

Programmable DC Power Supply

IT-M3140 Series User Manual



Model: IT-M3140 Series
Version: V1.4/5 , 2023

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CAUTION

A CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

A WARNING sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.



Note

A NOTE sign denotes important hint. It calls attention to tips or supplementary information that is essential for users to refer to.

Quality Certification and Assurance

We certify that series instrument meets all the published specifications at time of shipment from the factory.

Warranty

ITECH warrants that the product will be free from defects in material and workmanship under normal use for a period of one (1) year from the date of delivery (except those described in the Limitation of Warranty below).

For warranty service or repair, the product must be returned to a service center designated by ITECH.
















- The product returned to ITECH for warranty service must be shipped PRE-PAID. And ITECH will pay for return of the product to customer.
- If the product is returned to ITECH for warranty service from overseas, all the freights, duties and other taxes shall be on the account of customer.

Limitation of Warranty

This Warranty will be rendered invalid in case of the following:

- Damage caused by circuit installed by customer or using customer own products or accessories;
- Modified or repaired by customer without authorization;
- Damage caused by circuit installed by customer or not operating our products under designated environment;
- The product model or serial number is altered, deleted, removed or made illegible by customer;
- Damaged as a result of accidents, including but not limited to lightning, moisture, fire, improper use or negligence.

Safety Symbols

	Direct current		ON (power)
	Alternating current		OFF (power)
	Both direct and alternating current		Power-on state
	Chassis (earth ground) symbol.		Power-off state
	Earth (ground) terminal		Reference terminal
	Caution		Positive terminal
	Warning (refer to this manual for specific Warning or Caution information)		Negative terminal
	A chassis terminal	-	-

Safety Precautions

The following safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or specific warnings elsewhere in this manual will constitute a default under safety standards of design, manufacture and intended use of the instrument. ITECH assumes no liability for the customer's failure to comply with these precautions.

WARNING

- Do not use the instrument if it is damaged. Before operation, check the casing to see whether it cracks. Do not operate the instrument in the presence of inflammable gasses, vapors or dusts.
 - The instrument is provided with a power cord during delivery and should be connected to a socket with a protective earth terminal, a junction box or a three-phase distribution box. Before operation, be sure that the instrument is well grounded.
 - Please always use the provided cable to connect the instrument.
 - Check all marks on the instrument before connecting the instrument to power supply.
 - Ensure the voltage fluctuation of mains supply is less than 10% of the working voltage range in order to reduce risks of fire and electric shock.
 - Do not install alternative parts on the instrument or perform any unauthorized modification.
 - Do not use the instrument if the detachable cover is removed or loosen.
 - To prevent the possibility of accidental injuries, be sure to use the power adapter supplied by the manufacturer only.
 - We do not accept responsibility for any direct or indirect financial damage or loss of profit that might occur when using the instrument.
 - This instrument is used for industrial purposes, do not apply this product to IT power supply system.
 - Never use the instrument with a life-support system or any other equipment subject to safety requirements.
-

WARNING

- **SHOCK HAZARD Ground the Instrument.** This product is provided with a protective earth terminal. To minimize shock hazard, the instrument must be connected to the AC mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet or distribution box. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in injury or death.
 - **Before applying power, verify that all safety precautions are taken.** All connections must be made with the instrument turned off, and must be performed by qualified personnel who are aware of the hazards involved. Improper actions can cause fatal injury as well as equipment damage.
 - **SHOCK HAZARD, LETHAL VOLTAGES** This product can output the dangerous voltage that can cause personal injury, and the operator must always be protected from electric shock. Ensure that the output electrodes are either insulated or covered using the safety covers provided, so that no accidental contact with lethal voltages can occur.
 - **Never touch cables or connections immediately after turning off the instrument.** Verify that there is no dangerous voltage on the electrodes or sense terminals before touching them.
 - **After using the device, turn off the power switch of the device before unplugging the power cord or disassembling the terminals.** Do not touch the cable or the terminal immediately. Depending on the model, the dangerous voltage at the plug or terminal is maintained for 10 seconds after the device is switched off. Make sure that there is no dangerous voltage before touching them.
-

CAUTION

- **Failure to use the instrument as directed by the manufacturer may render its protective features void.**
 - **Always clean the casing with a dry cloth. Do not clean the internals.**
 - **Make sure the vent hole is always unblocked.**
-

Environmental Conditions





The instrument is designed for indoor use and an area with low condensation. The table below shows the general environmental requirements for the instrument.

Environmental Conditions	Requirements
Operating temperature	0°C ~ 40°C
Operating humidity	20% ~ 80%(non-condensation)
Storage temperature	-10°C ~ 70 °C
Altitude	Operating up to 2,000 meters
Installation category	II
Pollution degree	Pollution degree 2

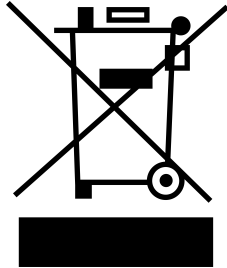

Note

In order to ensure the accuracy of measurement, it is recommended to operate the instrument half an hour after start-up.

Regulation Tag

	The CE tag shows that the product complies with the provisions of all relevant European laws (if the year is shown, it indicates that the year when the design is approved).
	The UKCA tag shows that the product complies with the provisions of all relevant United Kingdom laws (if the year is shown, it indicates that the year when the design is approved).
	This instrument complies with the WEEE directive (2002/96/EC) tag requirements. This attached product tag shows that the electrical/electronic product cannot be discarded in household waste.
	This symbol indicates that no danger will happen or toxic substances will not leak or cause damage in normal use within the specified period. The service life of the product is 10 years. The product can be used safely within the environmental protection period; otherwise, the product should be put into the recycling system.

Waste Electrical and Electronic Equipment (WEEE) Directive



Waste electrical and electronic equipment (WEEE) directive, 2002/96/EC

The product complies with tag requirements of the WEEE directive (2002/96/EC). This tag indicates that the electronic equipment cannot be disposed of as ordinary household waste. Product Category

According to the equipment classification in Annex I of the WEEE directive, this instrument belongs to the "Monitoring" product.

If you want to return the unnecessary instrument, please contact the nearest sales office of ITECH.

Compliance Information

Complies with the essential requirements of the following applicable European Directives, and carries the CE marking accordingly:

- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Low-Voltage Directive (Safety) 2014/35/EU

Conforms with the following product standards:

EMC Standard

IEC 61326-1:2012/ EN 61326-1:2013 ¹²³

Reference Standards

CISPR 11:2015+A1:2016 Ed 6.1

IEC 61000-3-2: 2018 RLV

IEC 61000-3-3: 2013+A1:2017

IEC 61000-4-2:2008

IEC 61000-4-3 2006+A1:2007+A2:2010/ EN 61000-4-3 A1:2008+A2:2010

IEC 61000-4-4:2012

IEC 61000-4-5:2014+A1:2017

IEC 61000-4-6:2013+cor1:2015

IEC 61000-4-11:2004+A1:2017

1. The product is intended for use in non-residential/non-domestic environments. Use of the product in residential/domestic environments may cause electromagnetic interference.
2. Connection of the instrument to a test object may produce radiations beyond the specified limit.
3. Use high-performance shielded interface cable to ensure conformity with the EMC standards listed above.

Safety Standard

IEC 61010-1:2010+A1:2016

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1 Quick Reference

This chapter briefly introduces the front panel, rear panel, keyboard button functions and front panel display functions of this series instrument to ensure a quick understanding of the appearance, structure and key usage features of the instrument before operating the instrument. This chapter does not introduce each operating characteristic in detail. It is just a quick reference guide to help you quickly learn the operating characteristics of the instrument.

- ◆ [Brief Introduction](#)
- ◆ [Front-Panel Overview](#)
- ◆ [Keyboard Introduction](#)
- ◆ [Home-Screen Overview](#)
- ◆ [Prompt Information Reference](#)
- ◆ [Rear-Panel Overview](#)
- ◆ [Front Panel Menu Reference](#)
- ◆ [Models and Options](#)

1.1 Brief Introduction

IT-M3140 Programmable DC Power Supply is specially designed for testing, production, R&D lab and ATE integration. It is only 2U half rack, but can output power up to 1850W and 3000W, and voltage output from 30V to 1200V. It has three output modes of constant voltage, constant current and constant power. Automatic wide-range output enables it to achieve a wider output voltage and current range at full power output, meeting a wider range of testing requirements and greatly saving equipment purchase costs.

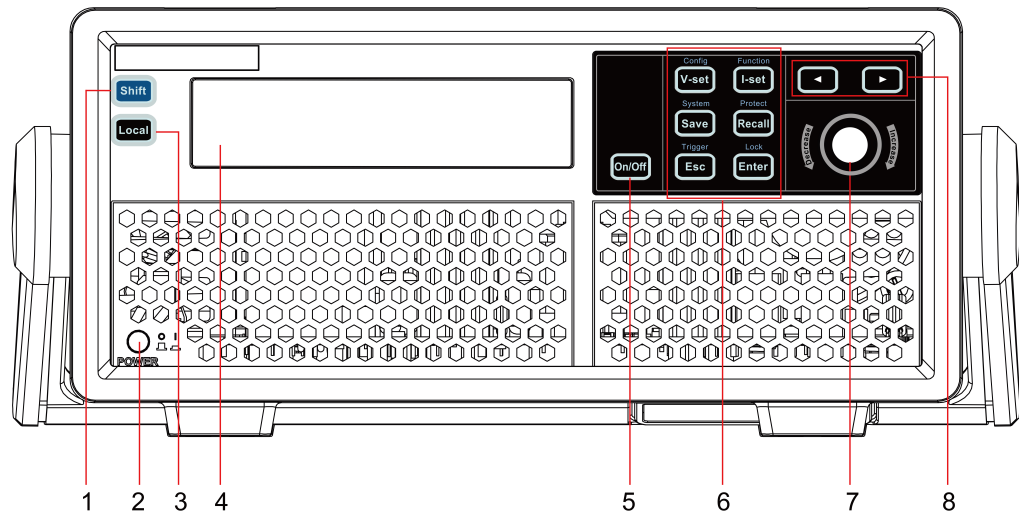
Performance and functions:

- Only 2U half rack, 1850W/3000W
- 30V-1200V, 150A
- Three output modes: CV/CC/CP
- CC/CV priority to avoid current overshoot
- Fast dynamic response: <1ms
- According to the voltage and current waveform output programmed by LIST, the rising and falling slopes are adjustable
- Fold back, UVP/OVP, UCP/OCP, OPP, OTP, inhibit protection, more secure and reliable
- The Sense protection circuit combined with software and hardware can effectively detect Sense reverse connection and missing connection, and protect the DUT

- Standard USB/LAN, optional RS232 & analog, GPIB, easy to integrate

1.2 Front-Panel Overview

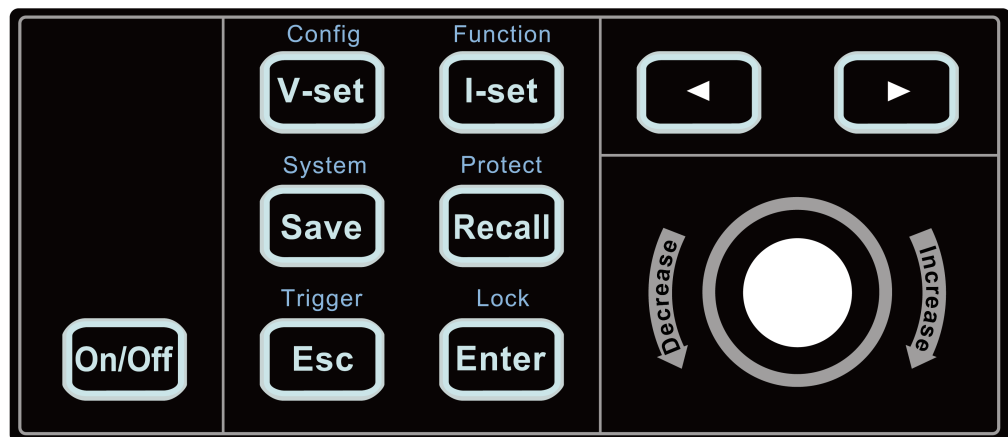
All of the IT-M3140 series power supplies have the same front panels. The detailed descriptions are shown as below.





No.	Name	Description
1	[Shift] key	Composite key, combined with other keys to realize functions marked above keys.
2	Power On/Off switch	Turns instrument on or off.
3	[Local] key	In remote control, press [Local] keys to switch the instrument to local control mode.
4	Vacuum fluorescent display (VFD)	Displays all instrument functions. The information changes based on selected function.
5	[On/Off] key	Turns the instrument output on or off. When lit, indicates that the output is enabled or on.
6	Function keys group	Refer to 1.3 Keyboard Introduction for the detailed description about the function keys.
7	Push-on knob	<ul style="list-style-type: none"> • Rotate the knob to adjust the voltage and current values or scroll pages to view menu items. Rotate the knob clockwise to increase the set value and anticlockwise to decrease the set value. • Pushing the knob acts like pressing [Enter] key to confirm an operation.
8	Left, and right arrow keys	Moves the cursor below the setting value or scrolls pages to view menu items.

1.3 Keyboard Introduction

The keyboard introduction of IT-M3140 series power supplies is shown as follows.



Keys	Description
[On/Off]	Turns the instrument output on or off. When lit, indicates that the output is enabled or on.
[V-set]	Sets the output voltage value.
[I-set]	Sets the output current value.
[Save]	Saves the present settings. IT-M3200 power supplies support up to 10 saved setups.
[Recall]	Returns the instrument to the specified setup.
[Esc]	Returns to the previous menu level.
[Enter]	Selects the menu item or confirm an operation.
 	Moves the cursor below the setting value or scrolls pages to view menu items.

