TELEDYNE TEST TOOLS
Everywhereyoulook™

T3PS16081P / 30051P Programmable Linear DC Power Supplies

User Manual

Contents

General Safety Summary

Read the following precautions carefully to avoid any personal injuries, or damage to the instrument or products connected to it. Use the instrument only as specified.

Use only the power cord supplied for the instrument.

Ground the instrument. The instrument is grounded through the ground conductor of the power cord. To avoid electric shock, always connect to grounded outlets. Make sure the instrument is grounded correctly before connecting its input or output terminals.

Observe all terminal ratings and signs on the instrument to avoid fire or electric shock. Before connecting to the instrument, read the manual to understand the input/output ratings.

Do not operate with suspected failures. If you suspect that the instrument is damaged, contact the Teledyne LeCroy Service Department immediately.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep the surface of the instrument clean and dry.

Avoid touching exposed circuits or wires. Do not touch exposed contacts or components when the power is on.

Do not operate without covers. Do not operate the instrument with covers or panels removed.

Use only the fuse specified for the instrument.

Use proper overvoltage protection.

Observe ventilation requirements. Ensure good ventilation. Check the vent and fan regularly to prevent overheating.

Safety Terms and Symbols

The following terms may appear on the instrument:

DANGER: Direct injury or hazard may occur.

WARNING: Potential injury or hazard may occur.

CAUTION: Potential damage to instrument/property may occur.

The following symbols may appear on the instrument:

CAUTION Risk of injury or damage. Refer to manual.	**WARNING** Risk of electric shock or burn	Earth Ground Terminal	Protective Conductor Terminal	Frame or Chassis Terminal	Power (On/Off)	Alternating Current

Operating Environment

Temperature: 0 °C to 40 °C

Relative Humidity: ≤ 80% RH at ≤ 30 °C

Altitude: ≤ 2000 m at ≤ 30 °C

Use indoors only.

Pollution degree 2. Use in an operating environment where normally only dry, non-conductive pollution occurs. Temporary conductivity caused by condensation should be expected.

AC Power

Input Voltage & Frequency: 100/120/220/230 V ± 10%, 50/60 Hz

The fuse type: 100/120 V: T6.3A/250V
220/230 V : T3.15A/250V

Mains Supply Connector: CAT II per IEC/EN 61010-1:2010, instrument intended to be supplied from the building wiring at utilization points (socket outlets and similar).

T3PS16081P / 30051P Brief Introduction

The Teledyne Test Tools Programmable DC Power Supply has a 2.8 inch TFT-LCD screen, programmable output, and real time measurement graphing. The T3PS16081P has a maximum output values of 16 V / 8 A, while the T3PS30051P has a maximum output value of 30 V / 5 A. Both models have remote sense capability, output short circuit and overload protection.

Figure 1: Side view of T3PS16081P and T3PS30051P

Main features:

- Single high-precision programmable output:
  T3PS16081P：16 V / 8 A, total power is 128 W
  T3PS30051P：30 V / 5 A, total power is 150 W
- Compact, easy to use, powerful, ideal for bench power supply applications
- Stable, Reliable and Low Noise: ≤ 350 uVrms / 3 mVpp

- Fast Transient Response Time: < 50μs
- Maximum resolution of 1mV/ 1mA with 5-bit voltage and 4-bit current display.
- Timer function sequences pre-set output values
- High resolution 2.8 inch TFT LCD(240*320 pixels)
- Two output modes: two-wire output and remote sense compensation function (maximum compensation up to 1V)
- Four varieties of input-line voltage values include 100V, 110V, 220V and 230V to satisfy user requirements
- Intelligent temperature-controlled fan, effectively reduces noise
- Clear graphical interface, with waveform display
- 5 internal system parameters save / recall, support for data storage space expansion
- Uses EasyPower PC software, real-time control via USB, LAN, support SCPI command set and LabView driver package to meet the remote control and communication requirements

Chapter 1 Quick Start Guide

In this chapter, we introduce the front panel and display interface of the T3PS16081P / 30051P, and also tips for how to check and operate the power supply the first time.

- General Inspection
- The front panel
- The rear panel
- Connecting power
- User interface
- Output Inspection
- Fuse Replacement

1.1 General Inspection

Please inspect your new instrument, follow the steps below.

1. Inspect the shipping container

Keep the shipping container or cushioning material until the contents of the shipment have been completely checked and the instrument has passed both electrical and mechanical tests. The consigner or carrier is responsible for damages to the instrument resulting from shipment. **Teledyne LeCroy** will not provide free maintenance or replacement for shipping damages.

2. Inspect the instrument

If there is damage, defects, or failures in electrical and mechanical tests of the product, please contact your nearest **Teledyne LeCroy** sales representative.

3. Check the accessories

Please check the accessories according to the packing list. If the accessories are incomplete or damaged, please contact your **Teledyne LeCroy** sales representative.

1.2 The Front Panel

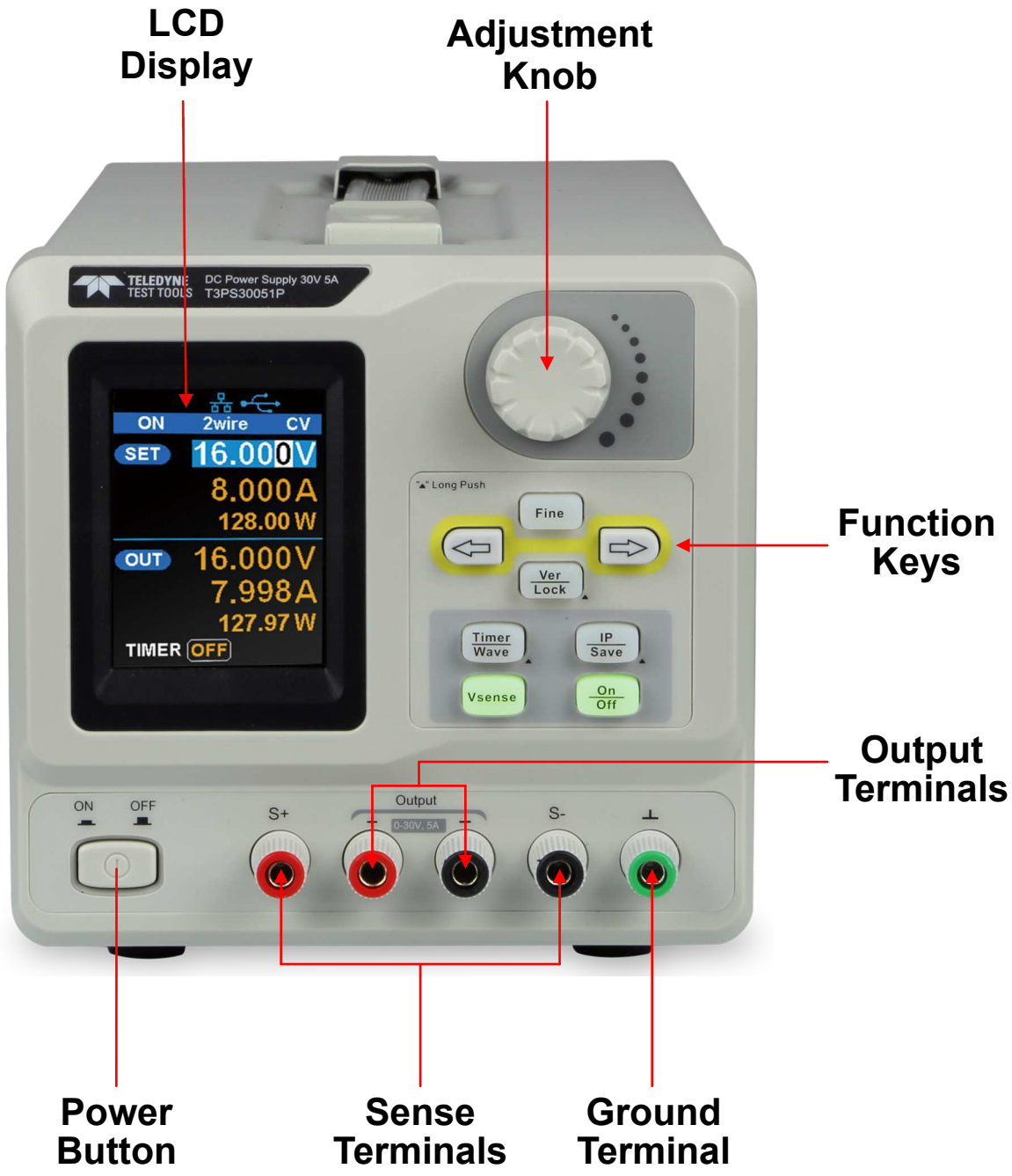


Figure 2: The front panel of the T3PS16081P / T3PS30051P

1. LCD

2.8 inch TFT display. It is used to display system parameter settings, system output state, menu options, prompt messages, etc.

2. Knob

When setting parameters, rotate the knob to increase or decrease the value of the digit at the cursor.

3. Function keys and Power button

When setting parameters, press the Fine button to move the cursor to select the position of digit to be modified.


The right and left direction buttons move the cursor to select the parameter to be modified.

Press the button briefly to enter the system message interface. Press the button for 1 second or longer to activate the lock function.

Press the button briefly to enter the timer interface. Press the left button to move the cursor from left to right，press the right button to move the cursor in the opposite direction. In the timer interface or main interface, press the On/Off button briefly to turn on/off the timer. Press the button for 1 second or longer to enter the waveform display mode.

