.



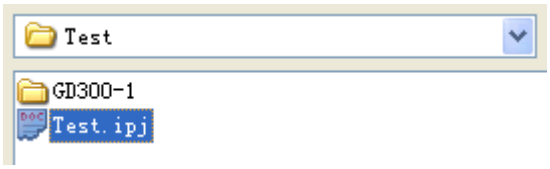
Step 3, add a single inverter or multiple inverters. If users select the option of Add multiple inverters, the software will search the connected inverters automatically.





★Open project

Open the created project in file extension *.ipj.



★Close project

Close the current opened project.

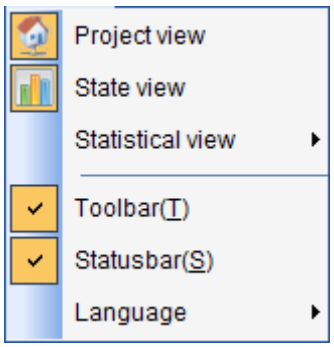
★Save as

Save the project as another path or name.

★Exit

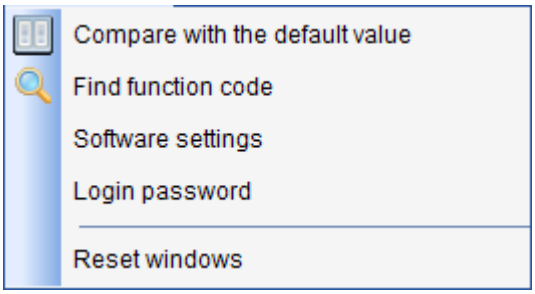
Exit the software.

3.1.2 View



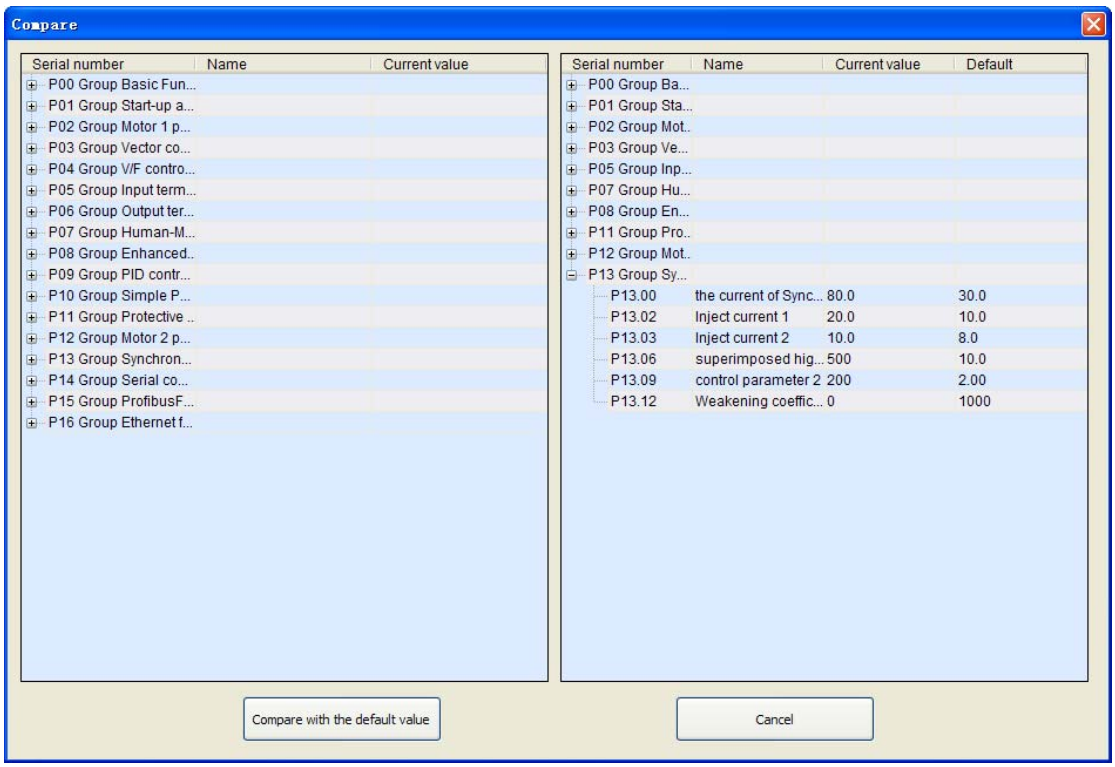
Show or hide the windows at all levels and support multi-language switch.

3.1.3 Operation



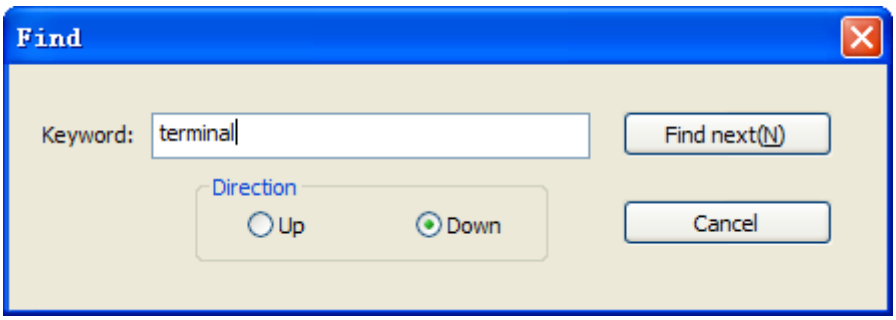
★Compare with the default value

Compare the current value with the default value of inverter parameters and then pick out different values. The left is the current value and the right is the compared result.



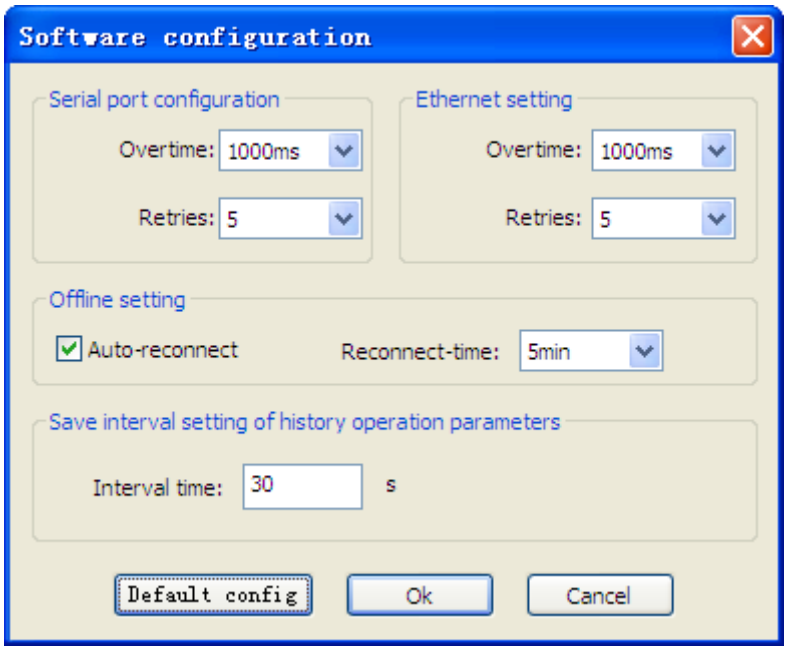
★Find function code

Input the keyword to find the location of function codes in the list of function parameters.