Composite key **[Shift]**, combined with other keys to realize functions marked above keys. The detailed functions are listed as follows.

Keys	Description
[Shift]+[V-set] (Config)	Enter the Config menu.
[Shift]+[I-set] (Function)	Enter the Function menu.
[Shift]+[Save] (System)	Enter the System menu.
[Shift]+[Recall] (Protect)	Enter the Protect menu.
[Shift]+[Esc] (Trigger)	Generate a local trigger signal.
[Shift]+[Enter] (Lock)	Turn the keyboard lock on or off.


1.4 Home-Screen Overview

The information displayed on the interface of the IT-M3140 power supply varies depending on the meter view settings. Details are described below.

- **When the meter view is set to CC+CV, the main interface 1 is displayed as follows:**



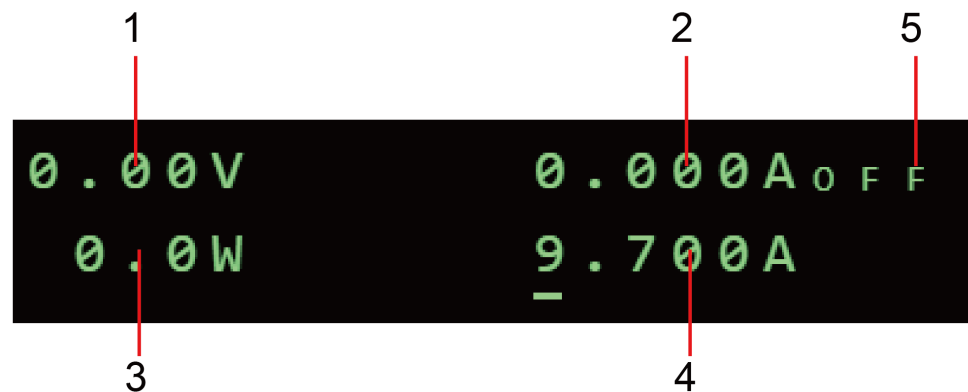
No.	Name	Description
1	V meter value	Displays the meter value of the voltage.
2	I meter value	Displays the meter value of the current.
3	V set value	Displays the setting value of the voltage.

No.	Name	Description
4	I set value	Displays the setting value of the current.
5	Output status	Displays the present output status. The power supply always has one of the following status visible: <ul style="list-style-type: none"> • OFF: The output is turned off. • CC: The output is turned on and the power supply is in constant current (CC) mode. • CV: The output is turned on and the power supply is in constant voltage (CV) mode. • : the power supply is in the output-on delay time or output-off delay time.



Note

When the main interface 1 is displayed, you can change the voltage set value and current set value by pressing the **[V-set]** and **[I-set]** keys on the front panel.

- **When the meter view is set to CP+CC/CV, the main interface 2 is displayed as follows:**




No.	Name	Description
1	V meter value	Displays the meter value of the voltage.
2	I meter value	Displays the meter value of the current.
3	P meter value	Displays the meter value of the power.

No.	Name	Description
4	I set value	Displays the setting value of the current.
5	Output status	Displays the present output status. The power supply always has one of the following status visible: <ul style="list-style-type: none"> • OFF: The output is turned off. • CC: The output is turned on and the power supply is in constant current (CC) mode. • CV: The output is turned on and the power supply is in constant voltage (CV) mode. • : the power supply is in the output-on delay time or output-off delay time.

- When the meter view is set to CP+CC/CV, the main interface 3 is displayed as follows:






No.	Name	Description
1	V meter value	Displays the meter value of the voltage.
2	I meter value	Displays the meter value of the current.
3	P meter value	Displays the meter value of the power.
4	V set value	Displays the setting value of the voltage.
5	Output status	Displays the present output status. The power supply always has one of the following status visible: <ul style="list-style-type: none"> • OFF: The output is turned off. • CC: The output is turned on and the power supply is in constant current (CC) mode. • CV: The output is turned on and the power supply is in constant voltage (CV) mode. • : the power supply is in the output-on delay time or output-off delay time.


Note

When in main interface 2, press the **[V-set]** key to switch to main interface 3, and press the **[I-set]** key again to switch back to main interface 2. When main interface 2 is displayed, the **[I-set]** key is illuminated and the **[V-set]** key is not illuminated; when main interface 3 is displayed, the **[V-set]** key is illuminated and the **[I-set]** key is not illuminated.

1.5 Prompt Information Reference

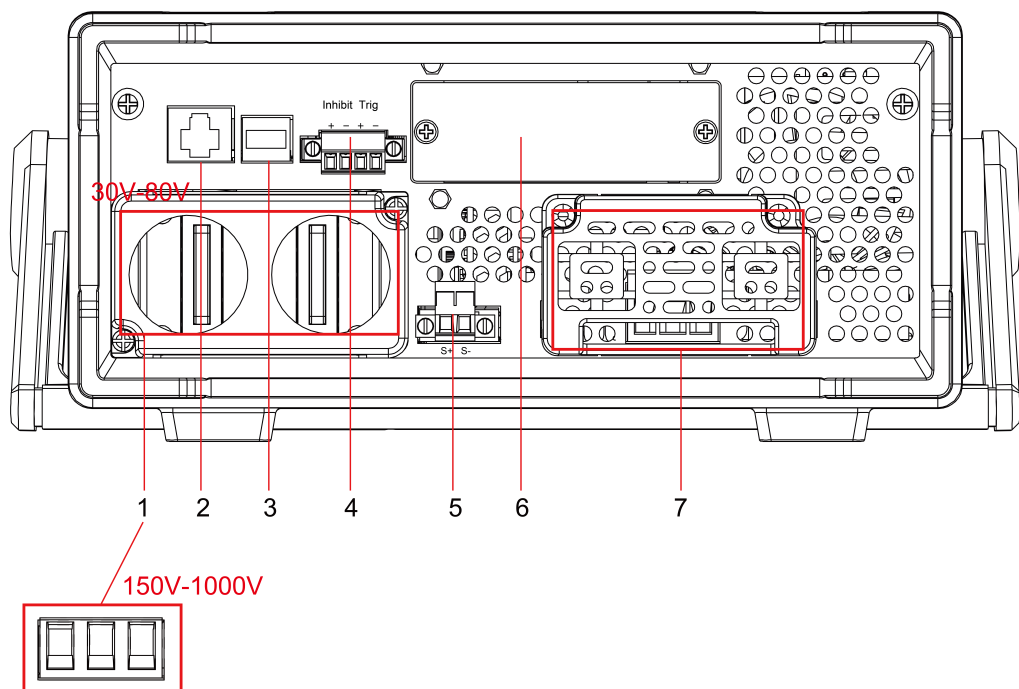
The instrument provides detailed prompt information to help the user learn the function well.

Prompt Information	Description
	Indicates output delay time
	Indicates the key is locked.
	Indicates the instrument is in remote control.
Ri	Indicates the output is self-locked.
System Selftest	Indicates the instrument is running the system selftest.
Over Current Protect	Indicates the instrument is under over-current protection.
Over Power Protect	Indicates the instrument is under over-power protection.
Over Voltage Protect	Indicates the instrument is under over-voltage protection.
Under Current Protect	Indicates the instrument is under under-current protection.
Under Voltage Protect	Indicates the instrument is under under-voltage protection.
Sense Protect	Indicates the instrument is under sense abnormal protection.
Over Temp Protect	Indicates the instrument is under over-temperature protection.
Watch Dog Protect	Indicates the instrument is under software watchdog protection.

Prompt Information	Description
Undefine Prot	Indicates the undefined protection happens.
The Key Is Locked!	Indicates the key is locked.
Save Successful	Indicates the save operation is successful.
Save Failed	Indicates the save operation fails.
File is empty!	Indicates the recalled file is empty.
Waiting for Trigger	Indicates the list program is waiting for trigger.
Input Cal Code To Start:	Indicates the user needs to input the calibration code
Cal Is Initing...	Indicates the calibration operation is initializing.
Calibration Finished!	Indicates the calibration operation is finished.

1.6 Rear-Panel Overview

The detailed descriptions of the IT-M3140 series power supplies are shown as below.



No.	Name	Description
1	DC output terminals	Used to connect DUT. <ul style="list-style-type: none"> • Pluggable terminals for 150V to 1000V models. • Electrode terminals for 30V to 80V models.
2	LAN communication interface	–
3	USB communication interface	–
4	<ul style="list-style-type: none"> • Output lock terminals (Inhibit±) • Trigger signal terminals (TRIG±) 	The descriptions of each terminals are as follows. <ul style="list-style-type: none"> • Output lock terminals, short Inhibit+ and Inhibit– terminals to disable the output function of the power supply. • Trigger signal terminals, when set to In, the terminals can receive high level pulse signal as a trigger source; when set to Out, if the trigger happens, the terminals can generate high level pulse signal.
5	Remote sense terminals (Sense±)	Remote sense terminals, used for maximizing measurement accuracy.
6	Optional expansion slot	Optional interfaces: <ul style="list-style-type: none"> • IT-E176: GPIB interface • IT-E177: External analog interface and RS232
7	AC power input socket	Used to connect AC power to start instrument, supports 99~264V AC input.

1.7 Front Panel Menu Reference

This section lists the maps of all front panel menu, including Config menu, System menu, Protect menu and Function menu. For a brief tutorial, refer to [3.4 Use the Front Panel Menu](#).

1.7.1 Configuration Menu Reference

Press **[Shift]+[V-set]** (Config) to enter into the configuration menu interface.

Config	Configuration menu		
	P-Set	Setting the power.	
	Mode	Set the output priority mode	
		CV Priority	Voltage priority mode

		CC Priority	Current priority mode
V-Rise Time	Voltage rising time Setting range: 0.025 to 10S.		When select CV priority, the menu shows the two items.
V-Fall Time	Voltage falling time Setting range: 0.025 to 10S.		
I-Rise Time	Current rising time Setting range: 0.025 to 10S.		When select CC priority, the menu shows the two items.
I-Fall Time	Current falling time Setting range: 0.025 to 10S.		
Output Res	Set the internal resistance.		
Timer	Set the output timer function.		
	Off		Turn the output timer off.
	On		Turn the output timer on.
		Time	Set the output time.
On Delay	Set the output-on delay time.		
Off Delay	Set the output-off delay time.		
Ext-Program	External Analog Function. This function is optional. The menu can only display when corresponding board card is inserted. For details, see 4.5 Analogue Function (Ext-Program) (Optional) .		

1.7.2 System Menu Reference

Press **[Shift]+[Save]** (System) to enter into the configuration menu interface.

System	System Menu		
	Beep	Set the key beeper state.	
		Off	Turn the key beeper off.
		On	Turn the key beeper on.
	PowerOn	Select the power-on state.	
		Reset	When the power supply is powered on, the power supply will initialize some settings and output state.
		Last	When the power supply is powered on, the power supply will remain the same settings and output state as last time you turned off the power supply.

		Last+Off	When the power supply is powered on, the power supply will remain the same settings as last time you turned off the power supply, but the output state is OFF state.	
	Sense	Set the sense function state.		
		Off	Turn the sense function off.	
		On	Turn the sense function on.	
	Comm	Set the communication information between instrument and PC.		
		USB	Universal serial bus (USB) communication interface.	
		LAN	LAN communication interface.	
			Lan Info	View the LAN information.
				<ul style="list-style-type: none"> • Status • IP Mode Status • IP Addr • Sub Net • Gateway • DNS1 (Primary address) • DNS2 (Secondary address) • MAC Addr • Host Name • Host Desc • Domain • TCPIP INSTR • Socket Port
			Lan Config	Configure LAN information.
			IP Mode	Set IP mode.
				Auto: automatically configure the address of the instrument.
				Manual: manually configure the address of the instrument by entering values in the following five fields. The following information only appear when Manual is selected. <ul style="list-style-type: none"> • IP Addr • Sub Net

					<ul style="list-style-type: none"> • Gateway • DNS1 (Primary address) • DNS2 (Secondary address) • Socket Port: 30000. Set the port number.
				Server Config	Display the LAN service information.
					Socket Port: Raw Socket port
			Lan Restore	Select whether to reset the LAN to the default settings or not.	
				<ul style="list-style-type: none"> • NO • YES 	
			Lan Save	Select whether to save the LAN setting or not.	
				<ul style="list-style-type: none"> • NO • YES 	
		RS232	When insert IT-E177 communication board into expansion slot, the menu displays this information.		
			RS232	RS232 communication interface.	
				Display as the following format: baud rate_data bit_parity bit_stop bit. <ul style="list-style-type: none"> • Select the baud rate from the following options: 4800, 9600, 19200, 38400, 57600, 115200 • The data bit, parity bit and stop bit are fixed: 8_None_1 	
		GPIB	When insert IT-E176 communication board into expansion slot, the menu displays this information.		
			General purpose interface bus (GPIB) communication interface. Set the communication address within the range from 0 to 30.		
	Trig	Set the rear panel interface TRIG± receiving and transmitting status, and control the trigger input/output signal of the instrument			
		Out	When the trigger source is set to Keypad or Bus and the trigger happens, the TRIG± interface generates a high pulse trigger signal.		
		In	When the trigger source is set to Ext , inputting a high pulse trigger signal through TRIG± interface can trigger the instrument		

	Trig Source	Set the trigger source	
		Keypad	Keypad trigger, [Shift]+[Esc] (Trigger)
		Bus	Remote interface trigger command, like *TRG
	Ext	External trigger, when the TRIG± interface state is set to IN and receive a high pulse signal, the instrument generates trigger.	
	Bleeder	Set the Bleeder circuit state (When DUT is the battery, the user need to turn the Bleeder circuit off)	
		On	Turn the Bleeder circuit on.
		Off	Turn the Bleeder circuit off.
	Inhibit Port	Set the inhibit output mode of external Inhibit IO.	
		Off	Disables the Inhibit Port function.
		Living	Living mode. When the external Inhibit± control terminals input is in the False state, the output is controlled by the [On/Off] key on the front panel; when the external Inhibit± control terminals input is in the True state, the output is turned off, and the output [On/Off] key is invalid at this time .
		Nomal	When Inhibit+ and Inhibit- are short-circuited, the Inhibit± control port input is in the True state, and if it is not short-circuited, it is in the False state.
			Inverted
		Latch	Latch mode. When the external Inhibit± control terminals detects the level change from False to True, the power output will be turned off. To release the latched state, you must first set the external Inhibit± control port to the False state, and send a command (OUTPut:PROTection:CLear) to clear the corresponding INH status bit.
		Nomal	When Inhibit+ and Inhibit- are short-circuited, the Inhibit± control port input is in the True state, and if it is not short-circuited, it is in the False state.
			Inverted
	Me-ter View	Switch the display parameters of the main interface.	
		CC+CV	The first row of the main interface displays the measured voltage value and current value, while the second row displays the voltage set value and current set value.
		CP+CC/ CV	The first row of the main interface displays the measured voltage value and current value, while the second row displays the

			measured power value and the set value of current (or voltage).
	System Reset	Select whether to restore the factory default settings or not.	
		NO	Don't restore the factory default settings.
		YES	Restore the factory default settings.
	System Info	View the system information.	
		Model	Display the instrument model.
		Ver	Display the control board version.
		CommVer	Display the communication board version.
		SN	Display the serial number.
		Last Cal	Display last calibration date.
		Run Time	Display the instrument running time.