Press the button briefly to configure the network connection information. Then press the left button to move the cursor from right to left, press the right button to move the cursor from left to right. Choose the DHCP window, press the On/Off button for a short period to turn On/Off the DHCP function.

Press the button for a longer period to enter the storage function system. Press the Fine button for a short period to choose the subproject, then press the Fine button for a longer period to determine the choice.

Press the button to enable/disable the remote sense function.

Press the button to enable/disable the channel output.

4. Output Terminals

Physical output connections to the external circuit.

5. Ground Terminal

This terminal is connected to the instrument chassis and ground wire, and is therefore in a grounded state.

6. Sense Terminals

Used to sense the voltage at the load. This allows the source to compensate for the voltage drop caused by the leads between the power supply and the load. Using the sense terminals increases the accuracy of the voltage delivered to the load.

7. Power key

Turn the instrument on or off.

1.3 The Rear Panel

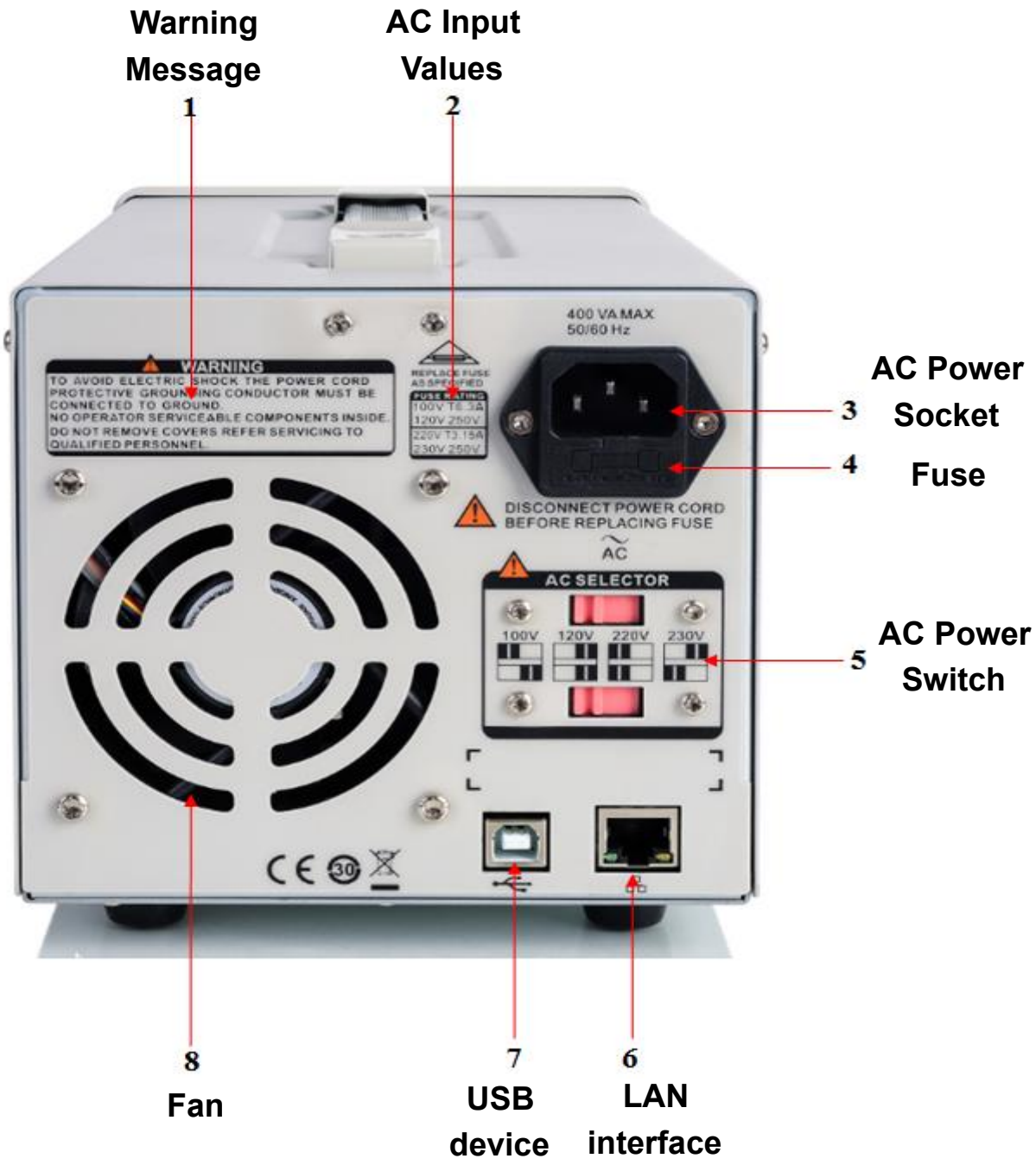


Figure 3: The rear panel of the T3PS16081P / T3PS30051P

1. Warning message

Safety message regarding operation and service.

2. AC input voltage description

The voltage frequency and the specified fuse have to match the AC input.

3. AC power socket

The socket for AC input power.

4. Fuse

The specified fuse relates to the input voltage (Please refer to the **“AC input voltage description“**)

5. AC line power selection switch

AC Input Voltages: 100/120/220/230 V

6. LAN interface

Connect to the local network using the RJ45 interface.

7. USB device

Used when connecting the instrument to an external computer to allow remote control.

8. Fan

1.4 Connect Power

The power supply supports a variety of AC line power input values. For each line voltage, the rear panel voltage selector settings are different, as shown in table 1 below.

Table 1: AC input line power specifications

AC power input	Voltage selector configure
100 VAC ± 10% , 50 - 60 Hz	
120 VAC ± 10% , 50 - 60 Hz	
220 VAC ± 10% , 50 - 60 Hz	
230 VAC ± 10% , 50 - 60 Hz	

Please connect the external AC power carefully using the steps below:

1. **Check the input power**

   Make certain that the AC line power to be connected to the instrument meets the requirements outlined in Table 1.

2. **Check the voltage selector on the rear panel**

   Make certain that the voltage selector setting on the rear panel of the instrument matches the actual input voltage.

3. Check the fuse

When the instrument leaves the factory, the specified fuse is installed. Please check whether the fuse matches the actual input voltage according to the "Input Power Requirements" on the rear panel of the instrument.

4. Connect the power

Connect the instrument to AC power supply using the power cord provided with the accessories. Then press the button  to turn on the power.

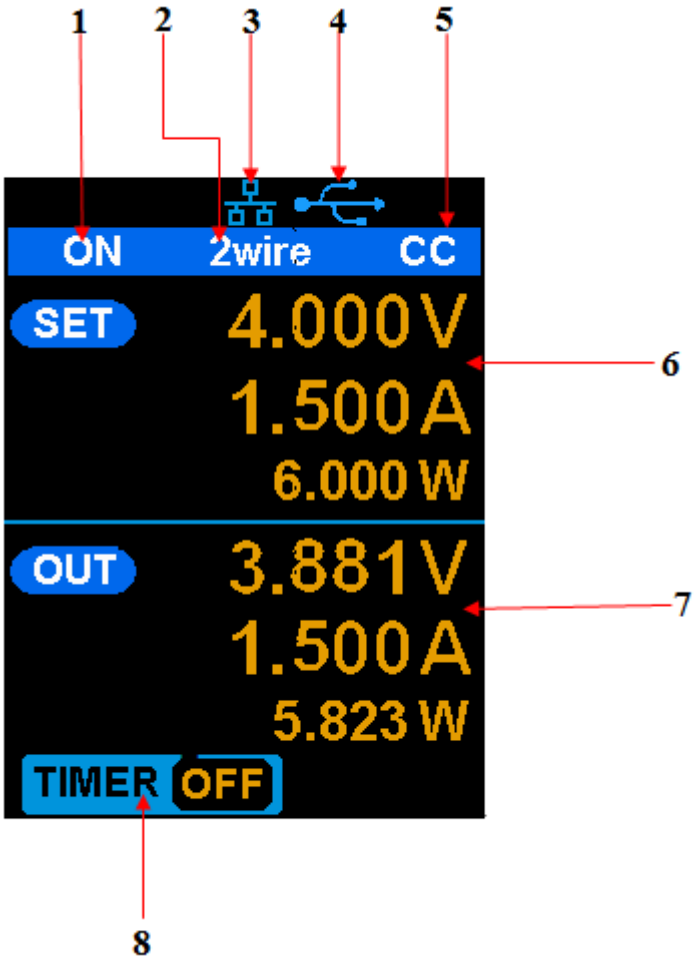
WARNING

Before switching the input power supply voltage, please disconnect the power supply before setting the voltage selector to the appropriate setting.

WARNING

To avoid electric shock, make certain that the instrument is correctly grounded.

1.5 User Interface



1. **Channel output state**

   On / Off

2. **Remote sense mode**

   2 wire：two wire mode, 4 wire：four wire（remote sense）mode.

3. **LAN connection icon**

   When the instrument is connected to a network through the LAN port this flag is displayed.

4. **USB connection icon**

   When the instrument is connected to a computer via the USB

Interface, this icon is displayed.

5. **Output mode**

   CV：Constant Voltage, CC：Constant Current.

6. **Output programmed values**

   Voltage, current, power settings

7. **Measured output values**

   Voltage, current, power actual output

8. **Timer state**

   On / Off

1.6 Output Inspection

1. Check the output voltage

- Turn on the power and make sure the channel current setting is not zero when the instrument has no-load.
- Press on/off button, the supply should be working in constant voltage (CV) mode. You can set the voltage range of the T3PS16081P by adjusting the voltage setpoint from the minimum (0 V) to the maximum value (16 V) and the voltage range of the T3PS30051P by adjusting the voltage setpoint from the minimum (0 V) to the maximum value (30 V).