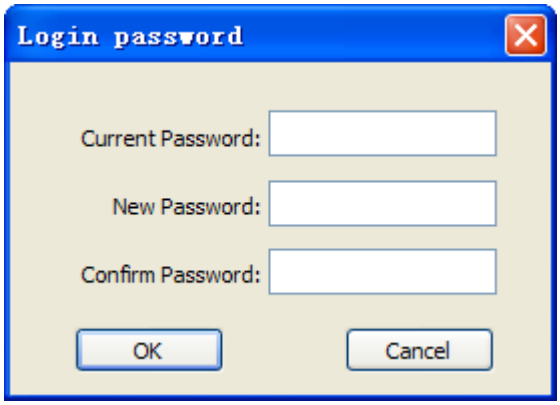
★Software settings

Set the basic parameters of serial port and Ethernet communication, including the time of communication overtime, the number of retries, etc.



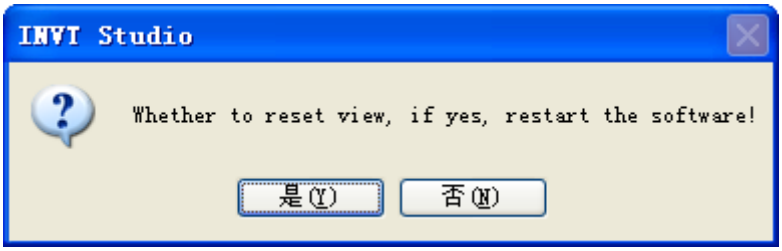
★Login password

Set the login password for starting the software. Software is no password by default, the original password is empty.

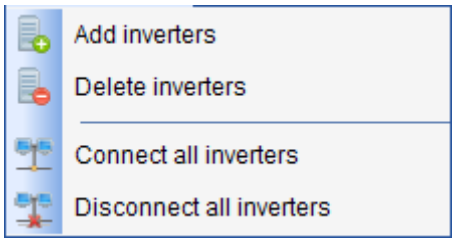


★Reset window

Restore the default layout when the window of INVT Studio is cluttered.



3.1.4 Connection

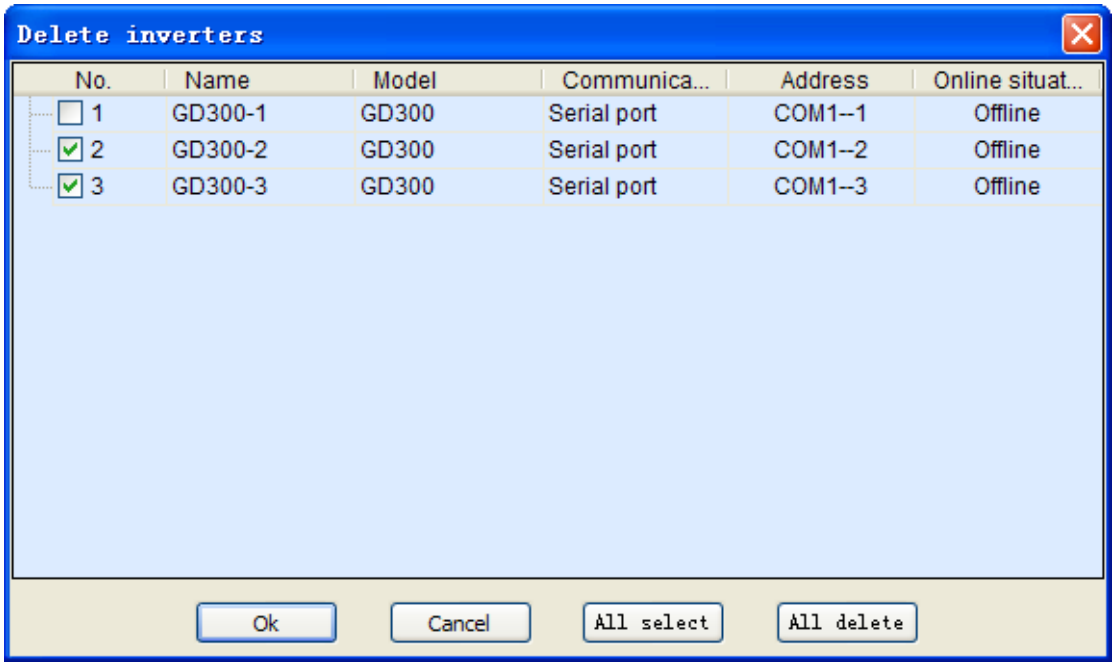


★Add inverters

Add new inverters.

★Delete inverters

Delete the added inverters.



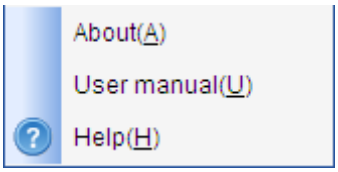
★Connect all inverters

Connect all inverters.

★Disconnect all inverters

Disconnect all inverters.

3.1.5 Help



About: Software version and copyright statements

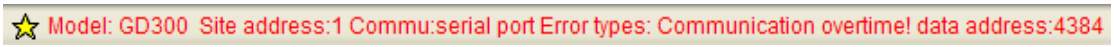
User manual: The operation of the software

Help: Query function code

3.2 Toolbar

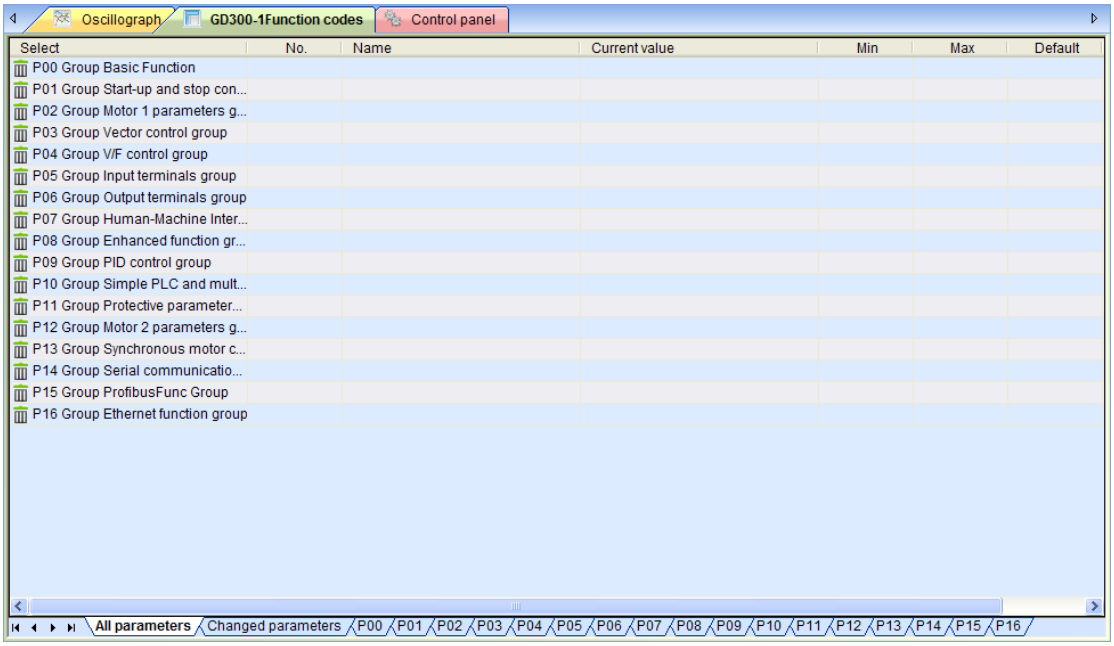
The function of each toolbar button can be found in menu bar. Users can operate these buttons as shortcuts.