1.7.3 Protect Function Menu Reference

Press **[Shift]+[Recall]** (Protect) to enter into the configuration menu interface.

Protect	Protection function menu		
	U-Max	The maximum output voltage setting value.	
	U-Min	The minimum output voltage setting value.	
	OVP	Over-voltage protection.	
		Off	Turn the OVP function off.
		On	Turn the OVP function on.
			Level Over-voltage limit.
			Delay Delay time.
	OCP	Over-current protection.	
		Off	Turn the OCP function off.
		On	Turn the OCP function off.
			Level Over-current limit.
			Delay Delay time.
	OPP	Over-power protection.	
		Off	Turn the OPP function off.
		On	Turn the OPP function on.

		Level	Over-power limit.
		Delay	Delay time.
UVP	Under-voltage protection.		
	Off	Turn the UVP function off.	
	On	Turn the UVP function on.	
		Level	Under-voltage limit.
		Delay	Delay time.
		Warm up	Warm-up time.
UCP	Under-current protection.		
	Off	Turn the UCP function off.	
	On	Turn the UCP function on.	
		Level	Under-current limit.
		Delay	Delay time.
		Warm up	Warm-up time.
FOLDBACK	Set up foldback function		
	Off	Turn off the FOLDBACK function	
	CC	Foldback protection is triggered when the power loop is switched to CC. Delay: delay time	
	CV	Foldback protection is triggered when the power loop is switched to CV. Delay: delay time	

1.7.4 Advanced Function Menu Reference

Press **[Shift]+[I-set]** (Function) to enter into the function menu interface.

The main functions of function menu are listed in the table below. Please refer to the corresponding sections for the detailed information about each function.

Function	Function menu	
	List	4.4 List Function

1.8 Models and Options

IT-M3140 series models

Model	Voltage (V)	Current (A)	Power (W)
IT-M3141	30V	150A	3kW
IT-M3131E	30V	150A	1850W
IT-M3142	80V	80A	3kW
IT-M3132E	80V	80A	1850W
IT-M3143	150V	40A	3kW
IT-M3133E	150V	40A	1850W
IT-M3144	300V	20A	3kW
IT-M3134E	300V	20A	1850W
IT-M3145	600V	10A	3kW
IT-M3135E	600V	10A	1850W
IT-M3146	1000V	6A	3kW
IT-M3136E	1000V	6A	1850W
IT-M3147	1200V	5A	3kW
IT-M3137E	1200V	5A	1850W

Options

This series instrument supports the following types of optional accessories (sold separately), the details are as below:

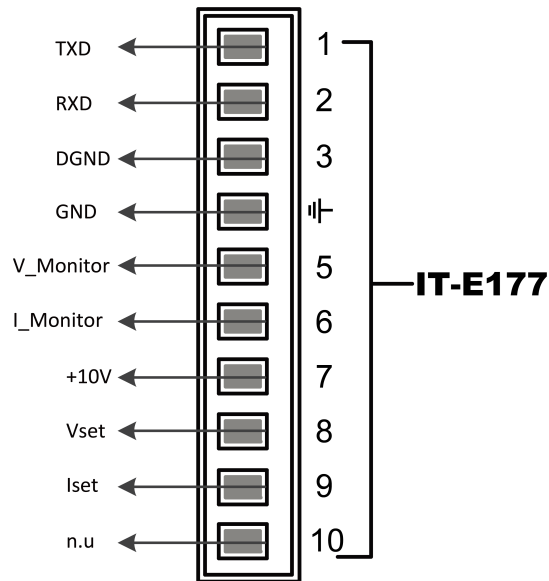
- **Optional interface card**

- IT-E176: Interface card for GPIB communication. When users need to use GPIB communication, they can choose to purchase this accessory.

For details, see [2.6.3 GPIB Interface](#).

- IT-E177: Interface card that includes RS232 communication interface, external analog and other functions.

The accessory has a total of 10 pins, and the details of each pin are as follows:



Pins	Description
1	RS232 TXD pin for transmitting data.
2	RS232 RXD pin for receiving data.
3	RS232 DGND pin for grounding.
4	Ground terminal, that is, the negative terminal of pin 5 to pin 10.
5	Voltage monitoring terminal. It can output a voltage of 0 to 10V to monitor the output voltage from 0 to full scale.
6	Current monitoring terminal. It can output a voltage of 0 to 10V to monitor the output current from 0 to full scale output current.
7	Reference voltage (10V) test terminal. The accuracy is 0.03%. You can use a multimeter to measure this pin. When the output voltage of the pin is in the range of $10 \pm 0.03\% \times 10$, it indicates that the accessory is functioning normally. Otherwise, the function is abnormal and cannot be used.
8 / 9	Terminals for external analog function. For details, see 4.5 Analogue Function (Ext-Program) (Optional) .
10	not used

- **Optional mounting kit**

IT-M3140 series can be installed on standard 19-inch brackets. ITECH has prepared the IT-E158 bracket as a mounting kit for users.

2 Inspection and Installation

- ◆ Verifying the Shipment
- ◆ Instrument Size Introduction
- ◆ Rack Mounting
- ◆ Connecting the Power Cord
- ◆ Connecting the Device Under Test (DUT)
- ◆ Connect the Communication Interface

2.1 Verifying the Shipment

Unpack the box and check the contents before operating the instrument. If wrong items have been delivered, if items are missing, or if there is a defect with the appearance of the items, contact the dealer from which you purchased the instrument immediately.

The package contents include:

Item	Qty.	Model	Remarks
Programmable DC Power Supply	x1	IT-M3140 series	Please refer to 1.8 Models and Options for the detailed models.
Power Cord	x1	-	User may select an appropriate power cord that matches the specifications of power socket used in the area. See the Section 2.4 Connecting the Power Cord for details.
USB communication cable	x1	-	This accessory is selected when the USB interface is used for starting up remote operation.
Ex-Factory Test Report	x1	-	It is the test report of the instrument before delivery.
Communication card (optional)	X	IT-E176/ ITE177	IT-E176 (GPIB communication card) and IT-E177 (Analog/RS232 communication card) are nonstandard accessories. The actual delivery quantity is subject to the user's order.


Note

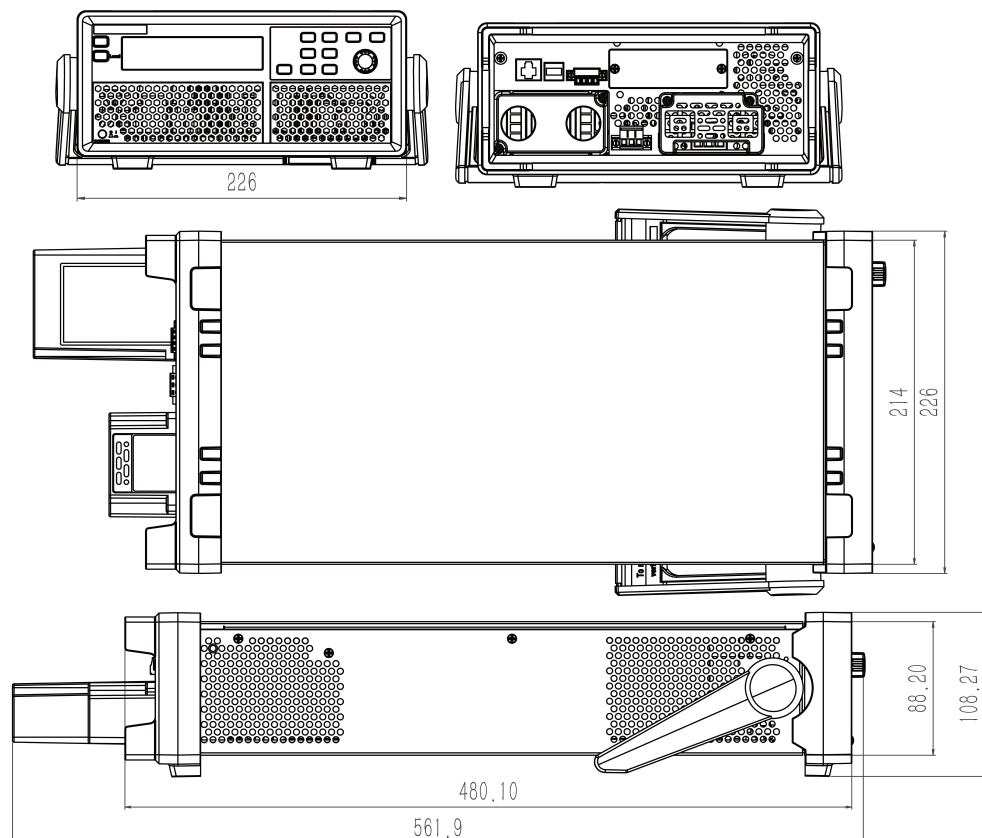
Upon verification of the shipment, keep the package and relevant contents thereof in a safe place. When returning the instrument for warranty service or repair, the specified packing requirements shall be met.

2.2 Instrument Size Introduction

The instrument should be installed at well-ventilated and rational-sized space. Please select appropriate space for installation based on the power supply size.

IT-M3140 series all models are the same dimension as below(unit: mm):

IT-M3140 series



2.3 Rack Mounting

This instrument can be installed on standard 19-inch rack. ITECH has prepared the IT-E158 bracket as a mounting kit for users. Users can select the

corresponding bracket manual for installation according to the specific bracket model purchased.

2.4 Connecting the Power Cord

Precautions

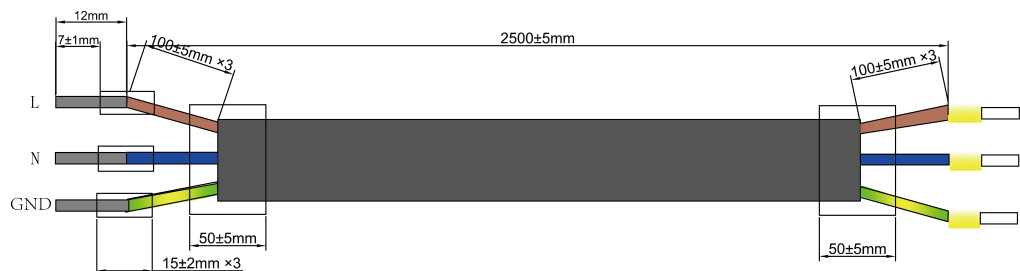
To prevent electric shock and damage to the instrument, observe the following precautions.

WARNING

- The power cords supplied with this product is certified for safety. In case the supplied lines assembly needs to be replaced, or an extension lines must be added, be sure that it can meet the required power ratings of this product. Any misuse voids the warranty of this product.
- Before connecting power cord, be sure to confirm that the power voltage matches with the supply voltage. Make sure that the position of the voltage switch on the left side of the instrument is consistent with the actual power supply voltage.
- Before connecting power cord, be sure to switch off the instrument. Power switch is in Off position.
- To avoid fire or electric shock, make sure to use the power cord supplied by ITECH.
- Do not use an extended power cord without protective grounding, otherwise the protection function will fail.
- Be sure to connect the main power socket to the power outlet with protective grounding. Do not use terminal board without protective grounding.

Categories of Power Cords

IT-M3140 series power supply provides the standard power cords as below.