2. Check the output current

- Turn on the power and make sure the voltage setting is not zero.
- Connect the output terminals (short) with an insulated wire that can handle 10 A or more (18 AWG single core, for example).
- Activate the output by pressing the on/off button. The low impedance (shorted) output will cause the instrument to enter current control (CC) mode. You can set the current range of the T3PS16081P by adjusting the current setpoint from the minimum (0 A) to the maximum value (8 A) and the current range of the T3PS30051P by adjusting the current setpoint from the minimum (0 A) to the maximum value (5 A).

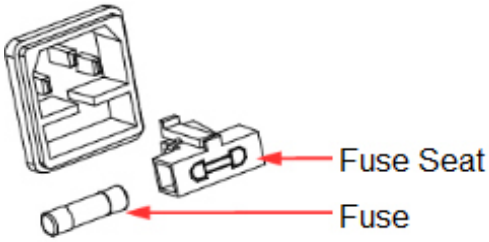
1.7 Fuse Replacement

The specifications of the fuse are relative to the actual input line voltage, shown in the table below. You also can refer to the rear panel “input power requirement”.

Input voltage	Fuse specification
100/120 VAC	T6.3A
220/230 VAC	T3.15A

To replace the fuse, please follow the steps below:

1. Turn off the instrument and remove the power cord.
2. Insert a small straight screwdriver into the slot at the power socket and gently pry out the fuse seat.



3. Adjust the power voltage selector manually to select the correct voltage scale.
4. Take out the fuse and replace it with the specified fuse (for the corresponding relationship between the AC input voltage and fuse specification, refer to the “input power requirement” at the rear panel).
5. Re-insert the fuse holder into the power socket (please pay attention to the directions).

WARNING

To avoid personal injuries, unplug the power supply before replacing the fuse. To avoid electric shock or fire, select the proper power supply specification and replace only with the proper fuse.

Chapter 2 Control panel operation

In this chapter, the functions and operation of the control panel will be introduced in detail.

Overview:

- Output summary
- Setting the output voltage and current of the power supply
- Remote terminal
- LAN configuration
- Save/recall
- Timer
- Waveform display
- Version information
- Lock
- Update

2.1 Output summary

The power supplies provide a floating output. The output rating of the T3PS16081P is 0-16 V / 0-8 A, while the output rating of the T3PS30051P is 0-30 V / 0-5 A. There are two modes of output: constant voltage (CV) and constant current (CC). There are two types of operation, two wire mode and remote sense mode.

Constant voltage output / constant current output:

In the constant current mode, the output current is a set value which can be controlled by the front panel. The user interface displays the output mode is ‘CC’ and the current is still at the set value. At this time, the voltage is lower than the set value. When the output current is less than the set value, the constant current mode will switch to constant voltage mode automatically.

In the constant voltage mode, the output current is less than the set value, which can be controlled by the front panel. The user interface displays the output mode is ‘CV’ and the voltage remains at the set value. When output current reaches the set value, the system switches to the constant current mode.

2-wire mode / remote sense mode:

When the power supply is set to the 2-wire mode, the display prompt shows the working mode as “2-wire”. When the output is on, the instrument will detect and display the output terminal’s actual output mode automatically.

In the remote sense mode, the prompt displays the working mode as “remote sense”. When the output is on and the remote sense terminal connect to the load, the instrument will detect and display the actual output.

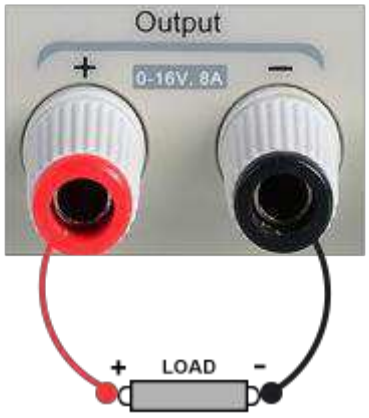
2.2 2-wire mode

The operation of the output power configuration follows:

Operation method:

1) Connect the output terminals

As shown in the figure below, connect the load to the output terminals.



CAUTION

To avoid damage to the instrument, please pay attention to the positive and negative terminal polarity when connecting the load.

2) Configure the output of voltage and current

i) Selecting the parameters to change by moving the left / right arrow keys.

ii) Press the Fine button to select the data's position, then rotate the knob to change the parameter.

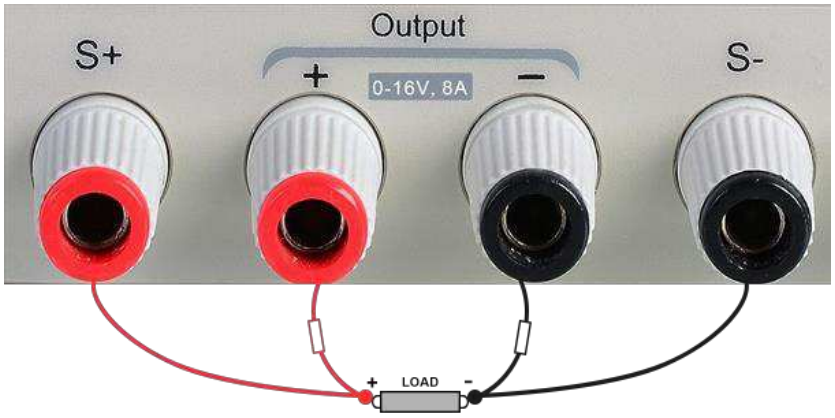
3) Enable the output

Make certain the mode is set to 2-wire (the Vsense key is off and the display shows 2-wire). Press the On/Off button, the button light will light up, the channel output is enabled and the display will show the power supply status is "On".

Note: Built-in overvoltage protection; When the output voltage of the T3PS16081P is greater than 22 ± 2 V or the output voltage of the T3PS30051P is greater than 36 ± 2 V, the output will automatically short-circuit, and limit the voltage output. If this occurs, please re-engage the output enable switch to resume normal output.

2.3 Remote Sense mode

When the power supply outputs a large current, a voltage drop can occur as a result of the resistance of the output cable. To ensure an accurate output voltage, the T3PS16081P / 30051P provide a 4-wire (remote sense) mode of operation. In this mode, the voltage at the load terminal is detected instead of the voltage at the power supply output. This allows the instrument to automatically compensate for the voltage drop caused by the load leads, ensuring that the user-specified voltage output matches the voltage delivered to the load. Front panel Sense connections are as shown below:



Operation method:

1. **Connect the output terminals and sense terminals**

   As shown above, connect the front panel Output terminal and Sense terminal to both ends of the load. When connecting, please pay attention to the polarity.

2. **Configure the voltage and current output**

   a) Select the parameters to change by moving the direction of the cursor.

b) Press the Fine button to select the cursor's position, then rotate the knob to adjust the parameter.

3 Select the 4-wire mode

Press the Vsense button, the button will light up. The power supply screen will show '4 wire' on the display.

4 Enable the output

Press the on/off button, the button is lit and the power supply display shows "on".

Note: In 4-wire mode, the maximum compensation voltage of the power supply is 1 V. When the voltage difference between the Output terminal and the Sense terminal is more than 1 V, the instrument will turn off automatically.

2.4 Configuration of LAN interface

The T3PS16081P / 30051P support USB Device and LAN interfaces. You can remotely control the power supply through these interfaces. When using the LAN interface, first set the interface parameters.

Operation methods:

1. Use the network cable to connect the LAN port on the rear panel with the network where the computer or computers are located.
2. Press IP/Save briefly to enter the network setting interface.

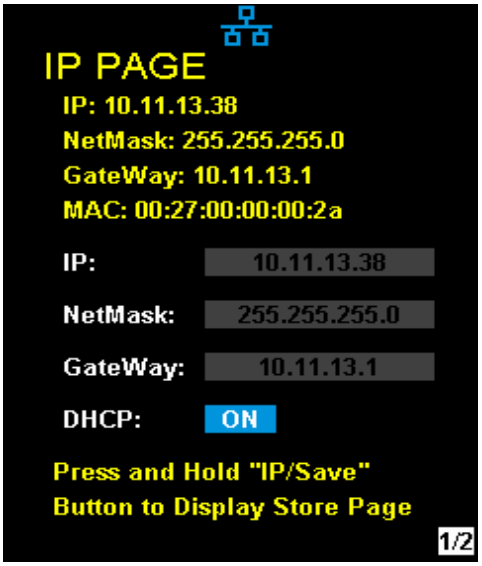
3. After setting the IP value, press the multi-function knob or press the Fine button for 1 second or longer to make the setting effective, then press the left / right arrow buttons repeatedly to move the cursor to the DHCP line. Turn the knob to set DHCP to ON or OFF, then press the multi-function knob or press the On/Off button briefly to turn on/off the DHCP.

   ON: The power supply will automatically set the IP address, subnet mask and gateway according to the current local access network.

   OFF: The user can manually set the IP address, subnet mask and gateway.

   - Press the left/right arrow button to change the position of cursor.
   - Rotate the knob or press the left and right arrow buttons for 1 second or longer to change the data.
   - Press Fine button to change the highlighted digit.
   - Press the knob or press the Fine button for a longer period to save the setting (all settings will take effect only if the knob is pressed or the Fine button is pressed for 1 second or longer.)