3.3 Status bar



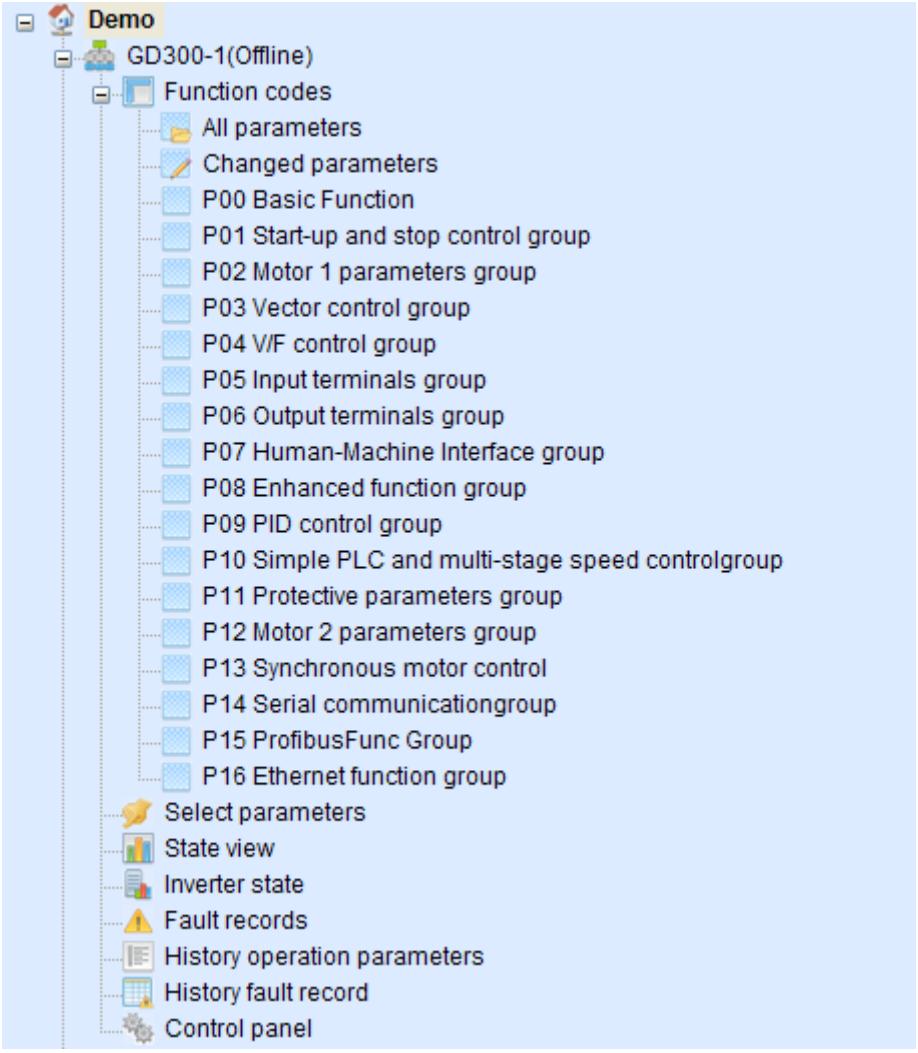
Prompt inverter connection states, read and write errors of function parameters, etc.

3.4 Main view



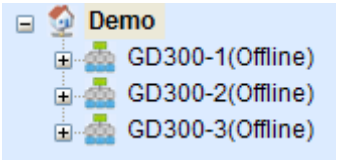
The main view is divided into three subpages, oscillograph, function codes and control panel, in charge of corresponding functions. For specific information, please refer to following chapters.

3.5 Project view

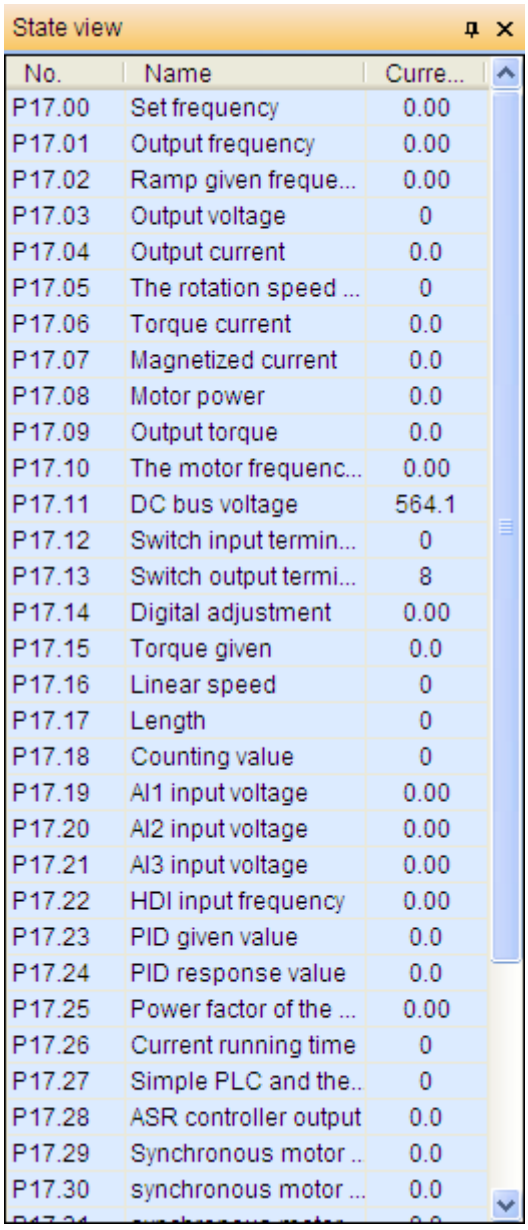


List a large quantity of inverter monitoring information, including project name, inverter identity, list of function parameters, select parameters, state view, inverter state, fault records, history operation parameters, history fault records, control panel, etc.

In order to monitor multiple inverters, the project view will list the added inverters. Users can switch inverters by double-click the names.