AC Power Input Level

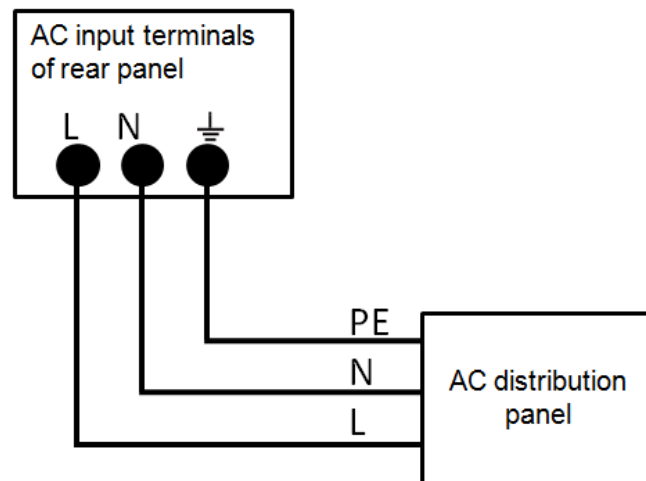
IT-M3140 power supplies operate at the following AC power input.

- Voltage 1: 99V to 176V (derating to 1500W), frequency: 50Hz/60Hz
- Voltage 2: 176V to 264V(rated power output), frequency: 50Hz/60Hz

Connecting the Power Cord

Connecting Method:

1. See the below illustration, one end of the AC power cord is connected to the AC input terminal in the rear board of the power supply. Connect the fire wire, zero line and ground to the corresponding terminal of the device.
2. Connect the three terminals brown to line (L), blue to neutral (N), and yellow-green to ground (PE) on the other end of the power cord to your AC distribution panel.



2.5 Connecting the Device Under Test (DUT)

The instrument supports two connection methods between power supply and DUT: Local measurement and Remote sensing. This series power supplies include built-in circuit that connect or disconnect the \pm sense terminals from their corresponding \pm output terminals. As shipped, the sense terminals are internally connected to the output terminals. This is referred to as Local measurement. If you need to use remote sensing, after making the connection, be sure to turn the sense function on. Please refer to [4.2.3 Set the Sense Function State](#) for the detailed operations.

Precautions

To prevent electric shock and damage to the instrument, observe the following precautions.

WARNING

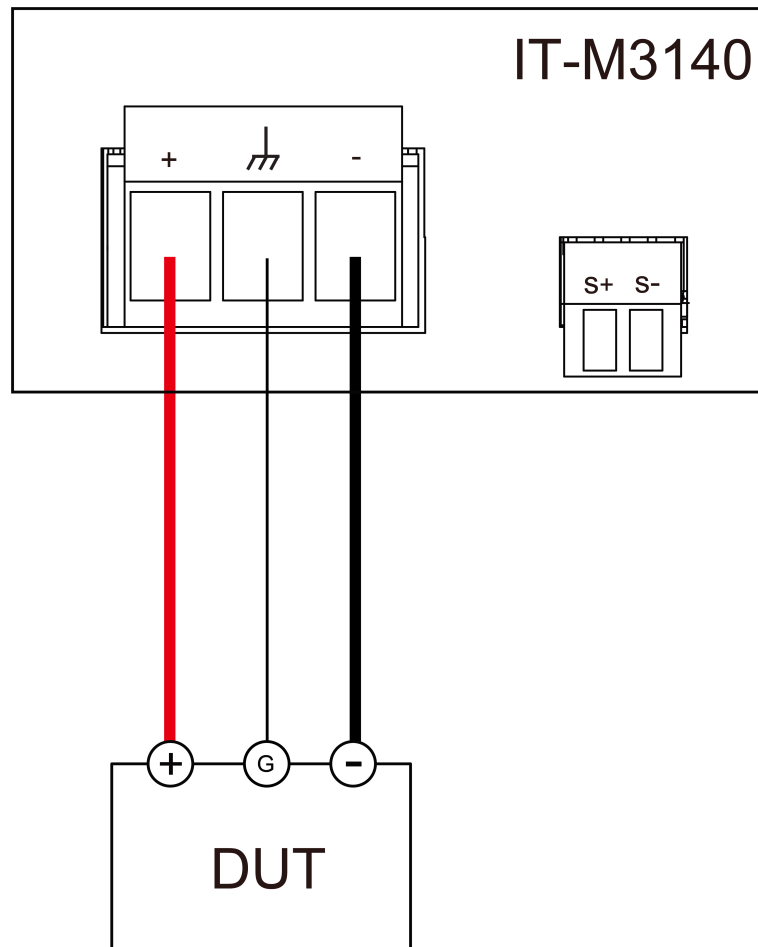
- Before connecting test cables, be sure to switch off the power supply. Power switch is in Off position, otherwise touching the output terminals on the rear panel may result in personal injury or death due to electric shock.
 - To avoid electrical shock, before testing, please make sure the rating values of the testing cables, and do not measure the current that higher than the rating value. All test cables shall be capable of withstanding the maximum short circuit output current of the power supply without causing overheat.
 - If several loads are provided, each pair of load wires shall safely withstand the rated short circuit output current of the power supply under full load.
 - To avoid battery short circuit, be sure to check that the test line end is not connected when connecting or disassembling the test line. When the test line end is connected with battery, short circuit may cause severe accident.
 - Please check that the test cables can withstand maximum current
 - During wiring, check that the anode and cathode of the test lines are properly and tightly connected; anode ON and cathode OFF are prohibited.
 - If you need to pull out the green output terminal, please lift it up and pull it out, otherwise it will damage the instrument.
-

Specification

Test cables are not standard accessories for the instrument. Please select optional red and black test cables for individual sales based on the maximum current value. For specifications of test cables and maximum current values, refer to [A.1 Appendix→Specifications of Red and Black Test Lines](#) for more information.

Local Measurement

The connection diagram and steps of local sensing are as follows.



1. Remove the output terminal cover.
2. Loosen the screws of the output terminals and connect the red and black test cables to the output terminals, and connect the ground terminal correctly. Re-tighten the screws.

When maximum current that one test cable can withstand fails to meet the current rated current, use multiple pieces of red and black test cables. For example, the maximum current is 1,200 A, then 4 pieces of 360 A red and black cables are required.

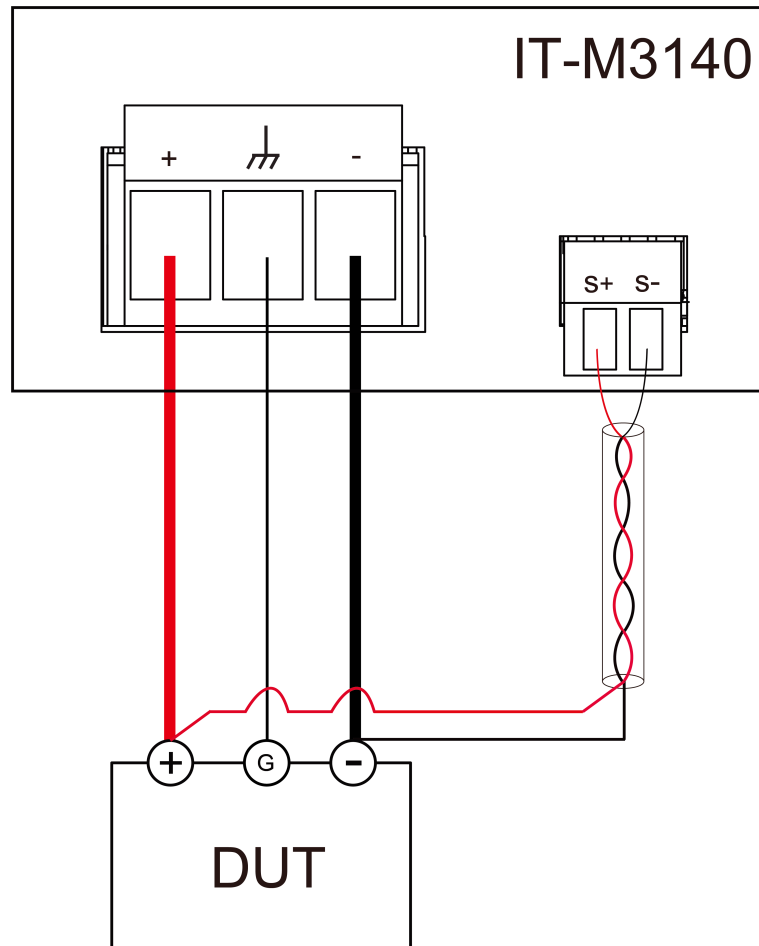
3. Thread the test cables through the output terminals cover and install the cover.
4. Connect the other end of the red and black cables to the DUT. The positive and negative poles must be properly connected and fastened when wiring.

Remote Sensing

When the DUT consumes large current or the wires are too long, there is a voltage drop on the wires between the DUT and output terminal of the power supply. To maximize measurement accuracy, you can use remote sense wire connections to monitor and improve the voltage adjustment on the DUT and compensate for the voltage drop on the wires .

When the power supply is used for measuring battery charge in actual applications, the voltage drop of the wire will lead to voltage inconsistency of both ends and inconsistency of the cutoff voltage of power supply and the actual voltage of battery, resulting in inaccurate measurement.

The connection diagram and steps of remote sensing are as follows.



Note

To ensure the stability of the system, use armored twisted-pair cables between the remote sense terminals and the equipment under test.

1. Remove the output terminal cover.
2. Loosen the screws of the output terminals and connect the red and black test cables to the output terminals, and connect the ground terminal correctly. Re-tighten the screws.

When maximum current that one test cable can withstand fails to meet the current rated current, use multiple pieces of red and black test cables. For example, the maximum current is 1,200 A, then 4 pieces of 360 A red and black cables are required.

3. Refer to the wiring diagram, and use armored twisted-pair cables to connect the remote sense terminals and the equipment under test.

4. Thread the red and black test cables and sense cables through the output terminals cover and install the cover.
5. Connect the other end of the remote sense cables and the red and black cables to the DUT. The positive and negative poles must be properly connected and fastened when wiring.
6. Power on the instrument and turn the sense function on. Please refer to [4.2.3 Set the Sense Function State](#) for the detailed operations.

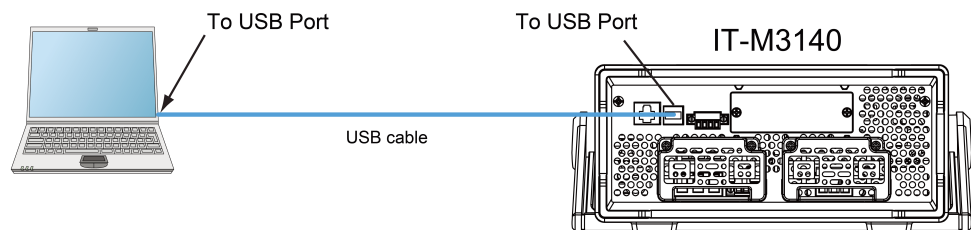
2.6 Connect the Communication Interface

This series power supply comes standard with two communication interfaces: USB and LAN, and supports two optional communication interfaces: GPIB, RS232. You can choose one of them to communicate with your computer. For details, see [1.8 Models and Options](#).

The reserved communication card installation slot is on the rear panel of the instrument. Users can install it directly after purchasing the communication card.

2.6.1 USB Interface

The USB interface is located on the rear panel of the instrument, the following can help users quickly understand the steps required to connect the USB interface. The figure below shows a typical USB interface system.



Note

- The rear panel shown in the figure is only an example. The actual appearance of the rear panel is subject to the specific instrument.

The operation steps to use the USB interface are as follows.

1. Refer to the USB connection diagram, Connect the power supply and the computer using a cable with two USB interfaces (each end).
2. Select the USB interface type in the system menu.
 - a. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
 - b. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.

- c. Use left and right keys or rotate the knob to select **USB** and press **[Enter]** key to confirm. The USB communication supports the following two interface types and no need to select manually.
 - **TMC**: USB_TMC interface.
 - **VCP**: virtual serial port. For Win7 system, you can download IT-M3140 VCP driver from ITECH official website or contact technical support engineer; for Win10 system, you do not need to install VCP driver.
- d. After finishing the setting, press **[Esc]** to exit.

2.6.2 LAN Interface

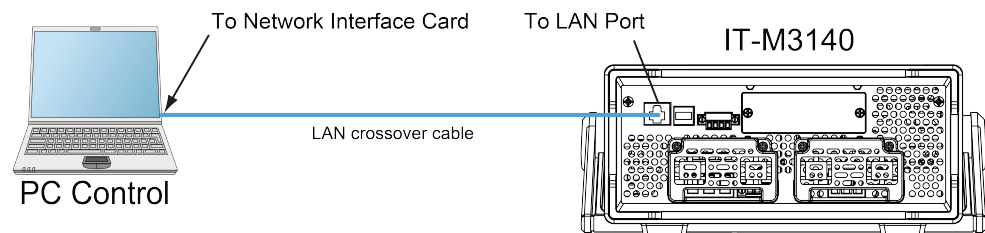
When the user connect PC through LAN interface, the following is required to use the LAN interface. The LAN interface complies with the LXI standard.

LAN Connection

Use the following steps to quickly connect your instrument to your LAN and configure it. Two typical LAN interface systems are described below: private LAN and site LAN.

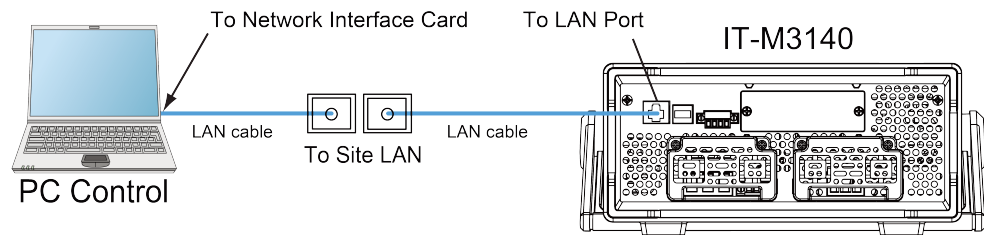
- **Connect to the private LAN**

A private LAN is a network in which LAN-enabled instruments and computers are directly connected. They are typically small, with no centrally managed resources. When connected to a computer, a crossover cable can be used to connect directly to the computer via the LAN interface.