4. Press IP/Save again to exit the network setting interface and return to the main screen.



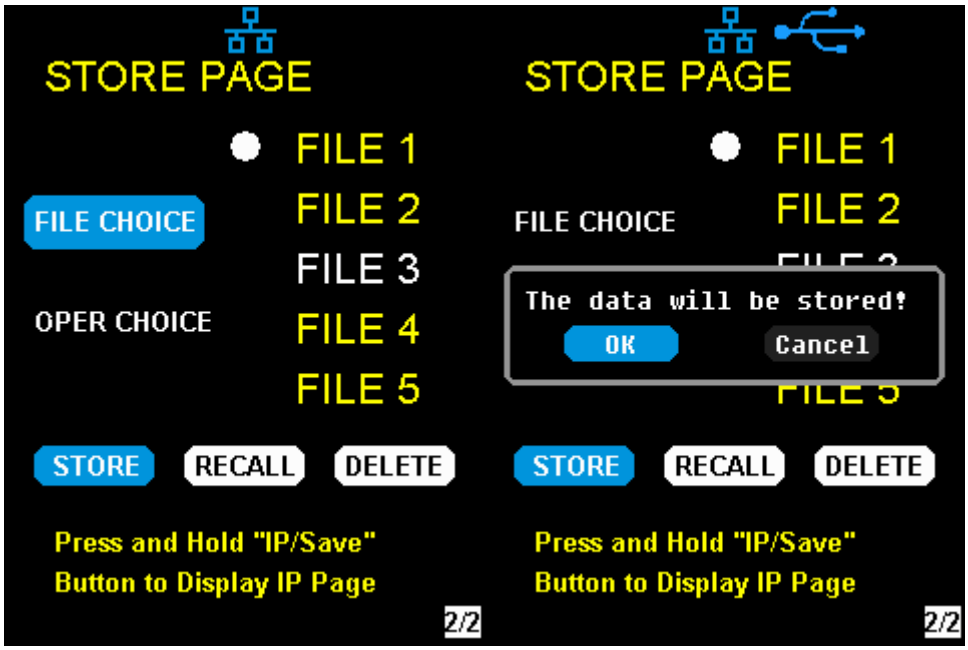
2.5 Save and recall

The power supply allows the user to save the current instrument status (including operating modes, voltage/current settings, timer parameters, etc.) to the internal memory and recall saved files when required.

- **Save**

  Operation steps:

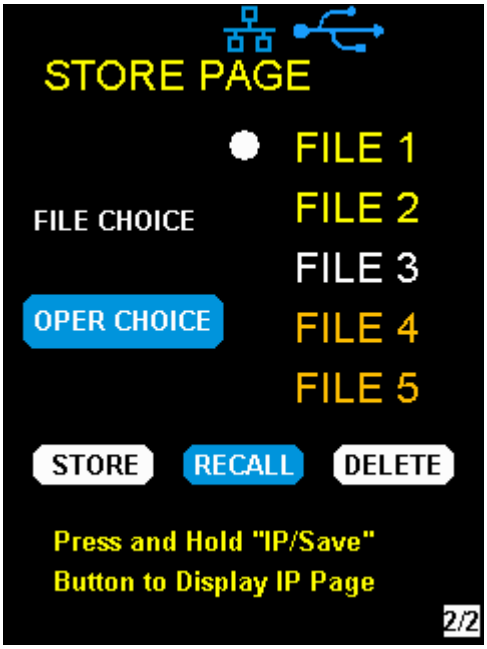
  1. Select the parameter settings to be saved;
  2. Press IP/Save for 1 second or longer to enter to the Store Page screen.
  3. Press the arrow buttons to move the cursor to “FILE CHOICE”;
  4. Rotate the knob or press the Fine button briefly to select the storage location (FILE 1-FILE 5);
  5. Press the arrow buttons to move the cursor to "OPER CHOICE"
  6. Turn the multi-function knob to select "STORE" and press the knob or press the Fine button for 1 second or longer to select "OK" to save the current settings. After saving, the corresponding file location will turn yellow.

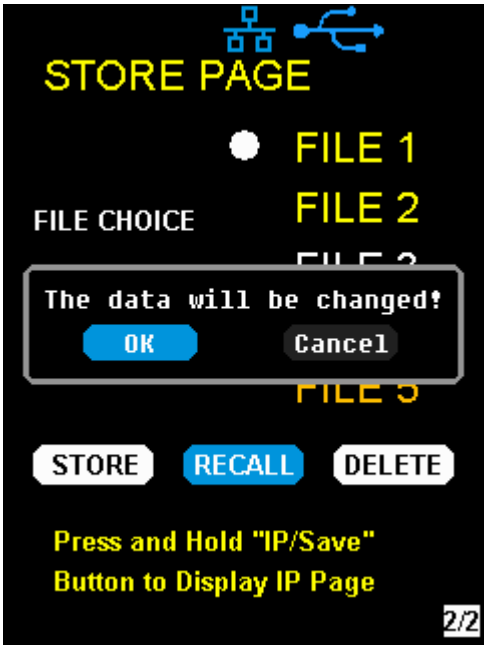


Recall

Operation steps:

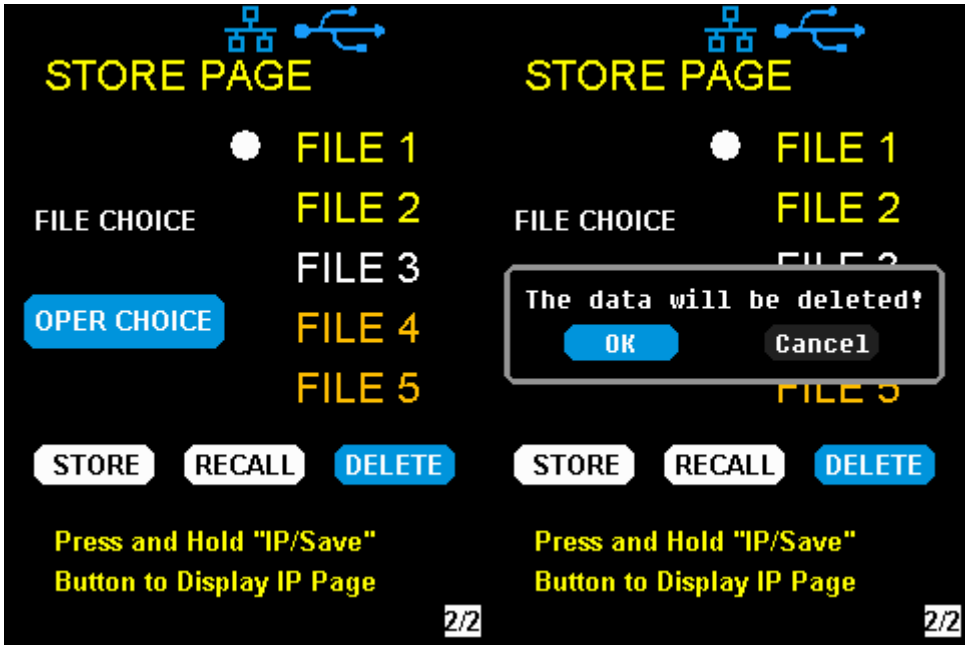
1. Press the IP/Save button for 1 second or longer to enter to the Store Page screen.
2. Press the arrow buttons to move the cursor to "FILE CHOICE".
3. Turn the rotary knob or press the Fine button briefly to select the instrument status file (FILE 1 - FILE 5).
4. Press the arrow buttons to move the cursor to "OPER CHOICE"
5. Turn the multi-function knob to select "RECALL" and press the knob or press the Fine button for 1 second or longer to select "OK" to recall the saved file.





- **Delete**

1. Press IP/Save for 1 second or longer to enter the Store Page interface;
2. Press the arrow buttons to move the cursor to "FILE CHOICE".
3. Turn the rotary knob or press the Fine button briefly to select the instrument status file (FILE 1 - FILE 5).
4. Press the arrow button to move the cursor to "OPER CHOICE"
5. Turn the multi-function knob to select "DELETE" and press the knob or press the Fine button for 1 second or longer to select "OK" to read the saved file.



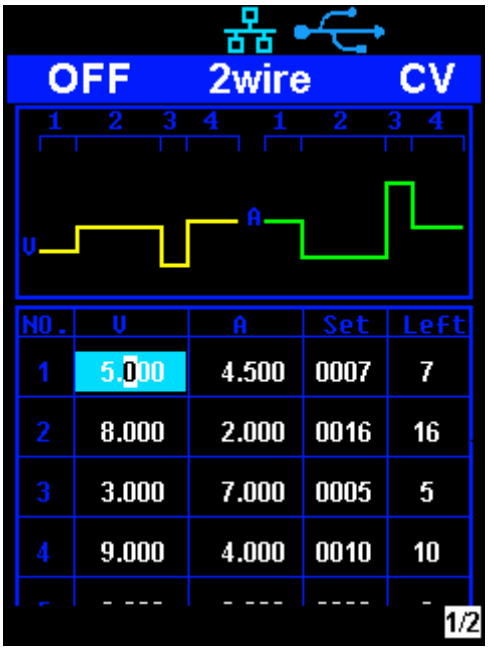
2.6 Timer

The T3PS16081P / 30051P provides a timer function. The timer can save five sets of settings, each set independent of the others. The user can set arbitrary parameters within the voltage, current, and dwell time values. The timer supports continuous output, with the longest time-out time ≤ 10000 s.