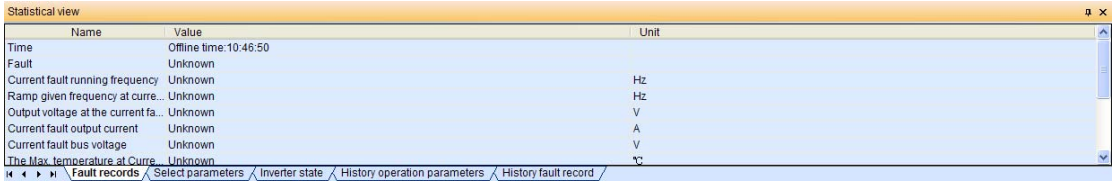


3.6 State view



Display inverter operation parameters. In normal communication, the data are refreshed at real time. The refresh cycle is 1s for serial communication and 200ms for Ethernet communication.

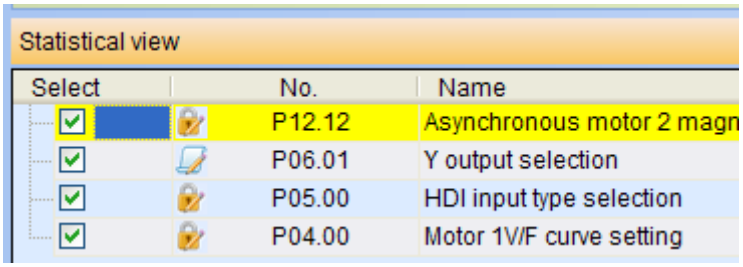
3.7 Statistical view



★Fault records

Record current inverter fault information, such as current fault time, fault code, fault running frequency, fault ramp reference frequency, output voltage, output current, bus voltage, input and output terminals state, etc.

★Select parameters



Tick the commonly used function codes as select parameters to enhance the efficiency of modifying function codes. Users can directly operate function codes in statistical view.

★Inverter state

Display current inverter connection state and fault type.

★History operation parameters

Record inverter history operation parameters in details. Users can view them according to specified date.

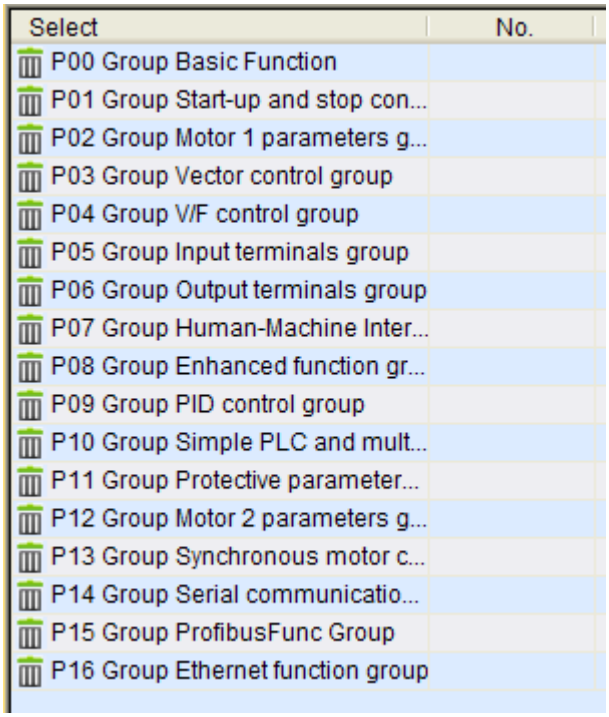
★History fault records

Record inverter history fault records in details. Users can view them according to specified date.

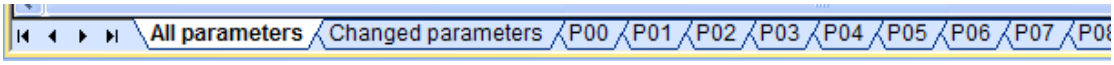
IV. Inverter parameters

4.1 View function codes

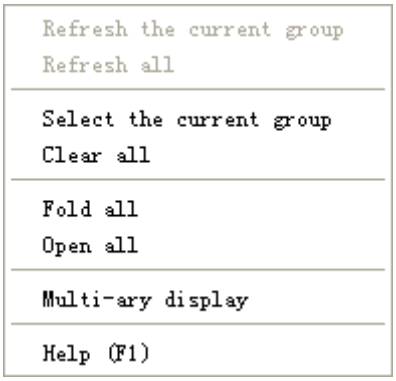
The main window of function parameters lists all function codes, including group, No., name, current value, maximum value, minimum value, default value and unit.



The tab also provides the shortcut index for each group.



The function parameters cannot refresh automatically, so users need to refresh them manually. Right click in the display view of function codes and pop up the following menu.

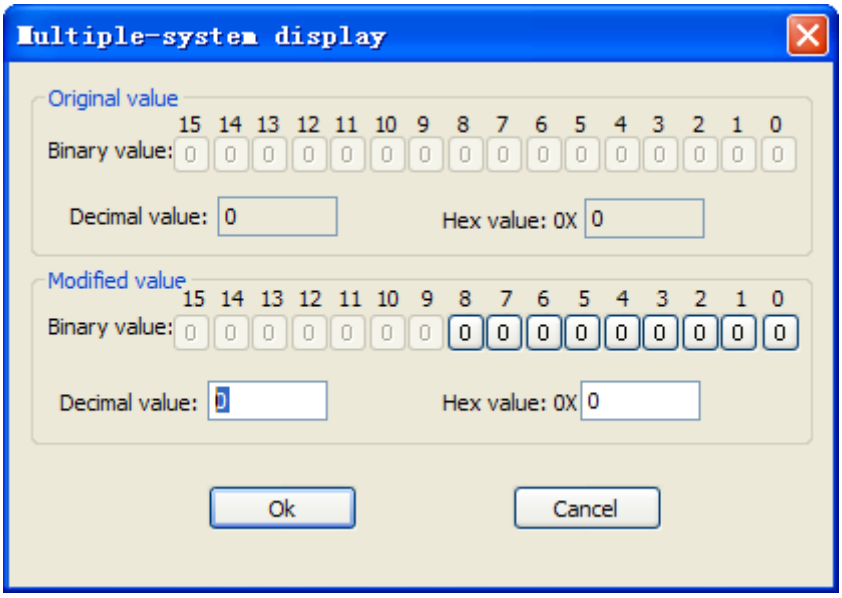


Select Refresh current group or Refresh all as required;

Select current group/Clear all: Tick the commonly used function codes as select parameters;

Close all tree/Open all tree: Unfold or fold the parameters tree;

Multi-level display: Support bit monitoring, read and write for status word and control word of function codes;



Help: View specific instructions of the current group.