- **Connect to the site LAN**

A site LAN is a local area network in which LAN-enabled instruments and computers are connected to the network through routers, hubs, and/or switches. They are typically large, centrally-managed networks with services such as DHCP and DNS servers. When connected to a computer, a direct attached network cable can be used to connect to the router, and the computer is also connected to the router.

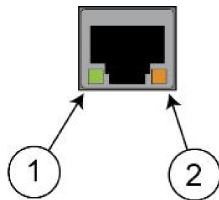


Note

- When using one crossover cable to connect PC directly, the gateway address should be consistent with that of the PC, and the IP address should be at the same network segment with the PC's IP address.
- When the instrument and computer are connected to the router, an independent IP address must be assigned for the instrument.

LAN Status Indicator

The lower icon notes the two status LEDs located at the bottom of the LAN port.



If neither of the LEDs is lit, the network is not connected.

- Position 1: when lit, it indicates that the LAN port is connected.
- Position 2: When flashing, it indicates that the LAN port is receiving or sending a message.

Configure LAN Interface Information

When shipped, DHCP is on, which may enable communication over LAN. The letters DHCP stands for Dynamic Host Configuration Protocol, a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. The user can view the related information of LAN interface or configure the communication parameters in system menu.

- Automatically configure the address of the instrument.(Auto)

When selected, the instrument will first try to obtain an IP address from a DHCP server. If a DHCP server is found, the DHCP server will assign an IP address, Subnet Mask, and Default Gateway to the instrument. If a DHCP server is unavailable, the instrument will try to obtain an IP address using AutoIP. AutoIP automatically assigns an IP address, Subnet Mask, and Default Gateway addresses on networks that do not have a DHCP server.

- Manually configure the address of the instrument.(Manual)

Set the following parameter. The following information only appear when Manual is selected.

- IP Addr: This value is the Internet Protocol (IP) address of the instrument. An IP address is required for all IP and TCP/IP communications with the instrument. An IP Address consists of 4 decimal numbers separated by periods. Each decimal number ranges from 0 through 255 with no leading zeros (for example, 169.254.2.20).
- Sub Net: This value is used to enable the instrument to determine if a client IP address is on the same local subnet. The same numbering notation applies as for the IP Address. When a client IP address is on a different subnet, all packets must be sent to the Default Gateway.
- Gateway: This value is the IP Address of the default gateway that allows the instrument to communicate with systems that are not on the local subnet, as determined by the subnet mask setting. The same numbering notation applies as for the IP Address. A value of 0.0.0.0 indicates that no default gateway is defined.
- DNS1: This field enters the primary address of the server. Contact your LAN administrator for server details. The same numbering notation applies as for the IP Address. A value of 0.0.0.0 indicates that no default server is defined.

DNS is an internet service that translates domain names into IP addresses. It is also needed for the instrument to find and display its host-name assigned by the network. Normally, DHCP discovers the DNS address information; you only need to change this if DHCP is unused or not functional.

- DNS2: This field enters the secondary address of the server. Contact your LAN administrator for server details. The same numbering notation applies as for the IP Address. A value of 0.0.0.0 indicates that no default server is defined.

The operation steps to configure are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **LAN** and press **[Enter]** key to confirm.
4. Use left and right keys or rotate the knob to select **Lan Config** and press **[Enter]** key to confirm.

The first displayed menu item **IP Mode** is to configure the instrument address.

5. Press **[Enter]** key to confirm. This parameter is in modification.
 - Auto: automatically configure the addressing of the instrument;
 - Manual: manually configure the addressing of the instrument.
If Manual is selected, set the parameters such as IP Addr and Sub Net.
6. After setting, press **[Esc]** to exit.

Confirm the LAN Setting

After configuring the LAN settings, the user need to confirm the settings to make it valid in the instrument. The operation steps to confirm the LAN settings are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **LAN** and press **[Enter]** key to confirm.
4. Use left and right keys or rotate the knob to select **Lan Save** and press **[Enter]** key to confirm.
 - NO: indicates refuse to save the LAN setting.
 - YES: indicates save the LAN setting.
5. After setting, press **[Esc]** to exit.

Reset the LAN to the Default Settings

The operation steps to reset the LAN to the default settings are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **LAN** and press **[Enter]** key to confirm.
4. Use left and right keys or rotate the knob to select **Lan Restore** and press **[Enter]** key to confirm.
 - NO: indicates refuse to reset the LAN to the default settings.
 - YES: indicates reset the LAN to the default settings.
5. After setting, press **[Esc]** to exit.

View LAN Interface Information

The operation steps to view the LAN interface information are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.

3. Use left and right keys or rotate the knob to select **LAN** and press **[Enter]** key to confirm.

The first displayed menu item **Lan Info** is to view the LAN interface information.

4. Press **[Enter]** key to confirm.
5. Use left and right keys or rotate the knob to view the LAN interface information. Refer to [System Menu](#) for more information.
6. After setting, press **[Esc]** to exit.

Enable LAN Service

The configurable services include: mDNS, Ping, Web, VXI-11 and Raw Socket. When using the LAN interface, these services are enabled by default and can be used directly. When using the Raw Socket function, you need to set the Socket Port number, please refer to the following steps:

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **LAN** and press **[Enter]** key to confirm.
4. Use left and right keys or rotate the knob to select **Lan Config** and press **[Enter]** key to confirm.
5. Use left and right keys or rotate the knob to select **Server Config** and press **[Enter]** key to confirm.
6. Select the Socket Port and press **[Enter]** key to confirm.
7. Rotate the knob to adjust the parameter and press **[Enter]** key to confirm.
8. After setting, press **[Esc]** to exit.

2.6.2.1 Web Interface

The instrument has a built-in Web interface for monitoring and controlling the instrument via a Web browser. To use the Web interface, connect the instrument and PC over LAN and enter the instrument's IP address into the address bar at the top of your PC's Web browser, you can access the front panel control functions including the LAN configuration parameters.



Note

The instrument supports simultaneous connection to up to 6 computers. If there are more connections, the instrument performance will be reduced.

Press the Enter key, the Web interface will appear in the browser as shown below. The following figure is just as an example and the Web interface of different models are different. The actual shown page shall be subject to the connected instrument.



You can select different interfaces by clicking the three buttons shown in the navigation bar on the left side of the window. The detailed descriptions are as follows.

- Web Control: enables the Web control to begin controlling the instrument. This page allows you to monitor and control the instrument;
- Information: displays the serial number of the instrument and more system information as well as LAN configuration parameters;
- Manual: go to the ITECH official website and view or download the relevant documents;

2.6.2.2 Using Sockets

CAUTION

The instruments allow up to six simultaneous socket connections to be made.

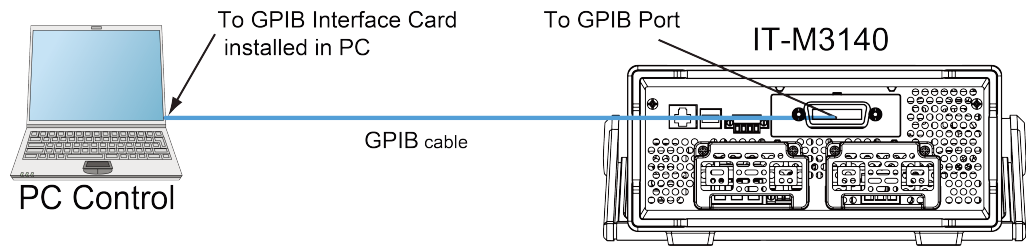
ITECH instruments have SCPI socket services, which can be used to send and receive SCPI commands, queries, and query responses. All commands must be terminated with a newline for the message to be parsed. All query responses will also be terminated with a newline.

2.6.3 GPIB Interface

When the optional interface card is a GPIB interface (IT-E176), you need to know the following.

Each device on the GPIB (IEEE-488) interface must have a unique whole number address between 0 and 30. Your computer's GPIB interface card address

must not conflict with any instrument on the interface bus. This setting is non-volatile; it will not be changed by power cycling or *RST. The figure below shows a typical GPIB interface system.



Note

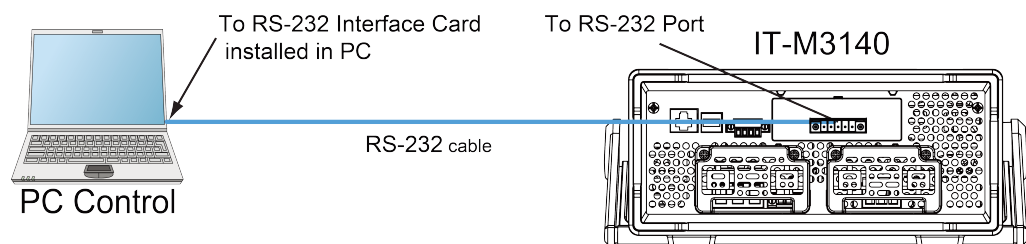
The rear panel shown in the figure is only an example. The actual appearance of the rear panel is subject to the specific instrument.

You can change the GPIB address in the system menu. The operation steps are as follows.

1. Refer to the GPIB connection diagram, Connect the power supply and the computer using a IEEE-488 bus.
2. Set the GPIB address in the system menu.
 - a. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
 - b. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.
 - c. Use left and right keys or rotate the knob to select **GPIB** and press **[Enter]** key to confirm.
 - d. Rotate the knob to adjust the GPIB address and press **[Enter]** key to confirm.
 - e. After finishing the setting, press **[Esc]** to exit.

2.6.4 RS232 Interface

When the optional interface card is RS232 interface (IT-E177), the following can help users quickly understand the steps required to connect the RS232 interface. The figure below shows a typical RS232 interface system that connects to your computer using an RS232 cable.

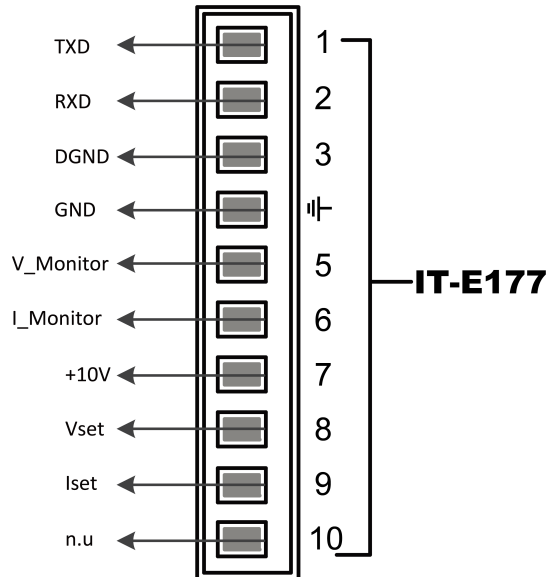



Note

The rear panel shown in the figure is only an example. The actual appearance of the rear panel is subject to the specific instrument.

Definition of RS232 Pins

The definition of RS232 pins are as follows.



When using the RS232 interface for communication, connect the pin 1, pin 2, and pin 3 of the IT-E177 to the PC. The pin description is as follows:

Pins	Description
1	TXD, transmit data
2	RXD, receive data
3	DGND, ground

RS232 Configuration

The user needs to configure the RS232 interface parameters in the system menu before using the remote control. The RS232 interface parameters are as follows.

Name	Description
Baud rate	Select the baud rate from the following options: 4800, 9600, 19200, 38400, 57600, 115200
Data Bit	8 (fixed)

Name	Description
parity bit	None (fixed)
stop bit	1 (fixed)

The operation steps are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **RS232** and press **[Enter]** key to confirm.

RS232

9600_8_None_1

4. Rotate the knob to set the baud rate.
5. After finishing the setting, press **[Esc]** to exit.

RS232 Troubleshooting

If you meet some problems when communicating with PC by RS232 interface, please check the following items:

- PC and power supply must have the same baud rate.
- Ensure you have used the correct communication cable. Please pay attention that some cable may not have a correct internal wiring even it is with an appropriate interface.
- The cable must be connected to the correct serial ports (COM1, COM2, etc) of PC.

3 Getting Started

- ◆ Power-on the Instrument
- ◆ Set the Output Voltage
- ◆ Set the Output Current
- ◆ Use the Front Panel Menu
- ◆ Output On/Off Control

3.1 Power-on the Instrument

When you turn the POWER switch on for the first time after purchase, the instrument starts with its factory default settings. Each time thereafter, the instrument starts according to the setting that you selected as outlined in [4.2.2 Set the Power-on State](#).

Precautions

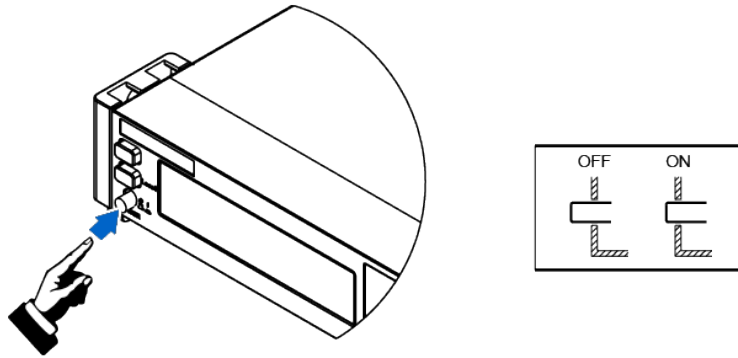
Before operation, please confirm that you have fully understood the safety instructions.