- Set the timer parameter

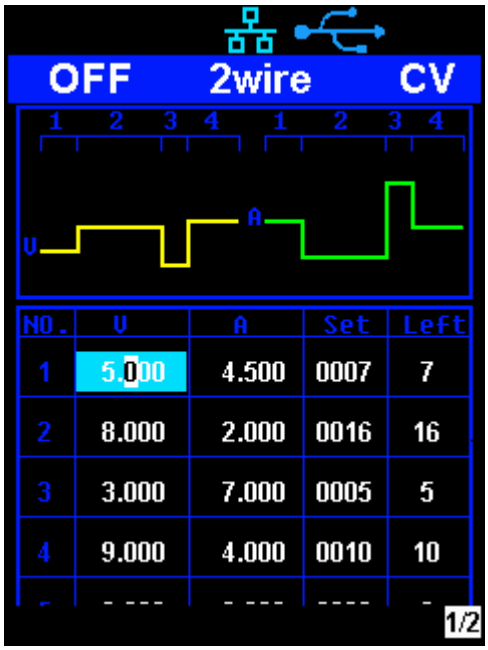
Method 1:

1. Press Timer/Wave to enter the Timer Setup interface, and the indicator will illuminate.
2. Using the arrow keys, move the cursor to select the desired parameter (voltage / current / time).
3. Rotate the multi-function knob or press the arrow buttons for 1 second or longer period to set the corresponding value. The Fine button can be used to move between the digits in any highlighted field.
4. Press Timer/Wave again to exit the Timer interface.



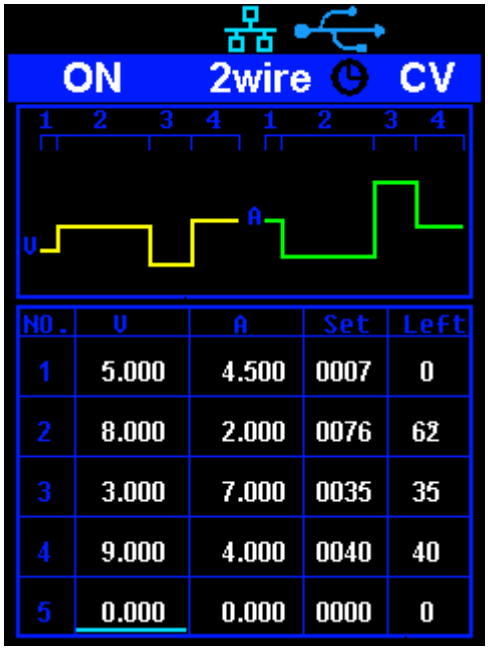
Start the Timer

1. Using the arrow keys, move cursor to Timer at the bottom of the screen in the Timer interface screen.
2. Rotate the multi-function knob to turn the Timer state to “ON”;
3. Press the knob to start the Timer. Notice the countdown shown to the right of the Timer On/ Off indicator. It will begin to count down for each segment of the timer profile.
4. Rotate the multi-function knob to turn the Timer state to “OFF”
5. Or press the On/Off button for 1 second or longer to turn on/off the Timer.



Method 2:

1. Press Timer/Wave button to enter the Timer interface.
2. Press the knob, start the timer profile.
3. Press the knob again, turn off the timer.
4. Or press the On/Off button for 1 second or longer to turn on/off the Timer.



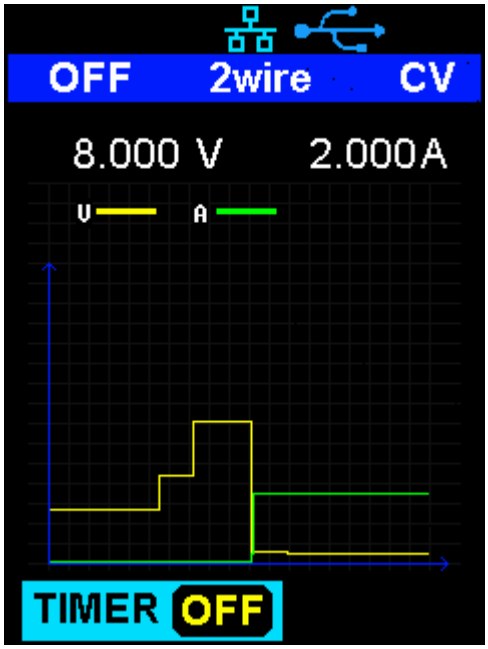
After starting the timer function, the timer will stop if you press the On/Off button to switch off the channel output. When the channel output is turned on again, the timer will continue counting from the last point in time it stopped. After the countdown steps have completed the timer will turn off automatically.

2.7 Waveform display

The T3PS16081P / 30051P displays the dynamic variation of the voltage and the current in the form of a trending graph.

Operation steps:

1. Press the Timer/Wave key for 1 second or longer to open the channel waveform display function. Once activated, the key light will illuminate and the waveform display interface is activated.
2. Press the On/Off key to turn on the output. Now you can observe the near-real-time changes of the channel output parameters (current/voltage).



Note: The yellow line indicates the voltage output curve, the green line indicates the current output curve, and the ordinate axis indicates the output value.

2.8 Version information

Under any interface, press Ver/Lock to enter the version information display interface. Version information includes: the number of instrument power-up boot cycles, software version, hardware version, product model, product serial number.

2.9 Lock key

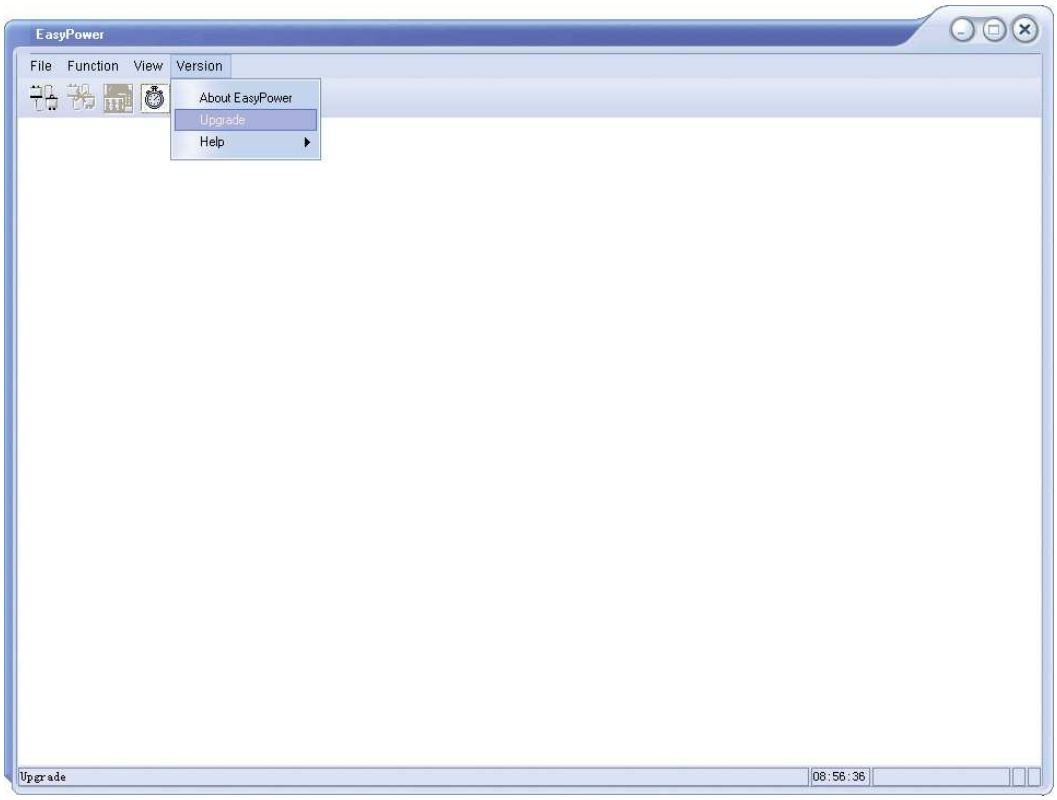
The T3PS16081P / 30051P allows the user to lock the front panel keys to avoid the risk of inadvertently changing a setting. Under any interface on the front panel, press the Ver/Lock key for 1 second or longer to enable the key lock function. At this point, the other buttons on the front panel are disabled, except for the power button. After the lock function is enabled, a "lock" icon appears at the top of the screen. Press and hold the Ver/Lock key again to disable the key lock function. The "Lock" icon at the top of the screen disappears.

2.10 Upgrade firmware

Software Upgrades are performed using Easypower, a PC-based management software program (available on the Teledyne LeCroy website), this is used to update the power supplies firmware via USB Device or LAN. Upgrade as follows:

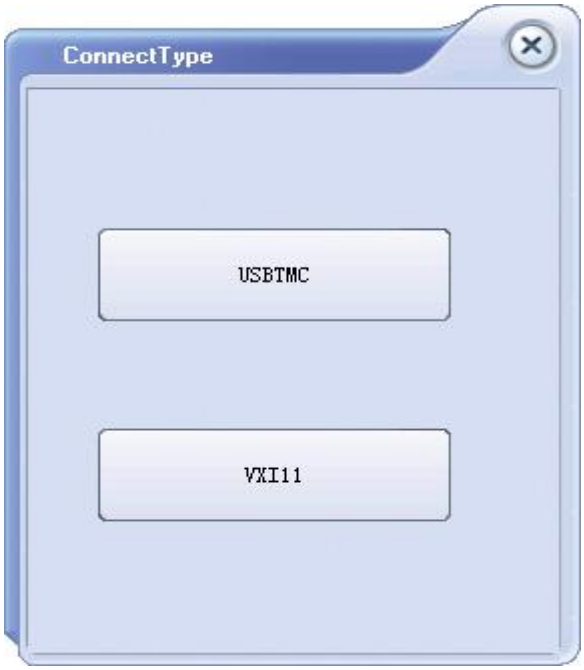
Upgrade in normal Interface

1. Open the EasyPower software after the USB interface has established its connection to the PC and run the EasyPower software.
2. Click Version and then choose Upgrade in the drop-down menu to enter the USB firmware upgrade dialogue.