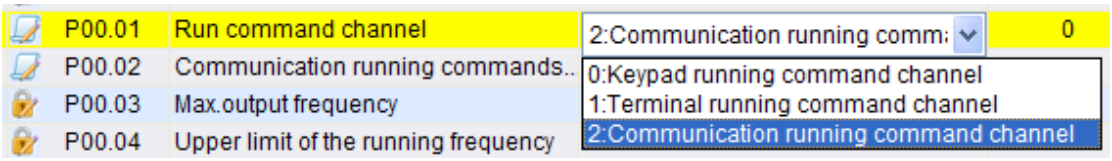
4.2 Modify function codes

Each function code has corresponding icon which indicates:

Icon	Description
	The parameters can be read or written in any condi...
	The parameter is not writable
	This parameter is not writable but readable
	The parameter is not writable or readable
	This parameter is not readable but writable

Double click the function code and pop up the modify box.

(1) If the function code is enumeration type, pop up the drop-down box. Finish setting by selecting corresponding item.



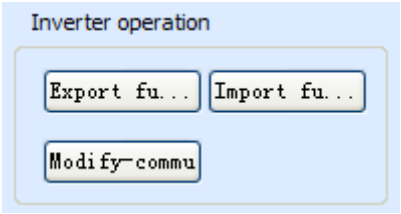
(2) If the function code is numeric type, pop up the edit box. Finish setting by clicking the margin after filling in numbers in the box.

Note: Recent modified function codes can be viewed in the page of modified parameters.

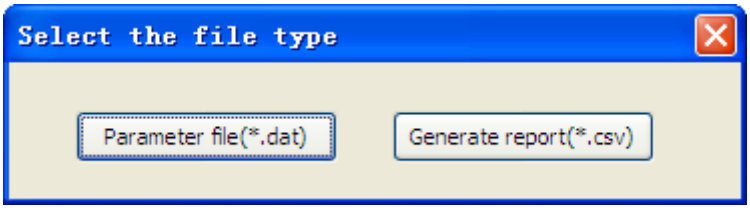
Select	No.	Name	Value after modification	Value before modificat...	Modify the time
	P00.03	Max.output frequency	20.00	50.00	2013-07-11 10:54:31
	P00.08	B frequency command ref..	1:A frequency command	0:Maximum output freque...	2013-07-11 10:54:27
	P00.06	A frequency command se...	4:High-speed pulse HDI ...	0:Keypad data setting	2013-07-11 10:54:25

4.3 Import and export function codes

Users can see the interface of inverter operation after entering the main window of control panel page.

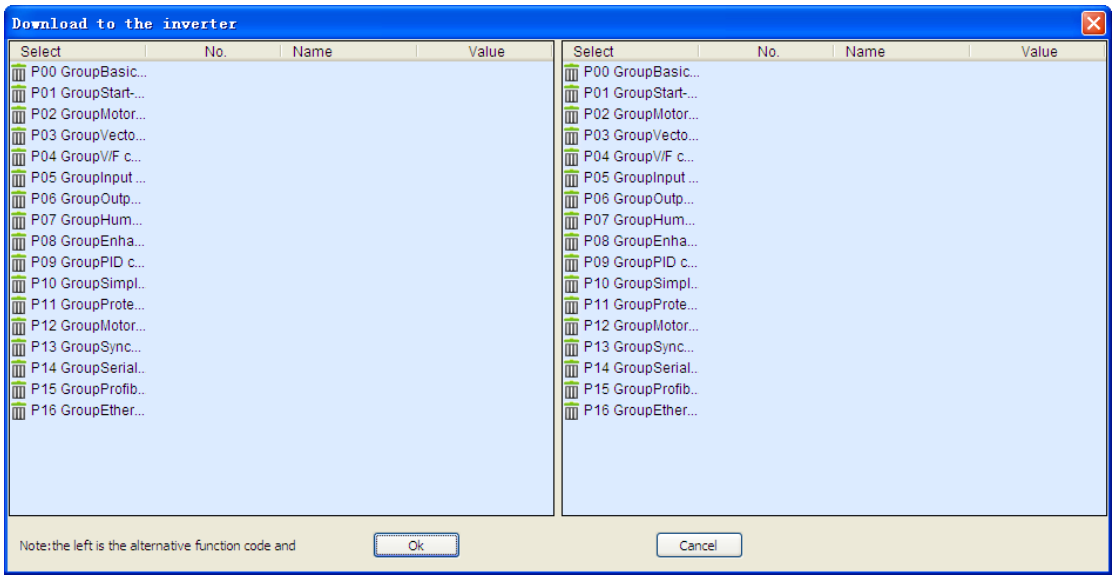


1. Export function codes: Save the function codes in different file types as needed. The parameter file (*.dat) is self-defined in binary format; the report file (*.csv) is comma-separated file which can be opened by Microsoft Office Excel.

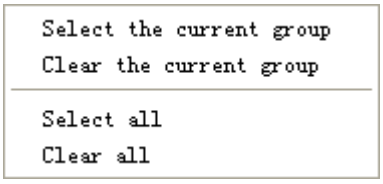


2. Import function codes: Import the saved binary file (*.dat) to the current inverter in connection.

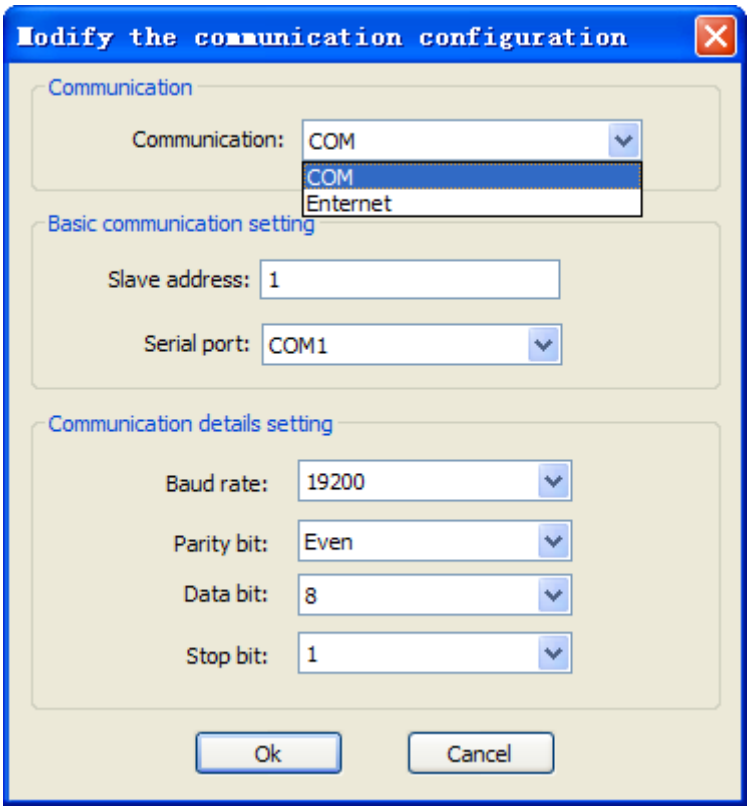
Open the existed file and pop up the following dialog box. The left is the alternative function codes and the right is the selected function codes. The function codes are user-defined and users can select them as needed.



Right click the margin and pop up the following menu for the convenience of selecting or clearing function code groups.