WARNING

- **Before connecting power cord, be sure to confirm that the power voltage matches with the supply voltage.**
- **Ensure that the input electrodes are either insulated or covered using the safety covers provided, so that no accidental contact with lethal voltages can occur.**
- **If you notice strange sounds, unusual odors, fire, or smoke around or from inside the instrument, flip the POWER switch to the (O) side to turn the instrument off, or remove the power cord plug from the outlet. The detachable power cord may be used as an emergency disconnecting device. Removing the power cord will disconnect AC input power to the unit.**

Power Switch Introduction

The power switch is located in the lower left corner of the front panel. The power switch is a button, and pressing once indicates ON and pressing again indicates OFF.



Turning the POWER Switch On

Check that the power cord is connected properly.

Flip the POWER switch to the (|) side to turn the instrument on. The front panel display will light up after a few seconds. It may take about 30 seconds or so for the power supply to initialize before it is ready for use.

If a self-test error occurs, an error message will be displayed in the front panel. Press the **[Esc]** button to try to clear the current fault status. The user can also restart the instrument to try to clear the fault status. Wait until the power is turned off and then start again. If the problem still cannot be solved after restarting, please contact the ITECH engineer. Common error messages are shown in the following table:

Error Messages	Description
Cal User Data Lose	User calibration information is lost.
Cal Factory Data Lose	Factory calibration information is lost.
ERROR SYSTEM DATA OVER	Illegal system data.
ERROR SYSTEM	System data setting failed.
ERROR SOURCE DATA OVER	Illegal source data.
ERROR CONFIG DATA OVER	Illegal config data.
ERROR SOURCE	Source data setting failed.
ERROR CONFIG	Config data setting failed.



Note

The instrument takes approximately 30 seconds to initialize before it is ready for use.

Turning the POWER Switch Off

Flip the POWER switch to the (O) side to turn the instrument off. When it is turned off, the instrument interface will prompt “Power Down”, and the instrument will store the setting information before shutdown in the group 1 non-volatile memory.

After you turn the POWER switch off, wait at least 10 seconds after the fan stops before you turn the POWER switch back on. Turning the instrument on too soon after you turn it off can cause damage to the inrush current limiter circuit, as well as reduce the life of components such as the POWER switch and the internal input fuses.

3.2 Set the Output Voltage

The setting range of voltage setting value is between 0V and full-scale rated output voltage, which is limited by U-Max and U-Min, i.e., the Vset setting value should not be higher than U-Max and not lower than U-Min. Please refer to [4.3.1 Set the Setting Value Limit Protection](#) for the setting of U-Max and U-Min. The output voltage can be set on the front panel according to the two methods below.

Continues input mode

When Meter View is set to CC+CV:

1. Press **[V-set]** key to position the cursor to the voltage setting value. Meanwhile, the **[V-set]** key will light up.

```

0.00V      0.000A
4.00V     9.700A
    
```

2. Rotate the knob clockwise to increase the voltage setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

When Meter View is set to CP+CC/CV:

1. Press **[V-set]** key to position the cursor to the voltage setting value. Meanwhile, the **[V-set]** key will light up.

```

0.00V      0.000A
0.0W      1.94V
    
```


2. Rotate the knob clockwise to increase the voltage setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

Step input mode

When Meter View is set to CC+CV:

1. Press **[V-set]** key to position the cursor to the voltage setting value. Meanwhile, the **[V-set]** key will light up.

```
0.00V      0.000A
4.00V     9.700A
```

2. Press the **[V-set]** key again to enter the step input mode.

```
0.00V      0.000A
V-set =    4.94V
```

3. Rotate the knob clockwise to increase the voltage setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

4. Press **[Enter]** key to confirm the voltage setting value.

Press **[Esc]** key to exit the input mode.

When Meter View is set to CP+CC/CV:

1. Press **[V-set]** key to position the cursor to the voltage setting value. Meanwhile, the **[V-set]** key will light up.

```
0.00V      0.000A
0.0W       1.94V
```

2. Press the **[V-set]** key again to enter the step input mode(the Vset setting value flashes).

```
0.00V      0.000A
0.0W       1.94V
```

3. Rotate the knob clockwise to increase the voltage setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

4. Press **[Enter]** key to confirm the voltage setting value.

Press **[Esc]** key to exit the input mode.



Note

When in continuous input mode, rotating the knob changes the set value in real time. When in step input mode, after rotating the knob to change the set value, you need to press the **[Enter]** key to confirm.

3.3 Set the Output Current

The current setting range is from 0 A to the maximum rated output current. The output current can be set on the front panel according to the two methods below.

Continues input mode

When Meter View is set to CC+CV:

1. Press **[I-set]** key to position the cursor to the current setting value. Meanwhile, the **[I-set]** key will light up.

```
0.00V    0.000A
2.00V    2.700A
```

2. Rotate the knob clockwise to increase the current setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

When Meter View is set to CP+CC/CV:

1. Press **[I-set]** key to position the cursor to the current setting value. Meanwhile, the **[I-set]** key will light up.

```
0.00V    0.000A
0.0W     1.700A
```

2. Rotate the knob clockwise to increase the current setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

Step input mode

When Meter View is set to CC+CV:

1. Press **[I-set]** key to position the cursor to the current setting value. Meanwhile, the **[I-set]** key will light up.

```
0.00V      0.000A
2.00V      1.700A
```

2. Press the **[I-set]** key again to enter the step input mode.

```
0.00V      0.000A
I-set =    1.700A
```

3. Rotate the knob clockwise to increase the current setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

4. Press **[Enter]** key to confirm the current setting value.

Press **[Esc]** key to exit the input mode.

When Meter View is set to CP+CC/CV:

1. Press **[I-set]** key to position the cursor to the current setting value. Meanwhile, the **[I-set]** key will light up.

```
0.00V      0.000A
0.0W       1.700A
```

2. Press the **[I-set]** key again to enter the step input mode (the Iset setting value flashes).

```
0.00V      0.000A
0.0W       1.700A
```

3. Rotate the knob clockwise to increase the current setting value and anti-clockwise to decrease the value. Set the required value.

The knob can be used together with the left/right navigation keys. Press the left/right navigation keys to move the cursor to a digit. Rotate the knob to change the digit value.

4. Press **[Enter]** key to confirm the current setting value.

Press **[Esc]** key to exit the input mode.



Note

When in continuous input mode, rotating the knob changes the set value in real time. When in step input mode, after rotating the knob to change the set value, you need to press the **[Enter]** key to confirm.

3.4 Use the Front Panel Menu

The front panel command menu lets you access most of the instrument's functions. Briefly:

- Press the corresponding composite button to access the menu of the desired settings.
- Use the left and right arrow keys or knob to move through the menu. Each menu item is preceded by a number.
- Press **[Enter]** to change the current menu item to the state to be edited, or select a command and move to the next level in the menu. In addition, after changing the setting you need to press **[Enter]** to save.
- Press **[Esc]** to return to the previous menu. When performing any function key operation, press **[Esc]** key to exit the function operation state.

Please refer to [1.7 Front Panel Menu Reference](#) for the detailed map of the front panel menus.

3.5 Output On/Off Control

WARNING

- The [On/Off] key light is off and turning the output off does not place the instrument in a safe state. Hazardous voltages may be present on all output and guard terminals. Putting the equipment into an output-off state does not guarantee that the outputs are powered off if a hardware or software fault occurs. See the cautions about connecting the test lines before connecting test lines.
 - To prevent electrical shock that could cause injury or death, please ensure that the power supply and DUT have been connected well before you turn the output on.
 - If the power supply has no output after the output is turned on, please check the output lock interface Inhibit± status on the rear panel of the power supply. For details, please see [4.2.8 Output Inhibit Control](#).
 - The [On/Off] key is used to turn the output on or off under normal circumstances. Even if the instrument is in control by PC or the keyboard is locked, the [On/Off] is still valid.
-

Press the [On/Off] key on the front panel to turn the output on and the [On/Off] key light is lit. Press the [On/Off] key again to turn the output off and the [On/Off] key light goes out. When the power supply is in the output-off state, the VFD displays that the power supply state is OFF. When the power supply is in the output-on state, the VFD displays that the power supply state switches to CC or CV.

4 Functions and Features

This chapter describes in detail the functions and features of the instrument, including the following sections:

- ◆ Output Function
- ◆ System-Related Operations
- ◆ Protection Function
- ◆ List Function
- ◆ Analogue Function (Ext-Program) (Optional)

IT-M3140 series power supplies have the following three operating modes:

- Fixed mode: This is the default mode when the power supply is powered on. In fixed mode, the output parameters, protection function and such regular operations all can be set.
- List mode: Once enter the list function setting interface, the instrument automatically enters into the list mode. In list mode, the user can create a test program made of multiple steps. The setting parameters in list mode are only valid for list operation.

4.1 Output Function

WARNING

SHOCK HAZARD, LETHAL VOLTAGES Many models generate voltages greater than 600 VDC! Ensure that all instrument connections are either insulated or covered using the safety covers provided, so that no accidental contact with lethal voltages can occur.


4.1.1 Set the Output Priority Mode

- Voltage priority mode keeps the output voltage constant. In voltage priority mode, the output voltage should be set to the desired value. The output is controlled by a constant-voltage feedback loop, which maintains the output voltage at its programmed setting.
- Current priority mode keeps the output current constant. In current priority mode, the output current should be set to the desired value. The output is controlled by a constant-current feedback loop, which maintains the output current at its programmed setting.

The procedures to set the output priority mode are as follows.

1. Press **[Shift]+[V-set]**(Config) to enter into the configuration menu interface.
2. Use knob or left and right keys to select **Mode**, press **[Enter]** to confirm.
3. Select **CC Priority** or **CV Priority**, press **[Enter]** to enter into the setting interface.
 - Select **CV Priority**, the menu displays V-Rise Time and V-Fall Time.
 - Select **CC Priority**, the menu displays I-Rise Time and I-Fall Time.
4. Select the desired menu item, press **[Enter]** to confirm.
5. Use knob to adjust the values and press **[Enter]** to confirm.

4.1.2 Set the Output-On/Output-Off Delay Time

You can set the output-on/output-off delay time within the range from 0 seconds to 10 seconds. During the output delay time, the VFD displays  on the top right corner. Once the output-on delay timer expires, the VFD displays "CC" or "CV". Once the output-off delay timer expires, the VFD displays "OFF".

- On Delay is from the time that a command to turn on the output is received until the output actually turns on.
- Off Delay is from the time that a command to turn off the output is received until the output actually turns off.

The procedures to set the output delay time are as follows.

1. Press **[Shift]+[V-set]**(Config) to enter into the configuration menu interface.
2. Use knob or left and right keys to select **On Delay** or **Off Delay** and press **[Enter]** to confirm.
3. Use knob to adjust the output-on/output-off delay time and press **[Enter]** to confirm.

4.1.3 Set the Output Timer Function

You can set the output timer within the range from 1.0 seconds to 86400 seconds. Once the timer expires, the output is turned off.

During the timing output, if the front panel has no operation for more than 5 seconds, the display will show the current output time of the timer: 00:00:05 (hour: minute:second). Press any button (except **[Shift]** key, **[Local]** key) to exit the timing display page.

The procedures to set the output timer are as follows.

1. Press **[Shift]+[V-set]**(Config) to enter into the configuration menu interface.
2. Use knob or left and right keys to select **Timer** and press **[Enter]** to confirm.

3. Use knob or left and right keys to select **On** to turn the timer function on and press **[Enter]** to confirm.
4. Use knob to adjust the output **Time** and press **[Enter]** to confirm.

4.1.4 Set the Internal Resistance

This series instrument provides internal resistance setting. The procedures are shown as below.

1. Press the composite keys **[Shift]+[V-set]** (Config) on the front panel to enter the configuration menu.
2. Rotate the knob to select **Output Res** and press **[Enter]** to confirm.
3. Use knob to adjust the internal resistance value and press **[Enter]** to confirm.

4.2 System-Related Operations

Though not directly related to output programming, the following functions also control instrument operation.

4.2.1 Set the Key Beeper

The user can turn the instrument beeper sound on or off base on personal requirement. The beeper sound works in the following scenarios:

- A beeper sound produced when the front panel key is pressed.
- When an error is generated inside the instrument, such as when the instrument receives an unprocessed command in the remote state.

The procedures to set the key beeper are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.

The first displayed menu item **Beep** is to set the key beeper.

2. Press **[Enter]** key and the parameter is in modification.
3. Rotate the knob to adjust the value.
 - On: default value, indicates the beeper is on.
 - Off: indicates the beeper is off.
4. Press **[Enter]** key to confirm.

At this point, the beeper sound operation immediately becomes valid.

4.2.2 Set the Power-on State

This menu item is used to control the settings and output state when the power supply is powered on.

The detailed power-on parameters and output state are as follows.

- The voltage and current setting values displayed on the main screen.
- The output state of the power supply, i.e., the **[On/Off]** key state.

The procedures to set the menu item are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **PowerOn** and press **[Enter]** key to make the parameter in modification.
3. Rotate the knob to select the value from the following options.
 - **Reset**: default value, indicates when the power supply is powered on, the power supply will initialize some settings and output state.
 - **Last**: indicates when powered on, the power supply will remain the same settings and output state as last time you turned off the power supply.
 - **Last+Off**: indicates when powered on, the power supply will remain the same settings as last time you turned off the power supply, but the output state is OFF state.
4. After finishing the setting, press **[Enter]** key to confirm.

4.2.3 Set the Sense Function State

This menu item is used to switch the power supply to local sensing or remote sensing.