3. Figure shows the firmware upgrade dialogue. Click file choosing icon ..., and then select the file to be upgraded which must have an ADS file extension.

4. Click the Upgrade button to begin the upgrade. The upgrade is finished when the progress bar completes and the instrument will automatically run the version after the upgrade.



Upgrade Via Guide Procedure

Upgrade via the guide procedure also can be used if the method above does not work. Specific steps are as follows:

1. Press the knob and simultaneously turn on the instrument. It will now enter the guide procedure mode.
2. After entering the guide procedure mode, the upgrade method is the same as in the previous procedure.

Chapter 3 Remote control

3.1 Control method

Based on NI-VISA

Users can remotely control the instrument by using NI-VISA from NI (National Instruments Corporation). In regards to NI-VISA, there is a full version and a live version (Run-Time Engine version). The full version includes NI device drivers and a tool called NI MAX. NI MAX is a user interface that controls the device. The real-time version is much smaller than the full version and includes only NI device drivers.

For example, you can download and install the latest version of NI-VISA at https://www.ni.com/en-gb/support/downloads/drivers/download.ni-visa.html

Next use the USB cable to connect the T3PS16081P / 30051P (via the rear panel's USB Device connector) to the computer or use a network cable to connect the power supply (through the back-panel's LAN connector) to the computer's LAN.
Based on NI-VISA, the user can remotely control the T3PS16081P / 30051P in two ways; one through the PC software EasyPower and the other through custom programming with SCPI commands. For more information, see Programming Examples.

Using Socket

Users can also use Socket through the network port and T3PS16081P / 30051P for TCP/IP protocol-based communications. Socket communication is a basic communication technology used in computer networks.

It allows applications to communicate through network hardware and the standard network protocol built into the operating system. This method requires two-way communication between the instrument and the computer network through an IP address and a fixed port number. T3PS16081P / 30051P Socket communication port is 5025.

Using a network cable after connecting the T3PS16081P / 30051P (through the rear panel LAN connector) to the local area network where the computer is located, you can customize the programming with SCPI commands to remotely control the T3PS16081P / 30051P. For more information, see section 3.5 Programming Examples.

3.2 Command format

The SCPI command is a tree hierarchy that includes multiple subsystems, each consisting of a root key and one or more level keys. Command keywords are separated by a colon ":". The keywords are followed by optional parameter settings. Commands and parameters are separated by a space, and the parameters are separated by commas ",", add a question mark "?", after the command line to inquire about this function.

Most SCPI commands are a mixture of uppercase and lowercase letters. Capital letters indicate abbreviations of shortened commands. For better program readability, use the long commands convention.

For example, [CH1:]VOLTage <voltage> VOLT or VOLTage, uppercase and lowercase letters in any combination will work. Therefore, VolTaGe, volt and Volt are acceptable. Other formats such as VOL and VOLTAG will generate errors.

- Brackets ({}) contain parameter choices. Brackets are not sent with the command string.
- Vertical line (|) separates parameter selections.
- Angle brackets (<>) indicates that you must specify a value for the parameter inside the brackets. For example, for the <voltage> parameter in angle brackets for the above command, you must specify a value for this parameter (for example, "CH1: VOLT 10"). Angle brackets do not send angle brackets along with the command string.
- Optional parameters are enclosed in square brackets ([]). If you do not specify a value for the optional parameter, the instrument uses the default value. For example, [CH1:] in the above command can be omitted (for example, "VOLT 10"). At this time, the command will operate on the current channel. Brackets are not sent with the command string.

3.3 Command Summary

1. *IDN?
2. *SAV
3. *RCL
4. INSTrument {CH1|CH2}
5. INSTrument ?
6. MEASure:CURRent?
7. MEAsure:VOLTage?
8. MEASure:POWEr?
9. [SOURce:]CURRent <current>

10. [SOURce:]CURRent ?
11. [SOURce:]VOLTage <volt>
12. [SOURce:] VOLTage?
13. OUTPut
14. OUTPut:TRACk
15. OUTPut:WAVE
16. TIMEr:SET
17. TIMEr:SET?
18. TIMEr
19. SYSTem:ERRor?
20. SYSTem:VERSion?
21. SYSTem: STATus?

3.4 Command description

1. *IDN?

Command format	*IDN?
Description	Query the manufacturer, product type, series NO. , software version and hardware version.
Return Info	Manufacturer, product type, series NO., software version.
Example	LeCroy, T3PS16081P, T3PS1XDAD1R0001, 2.01.01.06, V1.0

2. *SAV

Command format	*SAV <name>
Description	Save current state in nonvolatile memory with the specified name.
Example	*SAV 1

3. *RCL

Command format	*RCL <name>
Description	Recall state that had been saved from nonvolatile memory.
Example	*RCL 1

4. INSTrument

Command format	INSTrument <CH1>

Description	Select the channel that will be operated.
Example	INSTrument CH1

Command format	INSTrument?
Description	Query the current operating channel
Example	INSTrument?
Return Info	CH1

5. MEASure

Command format	MEASure: CURRent? < CH1|CH2>
Description	Query current value for specified channel, if there is no specified channel, query the current channel.
Example	MEASure: CURRent? CH1
Return Info	3.000

Command format	MEASure: VOLTage? < CH1>
Description	Query voltage value for specified channel, if there is no specified channel, query the current channel.
Example	MEASure: VOLTage? CH1
Return Info	16.000

Command format	MEASure: POWEr? < CH>
Description	Query power value for specified channel, if there is no specified channel, query the current channel.
Example	MEASure: POWEr? CH1
Return Info	90.000

6. CURRent

Command format <SOURce:>CURRent <value>

<SOURce>:={CH1}

Description Set current value of the selected channel

Example CH1:CURRent 0.5

Command format <SOURce>: CURRent?

<SOURce>:={CH1}

Description Query the current value of the selected channel.

Example CH1: CURRent?

Return Info 0.500

7. VOLTage

Command format <SOURce>: VOLTage <value>

<SOURce>:={CH1}

Description Set voltage value of the selected channel

Example CH1: VOLTage 15

Command format <SOURce>:CURRent?

<SOURce>:={CH1}

Description Query the voltage value of the selected channel.

Example CH1: VOLTage?

Return Info 15.000

8. MODE

Command	MODE:SET {2W|4W}
Description	To set the work operation of 2W or 4W
Example	MODE:SET 4W

9. OUTPut

Command format	OUTPut <SOURce>, <state> <SOURce>:={CH1}; <state>:={ON|OFF}
Description	Turn on/off the channel.
Example	OUTPut CH1, ON

10. TIMEr

Command format	TIMEr: SET <SOURce>, <secnum>, <volt>, <curr>, <time> <SOURce>:={CH1}; < secnum >;=1 to 5;
Description	Set timing parameters of specified channel
Example	TIMEr: SET CH1, 2, 3, 0.5, 2

Command format	TIMEr: SET? <SOURce>, <secnum> <SOURce>:={CH1}; < secnum >;=1 to 5;
Description	Query the voltage/current/time parameters of specified group of specified channel.
Example	TIMEr: SET? CH1, 2

Return Info	3, 0.5, 2
Command format	TIMEr <SOURce>, <state> <SOURce>:={CH1}; < state >;={ON | OFF};
Description	Turn on/off Timer function of specified channel
Instruction	The command works effectively only when <secnum> starts from 1.
Example	TIMEr CH1, ON

11、 SYSTem

Command format	SYSTem: ERRor?
Description	Query the error code and the information of the equipment.
Command format	SYSTem: VERSion?
Description	Query the software version of the equipment.
Example	SYSTem: VERSion?
Return Info	2.01.01.06
Command format	SYSTem: STATus?
Description	Query the current working state of the equipment.
Instruction	The return info is Hexadecimal format, but the actual state is binary, so you must change the return info into a binary format. The state correspondence relationship is

as follows.

Example SYSTem: STATus?

Return info 0x0224

Explanation: The returned information is hexadecimal, so the user needs to convert in to binary format when confirming the status. See the following table:

Bit NO.	**Corresponding state**
0	0: CV mode 1: CC mode
4	0: Output OFF 1: Output ON
5	0: 2W mode 1: 4W mode
6	0: TIMER OFF 1: TIMER ON
8	0: digital display; 1: waveform display

12. IPaddr

Command format IPaddr <IP address>

Description Used to assign a Static Internet Protocol (IP) address to the instrument

Example IPaddr 10.11.13.214

Explanation This command is invalid when the power is currently set to automatically obtain the network configuration (DHCP is ON)

Command format IPaddr?

Description Query the software the setting of IP address

Example SYSTem: VERSion?