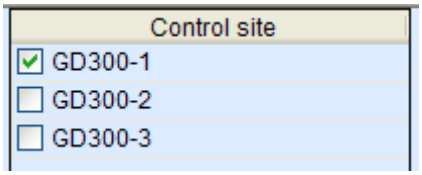


3. Modify communication configuration: Flexibly configure the current communication method without reestablishment. Perform shifting between serial and Ethernet communication via the option.

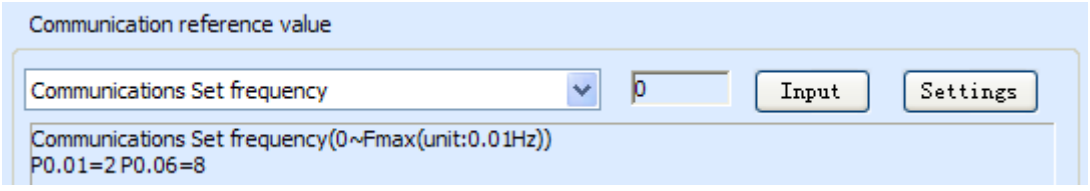


V. Inverter control

Ensure the site before inverter control:



1. Communication reference value: The value can be set in control panel page.

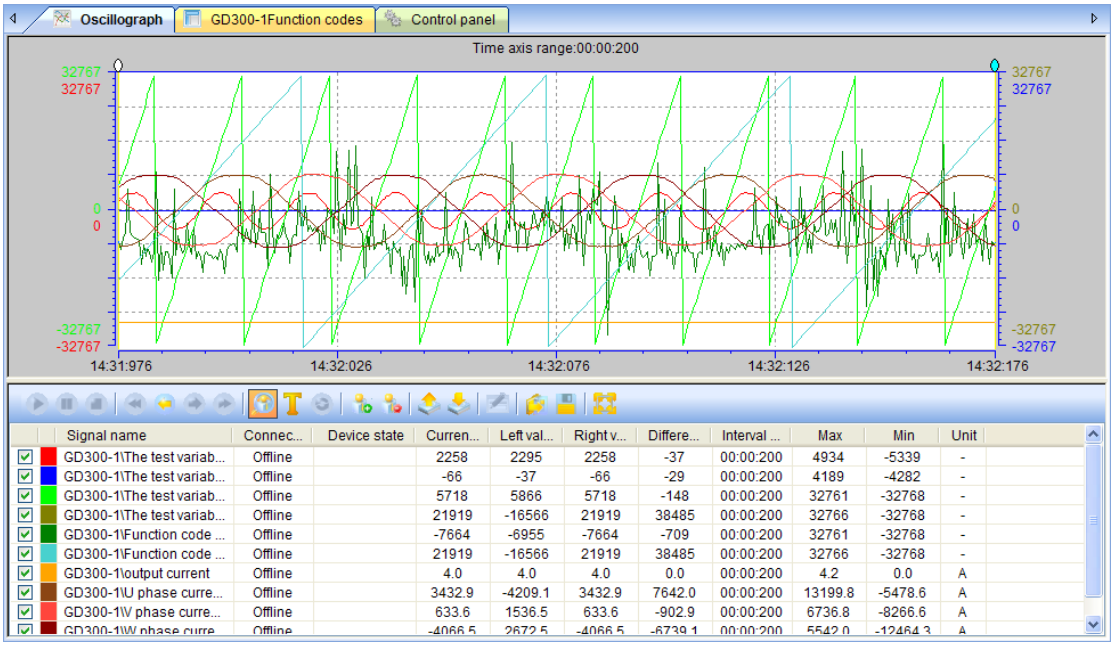


2. Operation control: To enable operation control, set running command channel to communication command channel. For example, set P00.01 to 2 for GD300 Modbus communication. Note: Due to the differences between different models of inverter operation control command, so button control panel design is different. For example, such as "Pre-excitation" button in some type of inverter doesn't exist.

VI. Inverter oscillograph

6.1 Oscillograph interface

The oscillograph takes charge of collecting inverter data and shows the data in waveforms, for the convenience of monitoring and analyzing operation data. The interface consists of two sections: signal drawing view and signal management view.



<table>
<tr><th>Name</th><th>Function</th></tr>
<tr><td>Signal drawing view</td><td>Draw waveforms, time axis, cursor, upper and lower limit of waveforms</td></tr>
<tr><td>Signal management view</td><td>Set the length of time axis, signal location, waveform color, waveform line, upper and lower limit of signals. The list for signal management view is defined as follows:
<table>
<tr><th>Column</th><th>Name</th><th>Meaning</th></tr>
<tr><td>1</td><td>Null</td><td>Signal waveform whether or not shown</td></tr>
<tr><td>2</td><td>Null</td><td>Signal waveform color</td></tr>
<tr><td>3</td><td>Signal name</td><td>Signal name</td></tr>
<tr><td>4</td><td>Connection</td><td>Whether the inverter is</td></tr>
</table>
</td></tr>
</table>

Name	Function			
			state	connected to the upper computer
		5	Device state	Inverter state
		6	Current value	The value at the right end of signal waveform, the newest collected data in oscillograph
		7	L-value	The value of corresponding signal of left cursor at the point of time
		8	R-value	The value of corresponding signal of right cursor at the point of time
		9	Difference	The value of corresponding signal of left cursor minus the value of corresponding signal of right cursor
		10	Interval of time	The interval of time between right and left cursor
		11	Max	The maximum value in signal data
		12	Min	The minimum value in signal data
		13	Unit	-

Signal management view Toolbar:

Column	Name	Meaning
1	Start	see 6.2
2	Pause	see 6.2
3	Stop	see 6.2
4	Previous waveform	see 6.3
5	The current waveform of forward 1/4	see 6.3
6	The current waveform back page 1/4	see 6.3
7	Next waveform	see 6.3
8	Waveform selection enable	see 6.4
9	X Timeline	see 6.5
10	The counter enable	-
11	Add the oscillographic channel	see 6.6
12	Delete the oscillographic channel	see 6.6
13	Signal channel up	-

Column	Name	Meaning
14	Signal channel down	-
15	Fault waveform	see 6.7
16	Open the history waveform	-
17	Save waveform	See6.8
18	Full screen / normal	-

6.2 Start, pause and stop oscillograph

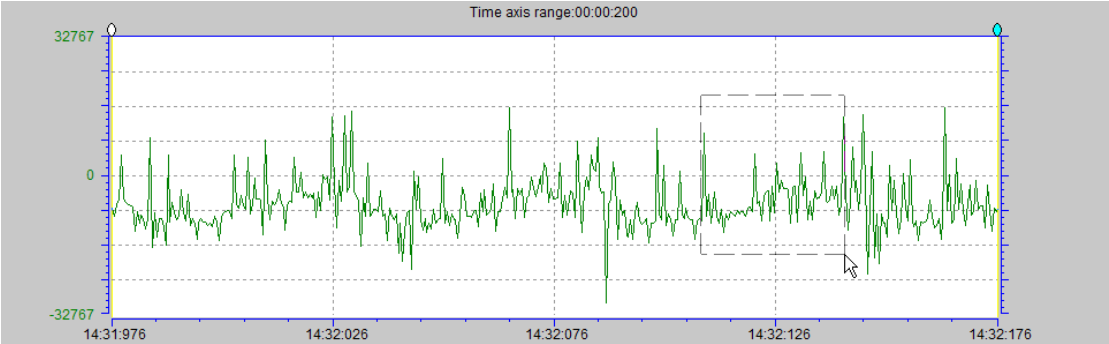
When the signals are added to signal management list and the device state is connected, click the activated  icon, the system will begin collecting data and drawing waveforms. In order to analyze a segment of waveforms without stopping collecting data, click the  icon, the oscillograph will stop refreshing waveforms and continue collecting data. After the completion of collecting data, click the  icon, the system will stop refreshing waveforms and collecting data.