IT-M3140 series power supplies support two connection methods between power supply and device under test (DUT): Local sensing and Remote sensing. The remote sensing is used for maximizing measurement accuracy. (Refer to [2.5 Connecting the Device Under Test \(DUT\)](#) for more information.)

The procedures to set the menu item are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Sense** and press **[Enter]** key to make the parameter in modification.
3. Rotate the knob to select the value from the following options.
 - **Off**: default value, indicates turn the sense function off.
 - **On**: indicates turn the sense function on.

4. After finishing the setting, press **[Enter]** key to confirm.

4.2.4 Set the Communication Information

This menu item is used to set the communication information between instrument and PC. The standard communication interfaces for this series power supply are USB and LAN,. You can also select the non-standard interface GPIB or RS232 based on personal requirement.

The procedures to set the menu item are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Comm** and press **[Enter]** key to make the parameter in modification.

The menu displays the corresponding interface information automatically based on the inserted communication board.

3. Use left and right keys or rotate the knob to adjust the values.
4. After finishing the setting, press **[Enter]** key to confirm.



Note

- The default communication method is USB. If other communication method is selected, the related parameters need to be set. For detailed parameter description, refer to [2.6 Connect the Communication Interface](#).
- The instrument supports the non-standard RS232 and GPIB interfaces, and the configuration items in the menu are dynamically displayed according to the interface user selected.

4.2.5 Set the TRIG± Interface Status (Trig)

The TRIG± interface is located on the rear panel of the instrument. For details, see [1.6 Rear-Panel Overview](#). The TRIG± interface allows a trigger signal to be applied to the instrument or a trigger signal from the instrument.

- In: When the trigger source is set to **Ext**, shorting TRIG+ and TRIG- interface can trigger the instrument.
- Out: When the trigger source is set to **Keypad** or **Bus** and the trigger happens, the TRIG± interface generates a high pulse trigger signal.

The procedures to set the menu item are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.

2. Use left and right keys or rotate the knob to select **Trig** and press **[Enter]** key to make the parameter in modification.
3. Rotate the knob to select **In** or **Out** and press **[Enter]** key to confirm.

4.2.6 Select Trigger Source(Trig Source)

This menu item is used to select the trigger source.

IT-M3200 series power supply supports the following trigger sources:

- Keypad: Select the front panel **[Shift]+[Esc]** (Trigger) button as the trigger source;
- Bus: Select the remote interface command as the trigger source, such as the ***TRG** command;
- Ext: Select the rear panel trigger signal interface TRIG± (IN status) as the trigger source. Please refer to [4.2.5 Set the TRIG± Interface Status \(Trig\)](#) for detailed information about TRIG± interface status settings.

The procedures to set the menu item are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Trig Source** and press **[Enter]** key to make the parameter in modification.
3. Rotate the knob to adjust the parameter.
4. After setting, press **[Enter]** key to confirm.

4.2.7 Set the Bleeder State (Bleeder)

This menu item is used to set the status of the bleeder circuit (**Bleeder**). **On** and **Off** apply to the following test scenarios:

- On (default): For test scenarios other than battery charging tests. After the **Bleeder** is turned on, when the test is finished and the output is turned off, the voltage can be dropped quickly.
- Off: For battery charging test scenarios. Since some devices inside the instrument can absorb power, when the test is finished and the battery is still connected to the test circuit, these devices will still discharge the battery even if the output is turned off or the instrument is powered off. Therefore, before connecting the battery to the test circuit, set **Bleeder** to **Off** to disconnect the bleeder circuit to avoid this problem.



Note

Turning off the **Bleeder** can omit the diode which is used to prevent reverse current during battery testing.

The procedures to set the menu item are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **Bleeder** and press **[Enter]** key to make the parameter in modification.
3. Rotate the knob to select **Off** or **On** and press **[Enter]** key to confirm.

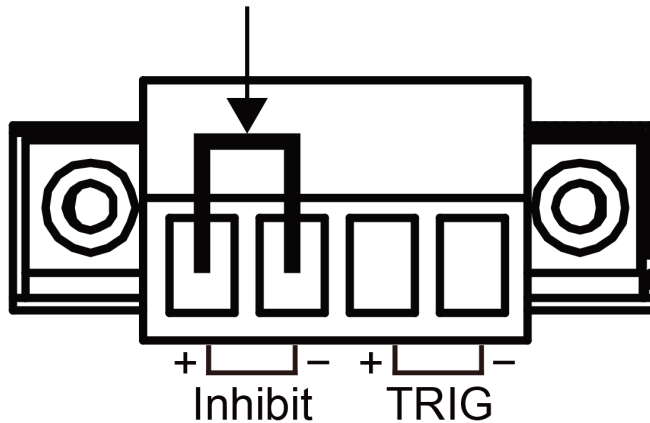
4.2.8 Output Inhibit Control

The IT-M3140 series power supply rear panel provides an output Inhibit interface Inhibit±, which can disable the power output to prevent the power supply from being operated incorrectly during the test and causing damage to the DUT.

- Off: Disables the Inhibit Port function.
- Living mode. When the external Inhibit± control terminals input is in the False state, the output is controlled by the **[On/Off]** key on the front panel; when the external Inhibit± control terminals input is in the True state, the output is turned off, and the output **[On/Off]** key is invalid at this time .
 - Nomal: When Inhibit+ and Inhibit– are short-circuited, the Inhibit± control port input is in the True state, and if it is not short-circuited, it is in the False state.
 - Inverted: When Inhibit+ and Inhibit– are short-circuited, the Inhibit± control port input is in the False state, and if it is not short-circuited, it is in the True state.
- Latch mode. When the external Inhibit± control terminals detects the level change from False to True, the power output will be turned off. To release the latched state, you must first set the external Inhibit± control port to the False state, and send a command (OUTPut:PROTEction:CLEar) to clear the corresponding INH status bit.
 - Nomal: When Inhibit+ and Inhibit– are short-circuited, the Inhibit± control port input is in the True state, and if it is not short-circuited, it is in the False state.
 - Inverted: When Inhibit+ and Inhibit– are short-circuited, the Inhibit± control port input is in the False state, and if it is not short-circuited, it is in the True state.

The figure below shows the short connection between the Inhibit± interfaces.

Inhibit output jumper.



4.2.9 View the System Information

This menu item is used to view the system information of the instrument.

The procedures to view the system information are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **System Info** and press **[Enter]** key to make the parameter in modification.

The user can use left and right keys or knob to view the following system information.

Name	Description
Model	The instrument model
Ver	The control board version
CommVer	The communication board version
SN	The serial number
Last Cal	Last calibration date
Run Time	Instrument running time

4.2.10 Restore the Factory Default Settings

This menu item is used to restore the factory default settings.

The procedures to set the menu item are as follows.

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.

2. Use left and right keys or rotate the knob to select **System Reset** and press **[Enter]** key to make the parameter in modification.
3. Use left and right keys or rotate the knob to select the value from the following options.
 - No: default value, indicates the power supply cancels this menu setting.
 - Yes: indicates the power supply restores the factory default settings.
4. After finishing the setting, press **[Enter]** key to confirm.

The detailed default parameters are listed in the following table.


No.	Parameter	Default Value
The setting values on the front panel		
1	Voltage	0
2	Current	0.1A
Config menu		
1	P-SET	MAX
2	Mode	CV Priority
3	V-Rise Time	0.1S
4	V-Fall Time	0.1S
5	Output Res	0.0mΩ
6	I-Rise Time	0.1S
7	I-Fall Time	0.1S
8	Timer	Off
9	Time	1.0 S
10	On Delay	0.000 S
11	Off Delay	0.000 S
System menu		
1	Beep	On
2	Power On	Reset
3	Sense	Off
4	USB mode	TMC
5	IP Addr	192.168.200.100
6	Sub Net	255.255.255.0

No.	Parameter	Default Value
7	Gateway	192.168.200.1
8	DNS1	192.168.200.1
9	DNS2	192.168.200.2
10	Raw Socket	On
11	Raw Socket Port	30000
13	RS232	9600_8_None_1
14	Bleeder	On
15	Trig	Out
16	Trig Source	Keypad
Protect menu		
1	U Max Level	MAX
2	U Min Level	0.00 V
3	OVP Mode	Off
4	OVP Level	MAX
5	OVP Delay	10.00 S
6	OCP Mode	Off
7	OCP Level	MAX
8	OCP Dealy	10.00 S
9	OPP Mode	Off
10	OPP Level	MAX
11	OPP Delay	10.00 S
12	UVP Mode	Off
13	UVP Level	0.00 V
14	UVP Delay	10.00 S
15	UVP Warm	30.00 S
16	UCP Mode	Off
17	UCP Level	0.000 A
18	UCP Delay	10.00 S
19	UCP Warm	30.00 S

4.2.11 Switch Local/Remote Mode


This series power supplies provide local operation and remote operation. The default mode is local operation mode.

- Local operation mode: use front panel keys to control the power supply.
- Remote operation mode: the power supply is connected to PC, the user uses the software in PC to control the power supply remotely.

During remote control operation, the remote symbol  is displayed at the top right corner of the front panel display. All panel keys, except the **[On/Off]**(Off function only) and **[Local]** keys, are locked.

You can press **[Local]** to switch the remote control to local control. The mode modification will not affect the output parameters.

4.2.12 Key Lock Function

The front panel controls can be locked to protect from accidental power supply parameter change. Press **[Shift]+[Enter]** (Lock) to lock front panel keys and the lock symbol  is shown on the front panel display. All panel keys, except the **[On/Off]** and **[Shift]+[Enter]** (Lock) keys, are locked. You can repress **[Shift]+[Enter]** (Lock) to unlock the front panel.

4.2.13 Save and Recall Operations

This series power supplies can save up to 10 common parameters in non-volatile memory (No. 1 to No. 10) for user to recall conveniently.



Note

The instrument provides a power-down save function. When the power is turned off, the setting information before shutdown is automatically stored in the first group of non-volatile memory.

The saved settings include the following parameters.

- The voltage setting value;
- The current setting value.

You can do the save and recall operations by the following two methods.

- Front panel keys: **[Save]** and **[Recall]** ;
- SCPI command: *SAV and *RCL.

Save Operations

1. Press **[Save]** to enter into the saving interface.
2. Set the storage location.
Use knob to adjust a value from 1 to 10 on the prompt interface "Save File = 1" to set the storage location in non-volatile memory.
3. Press **[Enter]** key to confirm.

Recall Operations

You can recall the parameters you saved in the specified memory location as the setting values.

1. Press **[Recall]** to enter into the saving interface.
2. Set the recall location.
Use knob to adjust a value from 1 to 10 on the prompt interface "Recall File = 1" to set the recall location in non-volatile memory.

The second lines displays the stored voltage and current values in the specified memory location
3. Press **[Enter]** key to confirm the recall operation.

4.3 Protection Function

This series power supplies provide the following protection functions. You can set these functions in the Protect menu.

- The maximum output voltage setting value (U-Max) and the minimum output voltage setting value (U-Min), these functions limit the setting value of the output voltage and current from front panel.
- Over-voltage protection, over-current protection, over-power protection, under-voltage protection, under-current protection and over-temperature protection, these functions disable the output to protect the device under test (DUT), as well as the power supply.

4.3.1 Set the Setting Value Limit Protection

To avoid causing damage to the DUT, after you set the U-Max and U-Min, the setting value from the **[V-set]** key on the front panel can't exceed the setting limit.

The operation steps are as follows.

1. Press **[Shift]+[Recall]** (Protect) to enter Protect menu interface.
2. Use left and right keys or rotate the knob to select **U-Max** or **U-Min** and press **[Enter]** key to confirm.
3. Rotate the knob to adjust the value and press **[Enter]** key to confirm.
4. Press **[Esc]** to exit the protection menu setting.

4.3.2 Set Over-Voltage Protection

Over-voltage protection function allows the user to enable the protection and set a over-voltage limit (**Level**) and delay time (**Delay**). This function prevents the output voltage from being higher than the limited output voltage and protects the connected DUT so it this is not over-voltage and possibly damaged due to an excessive voltage.

An over-voltage protection will occur if:

- Enable OVP;
- The output voltage value is greater than the set voltage protection point **Level** and the period is greater than the set protection delay time **Delay**.

Delay time **Delay** — You can specify an OVP delay to prevent momentary output settings, DUT and status changes from tripping the over-voltage protection. In most cases these momentary conditions would not be considered an over-voltage protection fault, and having an OVP condition disable the output when they occur would be a nuisance. Specifying an OVP delay lets the OVP circuit ignore these momentary changes during the specified delay period. Once the OVP delay time has expired and the over-voltage condition persists, the output will shut down.

When over-voltage protection occurs, the instrument responds as follows:

- Instrument output is off;
- The buzzer sounds;
- The interface displays “Over Voltage Protect” and flashes;
- Status register, the OV status bit is set to 1.

Enable OVP

1. Press **[Shift]+[Recall]** (Protect) to enter Protect menu interface.
2. Use left and right keys or rotate the knob to select **OVP** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **On** and press **[Enter]** key to confirm.
4. Rotate the knob to adjust the over-voltage limit **Level** and press **[Enter]** key to confirm.

5. Rotate the knob to adjust the delay time **Delay** and press **[Enter]** key to confirm.
6. Press **[Esc]** to exit the protection menu setting.

Clear Over-Voltage Protection

To clear the over-voltage and return to normal operation, firstly remove the conditions that caused the protection fault. Press **[Esc]** key (or send the command **PROtection:CLEar**) to clear the protection status. The “Over Voltage Protect” displayed in front panel is cleared and the instrument exits OVP status.