Return Info	10.11.13.214

13、 MASKaddr

Command format	MASKaddr <NetMask>
Description	Used to assign a subnet mask to the instrument
Example	MASKaddr 255.255.255.0
Explanation	This command is invalid when the power is currently set to automatically obtain the network configuration (DHCP is ON)

Command format	MASKaddr?
Description	Query the software the setting of the mask address
Example	SYSTem: VERSion?
Return Info	255.255.255.0

14、 GATEaddr

Command format	GATEaddr <GateWay>
Description	Used to assign agateway to the instrument
Example	GATEaddr 10.11.13.1
Explanation	This command is invalid when the power is currently set to automatically obtain the network configuration (DHCP is ON)

Command format	MASKaddr?
Description	Query the software the setting of the gateway address
Return Info	10.11.13.1

15. DHCP

Command format	DHCP{ON|OFF}
Description	Turn on or off the instrument's automatic network configuration feature.
Example	DHCP ON

Command format	DHCP?
Description	This is used to query whether the current automatic network configuration of the instrument is enabled
Return Info	ON

16. *LOCK

Command format	*LOCK
Description	Turn on the key lock to disable local or remote settings.
Example	*LOCK

Command format	*UNLOCK
Description	Turn off the key lock to validate the setting
Example	*UNLOCK

3.5 Programming examples

This section lists examples of programming with SCPI commands based on NI-VISA or Socket in Visual C ++, Visual Basic, MATLAB, Python, and more.

NI-VISA-based programming examples

1. First confirm that your computer has installed the NI VISA library (NI website can be downloaded from http://www.ni.com). The default installation path in this article is C: \Program Files\IVI Foundation\VISA.
2. This article mainly uses the power of the USB interface and PC communications, some examples involve the use of LAN interface. Please use the USB cable to connect the USB Device port on the rear panel of the power supply to the USB port on the PC. You can also use the LAN interface to communicate with the PC.
3. After the power is correctly connected to the PC for the first time, power on the instrument. At this time, the **Hardware Update** Wizard dialog box will pop up. Follow the instructions of the wizard to install the "USB Test and Measurement Device".

   At this point, programming preparation is completed. The following will detail the Visual C + +, Visual Basic and MATLAB development environment programming examples.

Visual C ++ programming examples

Environment: Win7 32bit system, Visual Studio

Example content: Using NI-VISA, access control devices via

USBTMC and TCP/IP, send commands to read the return value.

Follow these steps to complete the example:

1. Open Visual Studio and create a new vc ++ win32 project.

   Setting up the project environment to use the NI-VISA library, you have two options for using ni-visa, static mode and automatic mode:

   • static mode:

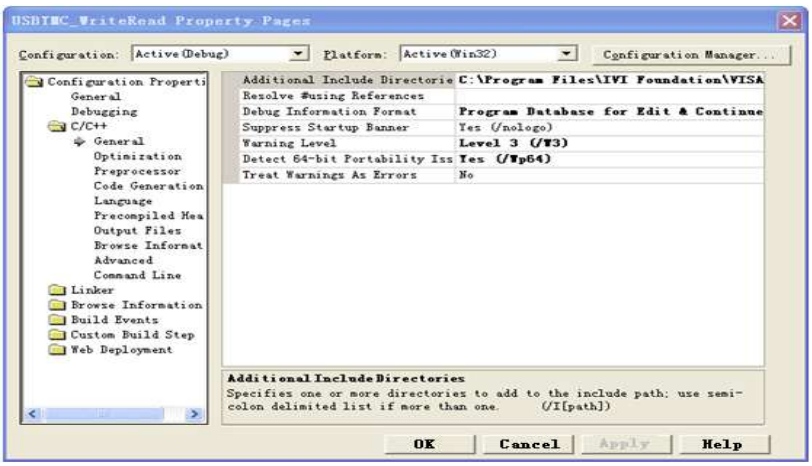
   Find the files on the NI-VISA installation path: visa.h, visatype.h, visa32.lib. Copy them to your project and add them to the project. In the project .cpp file, add the following two lines

   #include "visa.h"

   #pragma comment(lib,"visa32.lib")

   • automatic mode

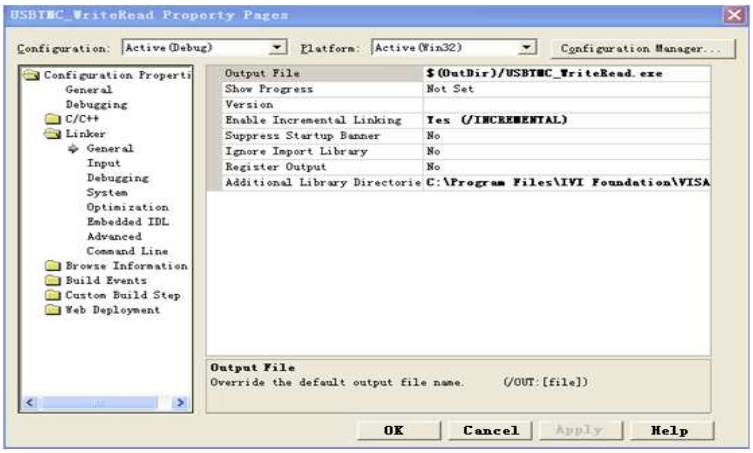
   Set .h files include directory, NI-VISA installation path. In our computer, we set the path to: C: \Program Files\IVI Foundation\VISA\WINNT\include. Set this path to the project - Properties - C / C ++ - General - Additional include path, as shown:



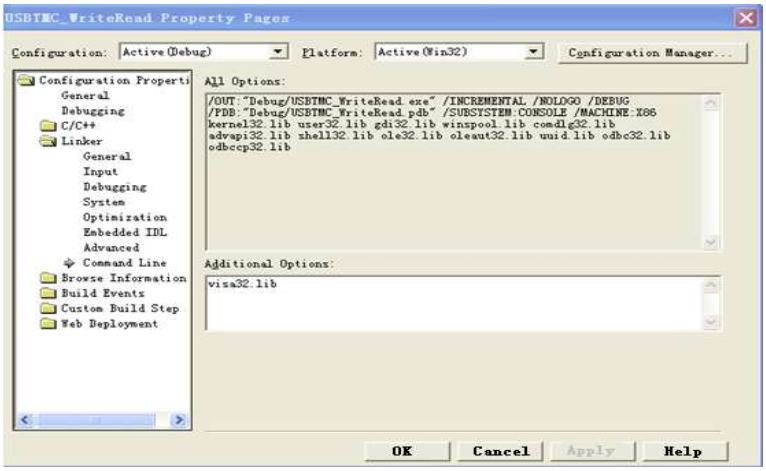
Set the library path to set the library file:

For example your NI-VISA installation path could be C: \Program Files\IVI Foundation\VISA\WINNT\LIB

\MSC. Set this path to Project - Performance - Connector - General - additional library directory, as shown:



Set the library file : project---properties---Linker---Command Line---Additional Options:visa32.lib



Including visa.h file: in XXX.cpp file: #include <visa.h>

2. Add code

- Based on USB interface code : Write a Usbtmc_test function.

```
int Usbtmc_test () {
/*  This code demonstrates using NI-VISA to send synchronous read and write commands to a USB Test & Measurement Class (USBTMC) instrument  */
/*  This example writes "* IDN? \n" string to all USBTMCs devices
```

```
connected to the system and tries to read back the result using a
read-write function   */
  /*   The general flow of the code is to open the Explorer   */
  /*   Open the VISA session to the instrument   */
  /*   Use viPrintf to write the instrument flag   */
  /*   Try to read a response with viScanf   */
  /*   Close the VISA session   */
  /************************************************************/
            ViSession defaultRM;
            ViSession instr; ViUInt32
            numInstrs; ViFindList findList; ViStatus status;
            char instrResourceString[VI_FIND_BUFLEN];
            unsigned char buffer[100];
            char stringinput[512];
            int i;
  /*   First, we have to call viOpenDefaultRM to get the manager's
handle   */
  /*    We will store this handle in defaultRM   */
  }
        status=viOpenDefaultRM (&defaultRM);
        if (status < VI_SUCCESS)
        {
      printf ("Could not open a session to the VISA Resource Manager!\n");
        return status;
        }
```

```
/** Look for all USB TMC VISA resources in our system  */
/* Then the number of resources stored in the system numInstrs
Lane  */
status = viFindRsrc (defaultRM, "USB?*INSTR", &findList,
&numInstrs, instrResourceString);
if (status < VI_SUCCESS)
{
printf ("An error occurred while finding resources.\nHit enter to continue.");
fflush(stdin); getchar();
viClose (defaultRM); return status;
}
```

We will now open a VISA session for all USB TMC instruments. We have to use a handle from viOpenDefaultRM, and we have to use a string to indicate the instrument to open, which is called instrument descriptor. The format of the string can be found in the right-click parameter description in the function panel. After opening a session to the device, we get a handle to the instrument used later when using the VISA feature. The AccessMode and timeout parameters in this function are reserved for future functions. These two parameters are given the value VI_NULL.

```
for (i=0; i<int(numInstrs); i++)
{
if (i > 0)
viFindNext (findList, instrResourceString);
status = viOpen (defaultRM, instrResourceString, VI_NULL, VI_NULL, &instr);
if (status < VI_SUCCESS)
{
printf ("Cannot open a session to the device %d.\n", i+1);
continue;
}
/** At this point, we now have a session open to the USB TMC instrument.
Now, we will use the viPrintf function to send the string "* IDN? \ N" to the
device, asking for the identification  */
```

```
char * cmmand ="*IDN?\n";
status = viPrintf      (instr, cmmand);
if (status < VI_SUCCESS)
{
      printf ("Error writing to the device %d.\n",
      i+1); status = viClose (instr);
      continue;
}
```

/** Now we will try to read back the response of a device information query from the device. We will use the viScanf function to get the data. After the data is read out, the response is displayed */

```
status =  viScanf(instr, "%t",
buffer);
if (status < VI_SUCCESS)
      printf ("Error reading a response from the device %d.\n", i+1); else
      printf ("\nDevice %d:%*s\n", i+1,retCount,
buffer); status = viClose (instr);
}
```