6.3 Shifting and playback of waveform segments

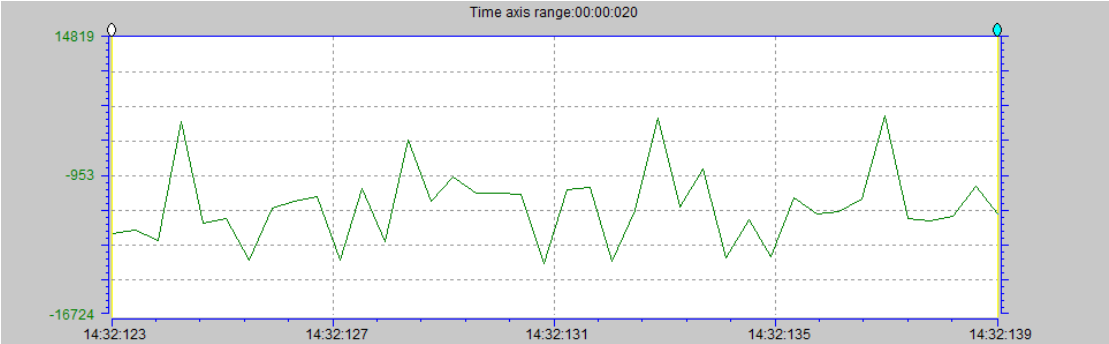
Wave segments are the waveforms at the time when the oscillograph starts and stops. Multiple waveform segments are saved in the same file. Shift to the previous segment by clicking the  icon and to the next segment by clicking the  icon.
Playback function is applied when the waveform segment cannot be totally displayed at a certain range of time axis. Users can play back the waveform 1/4 of time axis range before by clicking the  icon and the waveform 1/4 of time axis range after by clicking the  icon.

6.4 Selection

Select a region of waveforms by mouse, then zoom in to the whole drawing view and right click to return to original waveforms. Hold down the left mouse button at the start point (in waveform drawing view), drag the mouse to select a region and finally release.
Before selection:

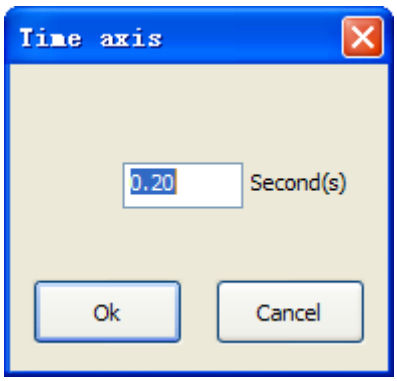


After selection:



6.5 Time axis

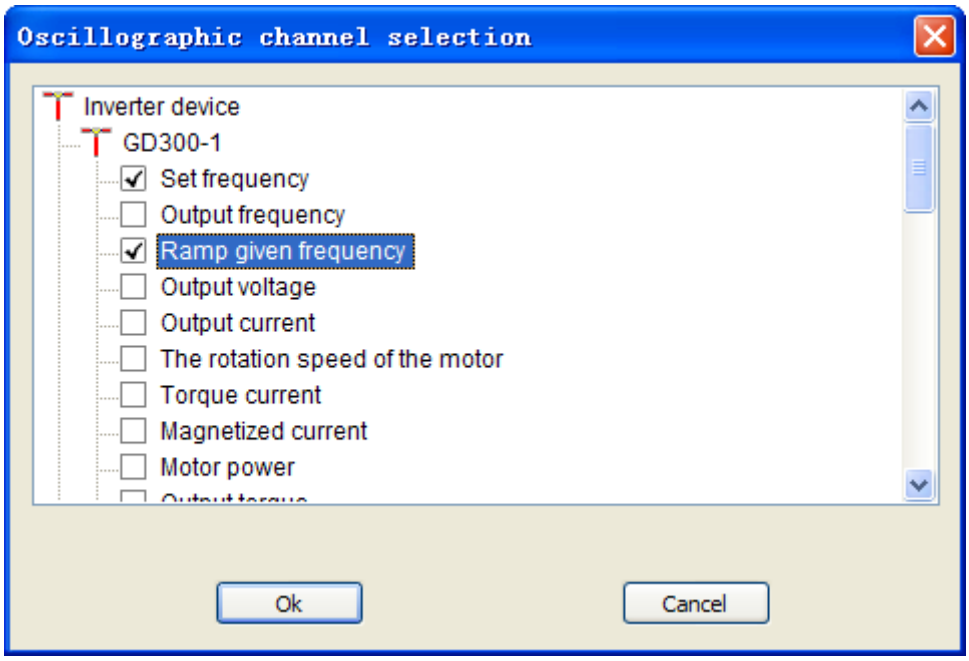
Users can click the  icon in signal control toolbar to modify the time axis.



6.6 Add and delete signals

Add signals to signal management list. The system will collect the data of the signals after the oscillograph starts. Adding signals is available in oscillography. Click  icon in signal control toolbar and pop up the dialog box of add signals. Single click the checkbox,