/** We will now close the session using the viClose instrument. This action frees up all system resources */

```
Return 0
}
```

- Based on the LAN port code Write a TCP_IP_Test function.

```
int TCP_IP_Test (char * pIP) {
char outputBuffer[VI_FIND_BUFLEN];
ViSession defaultRM,
     instr; ViStatus status;
     ViUInt32 count;
     ViUInt16 portNo;
      status = viOpenDefaultRM
     (&defaultRM); if (status <
     VI_SUCCESS)
     {

      printf("Could not open a session to the VISA Resource
      Manager!\n");

     }
char head[256] ="TCPIP0::"; char tail[] ="::INSTR";
char resource [256]; strcat(head,pIP); strcat(head,tail);
```

```
    status = viOpen (defaultRM, head, VI_LOAD_CONFIG, VI_NULL, &instr);
    if (status < VI_SUCCESS)
    {
        printf ("An error occurred opening the session\n"); viClose(defaultRM);
    }
    status = viPrintf(instr, "*idn?\n");
    status = viScanf(instr, "%t", outputBuffer);
    if (status < VI_SUCCESS)
    {
        printf("viRead failed with error code: %x \n",status);
        viClose(defaultRM);
    }
    else
        printf ("\ndata read from device: %*s\n", 0,outputBuffer);
    status = viClose (instr);
    status = viClose (defaultRM);
    return 0;
}
```

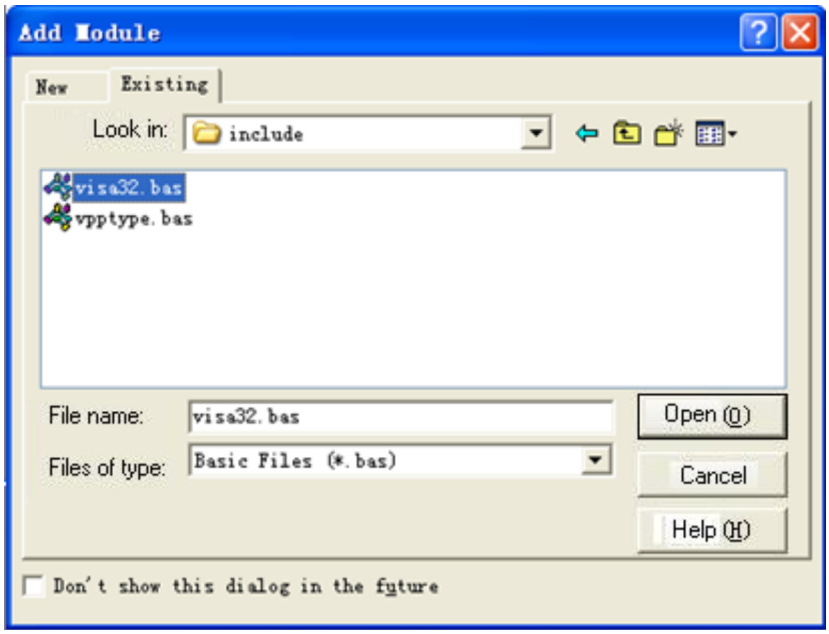
Visual Basic programming examples

Environment: Windows 7 32-bit systerm , Microsoft Visual Basic 6.0

Example Content: Using NI-VISA, access control devices via USBTMC and TCP/IP, send commands to read the return value.

Follow the steps to complete the example:

1. Open Visual Basic, create a standard application project (Standard EXE).
2. Using the NI-VISA library to set up the project environment, click on the project's existing tab >> add module. Search for the include folder file under the NI-VISA installation path in visa32.bas and add the file.



This allows VISA functions and VISA data types to be used in the program

3. Add code

- Based on USB interface code:

  Write Usbtmc_test function.

  function USBTMC_test()

This code demonstrates using NI-VISA to send synchronous read and write commands to a USB Test & Measurement Class

(USBTMC) instrument.

Create a VISA-USB object to connect to the USB instrument

```
vu = visa ('ni', 'USB0 :: 0xF4EC :: 0x1300 :: 0123456789 :: INSTR');
fopen(vu);
fprintf(vu,'*IDN?'); outputbuffer = fscanf(vu); disp(outputbuffer);
fclose(vu); delete(vu); clear vu;

end
```

- Based on the LAN port code:

  Write to the TCP_IP_Test function.

```
function TCP_IP_test( IPstr )
% This code demonstrates using NI-VISA to send synchronous read
and write commands to a TCP / IP instrument.


% Create a VISA-TCPIP object to connect to an instrument with an IP
address configured
vt = visa('ni',['TCPIP0::',IPstr,'::INSTR']);

% Open the created VISA object
fopen(vt);

% Send the string "* IDN?" To query device information
    fprintf(vt,'*IDN?');


    % Request data
    outputbuffer = fscanf(vt); disp(outputbuffer);

% Close the VISA object fclose(vt);
delete(vt);
clear vt;

end
```

Socket-based programming examples

Python programming examples

Because the operating system itself supports Socket communication, this communication method is relatively concise. Note that the T3PS16081P / 30051P use a fixed port number of 5025 for Socket communication, and the "\ n" (newline) must be added to the end of the SCPI command string.

Environment: Windows 7 32-bit system, Python v2.7.5

Example content: Access control devices via Socket, send commands to read the return value.

The following is the script content:

```
#!/usr/bin/env python
#-*- coding:utf-8 –*-
#---------------------------------------------------------------------------------------------
# Access the control device via Socket, send a command, read and print
the return #value.
#---------------------------------------------------------------------------------------------

import socket  # for sockets
import sys # for exit
import time # for sleep
#---------------------------------------------------------------------------------------------
remote_ip = "10.11.13.32"
port = 5025
count = 0

def SocketConnect():

    try:
        s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
    except socket.error:
        print ('Failed to create socket.')
        sys.exit();
    try:
        s.connect((remote_ip , port))
    except socket.error:
        print ('failed to connect to ip ' + remote_ip)
        return s
```

```
    def SocketQuery(Sock, cmd):

        try :
            Sock.sendall(cmd)
            time.sleep(1)
        except socket.error:
            print ('Send failed')
            sys.exit()
        reply = Sock.recv(4096)
        return reply

    def SocketClose(Sock):
        Sock.close()
        time.sleep(.300)

    def main():
        global remote_ip
        global port
        global count

        s = SocketConnect()
        for i in range(10):
            qStr = SocketQuery(s, b'*IDN?\n')
            print (str(count) + ":: " + str(qStr))
            count = count + 1
        SocketClose(s)
        input('Press "Enter" to exit')

if __name__ == '__main__':
    proc = main()
```

Chapter 4 Common troubleshooting

Here are some common failures and their solutions. If the problem persists after following the listed steps, please contact **Teledyne LeCroy**.

1. The instrument will not start up.

- Check whether the power is correctly connected.
- Check whether the power switch at the front panel is on.
- Remove the power cord and check whether the voltage selector is on the correct scale, whether the specification of the fuse is correct and whether the fuse is intact. If the fuse needs to be changed, please refer to "**To Replace the Fuse**".
- If the problem remains, please contact **Teledyne LeCroy**.

2. The constant voltage output is abnormal.

- Check whether the maximum output power of the scale currently selected fulfills the load requirement. If yes, go to the next step.
- Check the cable connecting the load and power supply for short-circuits.
- Check whether the load is normal.
- Check whether the current setting value of this scale is proper. If it is too low, increase it.
- If the problem remains, please contact **Teledyne LeCroy**.

3. The constant current output is abnormal.

- Check whether the maximum output power of the scale currently selected fulfills the load requirement. If yes, go to the next step.
- Check whether the cable connecting the load and power supply is in good condition.
- Check whether the load is normal.
- Check whether the voltage setting value of this scale is proper. If it is too low, increase it.
- If the problem remains, please contact **Teledyne LeCroy**.

Chapter 5 Service and Support

5.1 Maintenance summary

Teledyne Test Tools warrants that the products it manufactures and sells will be free from defects in materials and workmanship for three years from the date of shipment from an authorized Teledyne Test Tools distributor. If a product is proved to be defective within the warranty period, Teledyne Test Tools will repair or replace the unit as described in the complete warranty statement.

To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest Teledyne Test Tools sales and service office. Except as provided in this summary or the applicable warranty statement, Teledyne Test Tools makes no warranty of any kind, express or implied, including but not limited to the implied warranties of merchantability and special applicability. In no event shall Teledyne Test Tools be liable for indirect, special or consequential damages.

5.1 Contact Teledyne LeCroy

Teledyne LeCroy (US Headquarters)

700 Chestnut Ridge Road
Chestnut Ridge, NY. USA
10977-6499
Phone: 800-553-2769 or 845-425-2000
Fax Sales: 845-578-5985
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(Oscilloscopes, Waveform Generators, Signal Integrity)
Web Site: http://teledynelecroy.com/
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World wide support can be found at: https://
teledynelecroy.com/support/contact

TELEDYNE TEST TOOLS
Everywhereyoulook™

ABOUT TELEDYNE TEST TOOLS

Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand expands on the Teledyne LeCroy product portfolio by adding a comprehensive range of test equipment solutions for its customers. The new range of product solutions deliver engineers with a broad range of quality test solutions that enables speed to market product validation and design. More and more designers, engineers and lecturers are relying on Teledyne Test Tools to meet their testing, education and electronics validation needs with confidence and within budget.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy have sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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