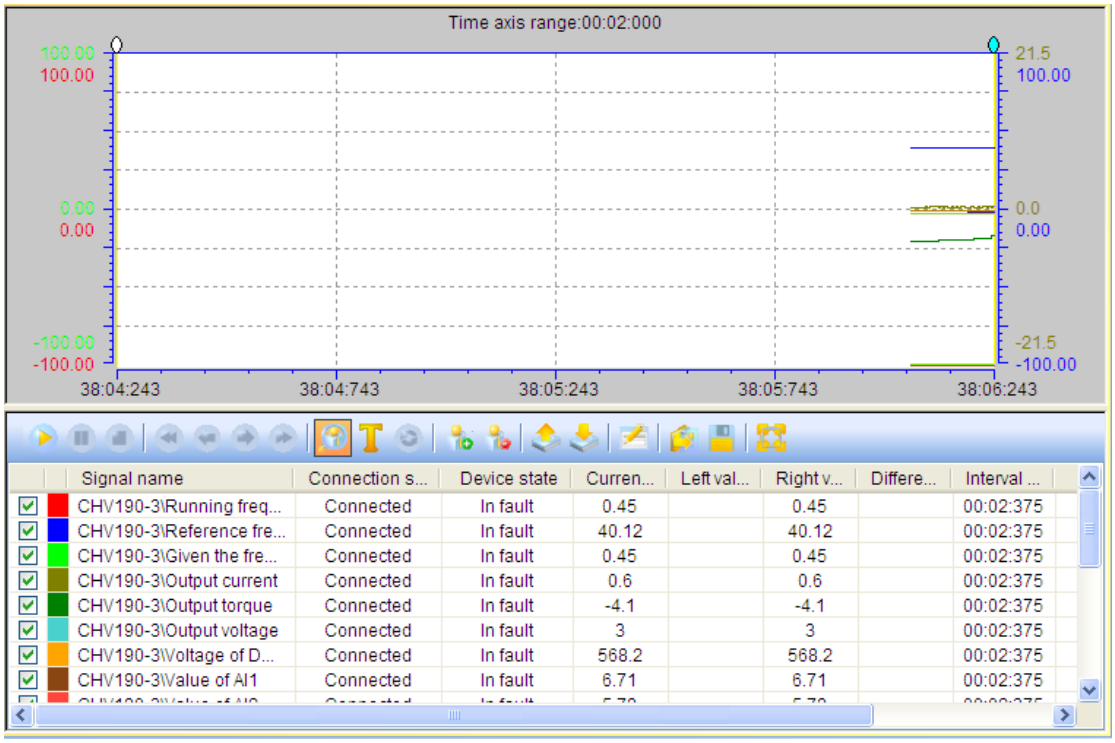
'√' indicates the signal is selected; click again, the selection is canceled. Then single click OK button. Note: The added signals will no longer appear in the signal list. When connected to a single inverter software time add up to 10 signals, connecting more than one inverter can only add 20 at a time.



Delete signals from signal management list, together with attributes and data. Deleting signals is available in oscillography. Select the signals that need to be deleted, then click  icon in signal control toolbar.

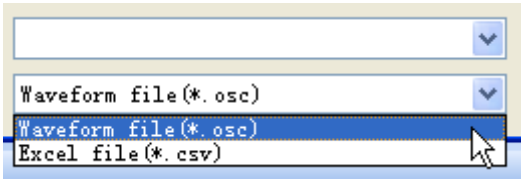
6.7 Fault waveform

To find the causes of faults, the inverter saves the running data of 200ms before the fault. The system provides the functions of black box which, recently, supports accessible fault waveforms only when CHV190 inverter in network communication. Click the  icon in signal control toolbar, extract the fault waveforms automatically and display on the oscillograph.



6.8 Save waveforms

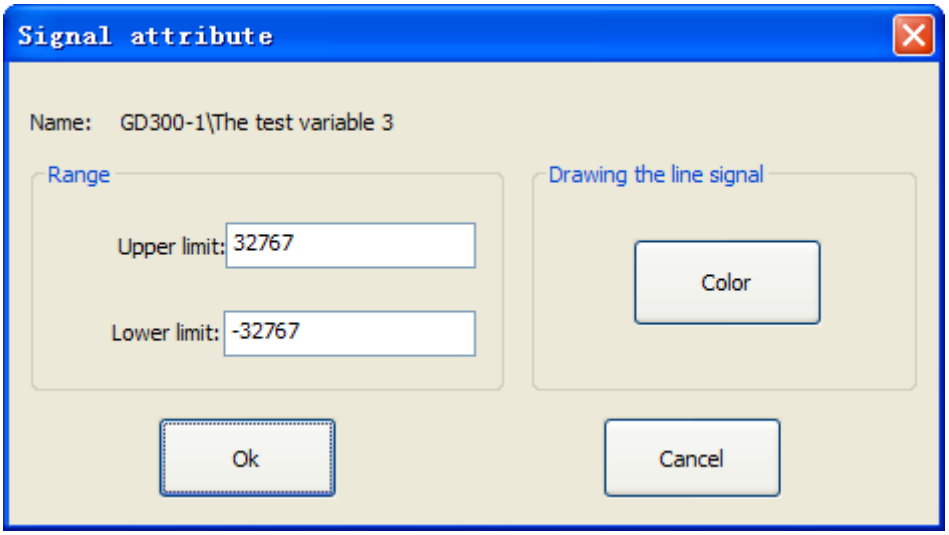
To save the collected signal data, click the  icon in toolbar and pop up the dialog box of save file.



There are two ways to save files, in self-defined files (*.osc) or comma-separated files (*.csv).

6.9 Signal attribute setting

Adjust the waveform color and line to analyze the signal data. In the list of signal management view, double click the option of signals that needs setting and pop up the dialog box of signal attribute.



6.10 Left and right cursor

Obtain all signals values at the same point of time, difference between the corresponding signal values and the interval of time between left and right cursor. The cursor facilitates users analyzing the signal data. The mouse pointer is in the circle of the cursor. By holding down the mouse pointer, the cursor can be dragged to move left and right. Operate fine tuning via left and right keypad button.

VII. HotKey

Help	F1
Login factory function group	F3
Logout factory function group	F4
Refresh function codes	F5
Full-screen switch	F11

VIII. Trouble shooting

The software may have some problems during operation and corresponding solutions are shown below. If you cannot solve the problems, please contact with local dealers or INVT offices.

Common problems	Causes	Solutions
Connecting serial port failed	The computer has no serial port.	Check computer configuration.

	The number of serial port is incorrect.	System attribute-hardware-device manager: check the serial port NO., then set the serial port NO. of upper computer.
	Serial port is occupied.	Check the opened software and close the software occupying the serial port.
Connecting network failed	No network	Check hardware connection.
	PC IP and inverter IP are not on the same network segment.	For example, PC IP:192.168.4.101, inverter IP: 192.168.4.*.*, the fourth segment of the 2nd address is any number between 0 and 255 except 101.
	Inverter type does not match.	Check whether the project file type is consistent with inverter type.
	Network port is occupied or disabled	Check the state of network port, 100 and 101 network ports are used. Only GD5000 is special, it's ports are 6000 and 6001.
Adding inverter failed	Interface connection is abnormal.	Check hardware connection.
	Parameter setting of serial port does not match.	Check whether the set parameter of serial port of upper computer is the same as that of inverter.
	Wrong slave address of serial port	Check Modbus communication address of the inverter.
	RS232-to-RS485 converter does not match.	Replace computer or converter. (Recommend HEXIN.)
	Inverter type cannot be recognized.	Check the inverter type supported by the system.
Unable to control inverter	Running command channel is not set to communication command channel.	Check the manual and set running command channel to communication command channel.
	Control station is not selected.	Select control station properly.
Unable to set communication set value	Communication setting is controlled by the setting mode.	Check the manual and set the corresponding mode.
Unable to start oscillograph	The configuration table and inverter do not	Update the configuration table.

	match.	
No waveforms after the oscillograph starts	The network port is occupied or disabled	Check the state of network port, 100 and 101 network ports are used. Only GD5000 is special, it’s ports are 6000 and 6001.
	The operating system's firewall	In Windows 7 system must close the firewall, or when the firewall prompts the pop-up dialog box don't choose "cancel".