4.3.3 Set Over-Current Protection

Over-current protection function allows the user to enable the protection and set a over-current limit (**Level**) and delay time (**Delay**). This function prevents the output current from being higher than the limited output current and protects the connected DUT so it this is not over-current and possibly damaged due to an excessive current.

An over-current protection will occur if:

- Enable OCP;
- The output current value is greater than the set current protection point **Level** and the period is greater than the set protection delay time **Delay**.

Delay time **Delay** — You can specify an OCP delay to prevent momentary output settings, DUT and status changes from tripping the over-current protection. In most cases these momentary conditions would not be considered an over-current protection fault, and having an OCP condition disable the output when they occur would be a nuisance. Specifying an OCP delay lets the OCP circuit ignore these momentary changes during the specified delay period. Once the OCP delay time has expired and the over-current condition persists, the output will shut down.

When over-current protection occurs, the instrument responds as follows:

- Instrument output is off;
- The buzzer sounds intermittently;
- The interface displays “Over Current Protect” and flashes;
- Status register, the OC status bit is set to 1.

Enable OCP

1. Press **[Shift]+[Recall]** (Protect) to enter Protect menu interface.

2. Use left and right keys or rotate the knob to select **OCP** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **On** and press **[Enter]** key to confirm.
4. Rotate the knob to adjust the over-current limit **Level** and press **[Enter]** key to confirm.
5. Rotate the knob to adjust the delay time **Delay** and press **[Enter]** key to confirm.
6. Press **[Esc]** to exit the protection menu setting.

Clear Over-Current Protection

To clear the over-current and return to normal operation, firstly remove the conditions that caused the protection fault. Press **[Esc]** key (or send the command **PROtection:CLEar**) to clear the protection status. The “Over Current Protect” displayed in front panel is cleared and the instrument exits OCP status.

4.3.4 Set Over-Power Protection

Over-power protection function allows the user to enable the protection and set a over-power limit (**Level**) and delay time (**Delay**). This function prevents the output power from being higher than the limited output power and protects the connected DUT so it this is not over-power and possibly damaged due to an excessive power.

An over-power protection will occur if:

- Enable OPP;
- The output power value is greater than the set power protection point **Level** and the period is greater than the set protection delay time **Delay**.

Delay time Delay — You can specify an OPP delay to prevent momentary output settings, DUT and status changes from tripping the over-power protection. In most cases these momentary conditions would not be considered an over-power protection fault, and having an OPP condition disable the output when they occur would be a nuisance. Specifying an OPP delay lets the OPP circuit ignore these momentary changes during the specified delay period. Once the OPP delay time has expired and the over-power condition persists, the output will shut down.

When over-power protection occurs, the instrument responds as follows:

- Instrument output is off;
- The buzzer sounds intermittently;
- The interface displays “Over Power Protect” and flashes;

- Status register, the OP status bit is set to 1.

Enable OPP

1. Press **[Shift]+[Recall]** (Protect) to enter Protect menu interface.
2. Use left and right keys or rotate the knob to select **OPP** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **On** and press **[Enter]** key to confirm.
4. Rotate the knob to adjust the over-power limit **Level** and press **[Enter]** key to confirm.
5. Rotate the knob to adjust the delay time **Delay** and press **[Enter]** key to confirm.
6. Press **[Esc]** to exit the protection menu setting.

Clear Over-Power Protection

To clear the over-power and return to normal operation, firstly remove the conditions that caused the protection fault. Press **[Esc]** key (or send the command **PROtection:CLEar**) to clear the protection status. The “Over Power Protect” displayed in front panel is cleared and the instrument exits OPP status.

4.3.5 Set Under-Voltage Protection

Under-voltage protection function allows the user to enable the protection and set a under-voltage limit (**Level**), delay time (**Delay**) and warm-up time (**Warm Up**).

An under-voltage protection will occur if:

- Enable UVP;
- The output time exceeds the warm-up time;

Warm-up time **Warm Up** — You can specify the warm-up time for UVP protection to make the instrument not judge the under-voltage protection fault within the specified warm-up time.

- The output voltage value is less than the set voltage protection point **Level** and the period is greater than the set protection delay time **Delay**.

Delay time **Delay** — You can specify an UVP delay to prevent momentary output settings, DUT and status changes from tripping the under-voltage protection. In most cases these momentary conditions would not be considered an under-voltage protection fault, and having an UVP condition disable the output when they occur would be a nuisance. Specifying an UVP delay lets the UVP circuit ignore these momentary changes during the specified

delay period. Once the UVP delay time has expired and the under-voltage condition persists, the output will shut down.

When under-voltage protection occurs, the instrument responds as follows:

- Instrument output is off;
- The buzzer sounds intermittently;
- The interface displays “Under Voltage Protect” and flashes;
- Status register, the UV status bit is set to 1.

Enable UVP

1. Press **[Shift]+[Recall]** (Protect) to enter Protect menu interface.
2. Use left and right keys or rotate the knob to select **UVP** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **On** and press **[Enter]** key to confirm.
4. Rotate the knob to adjust the under-voltage limit **Level** and press **[Enter]** key to confirm.
5. Rotate the knob to adjust the delay time **Delay** and press **[Enter]** key to confirm.
6. Rotate the knob to adjust the warm-up time **Warm Up** and press **[Enter]** key to confirm.
7. Press **[Esc]** to exit the protection menu setting.

Clear Under-Voltage Protection

To clear the under-voltage and return to normal operation, firstly remove the conditions that caused the protection fault. Press **[Esc]** key (or send the command **PROtection:CLEar**) to clear the protection status. The “Under Voltage Protect” displayed in front panel is cleared and the instrument exits UVP status.

4.3.6 Set Under-Current Protection

Under-current protection function allows the user to enable the protection and set a under-current limit (**Level**), delay time (**Delay**) and warm-up time (**Warm Up**).

An under-current protection will occur if:

- Enable UCP;
- The output time exceeds the warm-up time;

Warm-up time **Warm Up** — You can specify the warm-up time for UCP protection to make the instrument not judge the under-current protection fault within the specified warm-up time.

- The output current value is less than the set current protection point **Level** and the period is greater than the set protection delay time **Delay**.

Delay time **Delay** — You can specify an UCP delay to prevent momentary output settings, DUT and status changes from tripping the under-current protection. In most cases these momentary conditions would not be considered an under-current protection fault, and having an UCP condition disable the output when they occur would be a nuisance. Specifying an UCP delay lets the UCP circuit ignore these momentary changes during the specified delay period. Once the UCP delay time has expired and the under-current condition persists, the output will shut down.

When under-current protection occurs, the instrument responds as follows:

- Instrument output is off;
- The buzzer sounds intermittently;
- The interface displays “Under Current Protect” and flashes;
- Status register, the UC status bit is set to 1.

Enable UCP

1. Press **[Shift]+[Recall]** (Protect) to enter Protect menu interface.
2. Use left and right keys or rotate the knob to select **UCP** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **On** and press **[Enter]** key to confirm.
4. Rotate the knob to adjust the under-current limit **Level** and press **[Enter]** key to confirm.
5. Rotate the knob to adjust the delay time **Delay** and press **[Enter]** key to confirm.
6. Rotate the knob to adjust the warm-up time **Warm Up** and press **[Enter]** key to confirm.
7. Press **[Esc]** to exit the protection menu setting.

Clear Under-Current Protection

To clear the under-current and return to normal operation, firstly remove the conditions that caused the protection fault. Press **[Esc]** key (or send the command **PROtection:CLEar**) to clear the protection status. The “Under Current Protect” displayed in front panel is cleared and the instrument exits UCP status.

4.3.7 Over-Temperature Protection

To prevent damaging heat build-up and ensure specified performance, make sure there is adequate ventilation and air flow around the instrument to ensure

proper cooling. Do not cover the ventilation holes on the top, sides, or bottom of the instrument.

Even with proper ventilation, the instrument can overheat in the following situations

- If the ambient temperature is too high;
- If you use the instrument to test for long periods.

Over-temperature protection is a protective measure implemented when the internal temperature of the instrument exceeds 85 degrees. Once the over-temperature protection has been triggered, the output will shut down and VFD shows “Over Temp Prot”.

If an over-temperature condition occurs, turn off the instrument and allow it to cool for 30 minutes. You cannot turn the output on until the instrument cools down. Press **[On/Off]** key to turn the output on.

CAUTION

When you return power to the instrument, verify that the cooling fan is running. If not, please contact ITECH. Leaving the instrument turned on with the failure message displayed or with an inoperative cooling fan may result in damage to the instrument.

4.3.8 Set foldback protection

This series of instruments has a Foldback protection function, which is used to turn off the output when the power supply CV / CC is switched, so as to protect certain DUTs that are sensitive to voltage overshoot and current overshoot. Foldback protection allows the user to specify a working mode and set the protection delay time. If the current working mode is switched, the protection will be triggered from the working loop switch. When the delay time is exhausted, the protection will be triggered and the output will be turned off.

- Enable FOLDBACK function;
- The loop is switched to the set working mode and the duration is greater than the set protection delay time;

When foldback protection occurs, the instrument responds as follows:

- Instrument output is off;
- The buzzer sounds intermittently;
- The interface displays “Foldback Protect” and flashes;
- Status register, the Foldback status bit is set to 1.

Enable FOLDBACK function

1. Press **[Shift]+[Recall]** (Protect) to enter Protect menu interface.
2. Use left and right keys or rotate the knob to select **FOLDBACK** and press **[Enter]** key to confirm.
3. Select **CC** or **CV** and press **[Enter]** key to confirm.
 - Selecting CC means that the instrument triggers protection when the operating mode of the instrument switches to CC mode.
 - Selecting CV means that the instrument triggers protection when the operating mode of the instrument is switched to CV mode.
 - Select OFF to turn off the foldback function.
4. Rotate the knob to adjust the **Delay** and press **[Enter]** key to confirm.
5. Press **[Esc]** to exit the protection menu setting.

Delay FOLDBACK

You can specify a time for the FOLDBACK delay, which can make the instrument ignore the instantaneous change of the operating mode in the specified delay interval. In most cases, this instantaneous situation is not considered as a switching state, and there is no need to trigger the foldback function and disable Output. Once the FOLDBACK delay time is exceeded, the output is turned off.

4.4 List Function

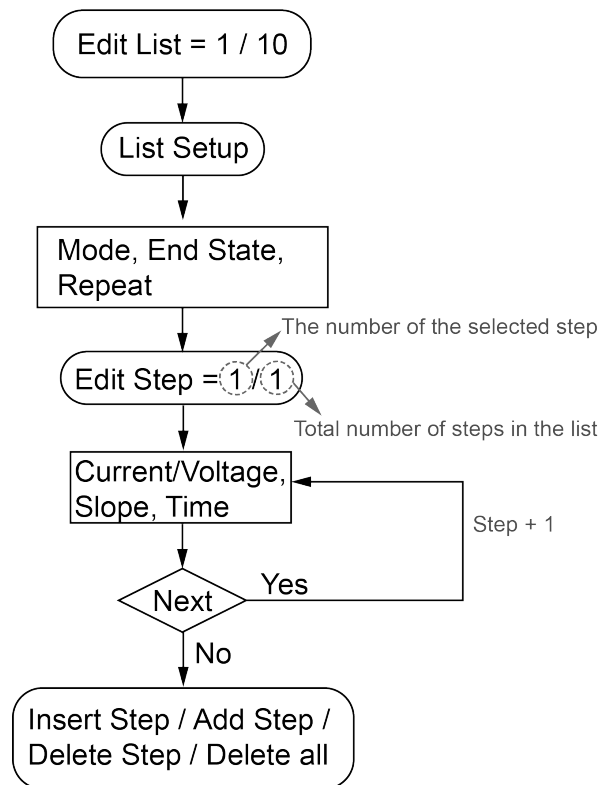
The user can use list function to create a test program made of multiple steps. Up to 10 programs (List1 to List10) can be created in the list mode for this series power supplies. Each list program can be made of up to 100 steps. The user need to set voltage or current, slope and dwell time for each step. The user also can set repeat times, end state and so on for each list program. The descriptions of list function menu are listed in the table below.

List Mode	List mode		
	Run List	Turn the list mode on/off.	
		On	Turn the list mode on.
		Off	Turn the list mode off.
	Recall List	Select a list program to view.	
		List Setup	View the setting parameters of the selected list program.
		View Step	Select the desired step to view.
	Edit List	Edit list program.	

		List Setup	Set the list program.		
			Mode	Set the operation mode for list program. <ul style="list-style-type: none"> • CC: current mode; • CV: voltage mode. 	
			End State	Set the running state after the list program is running over. <ul style="list-style-type: none"> • Normal: keep outputting the voltage and current setting in main interface when the dwell time is over. • Last: keep outputting the last step when the dwell time is over. 	
			Repeat	Set the number of list repetitions within the range from 1 to 100.	
		Edit Step	Edit parameters for each step.		
			Current/Voltage	Current value or voltage value. (The voltage appears when CV mode is selected; the current appears when CC mode is selected.)	
			Slope	Slope value.	
			Time	Duration (0.001~3600), unit: second.	
			Next	Select whether to edit the next step: <ul style="list-style-type: none"> • Yes • No 	
		Insert Step	Insert steps before each specified step.		
		Add Step	Add steps after each specified step.		
		Delete Step	Delete the selected step.		
		Delete all	Delete all steps.		
		Copy File X to X	Copy list program.		

4.4.1 Edit List Program

You can use the list program to perform a variety of output waveform simulations. The execution flowchart of list program is as follows.



The detailed operation steps are as follows.

1. Press **[Shift]+[I-set]** (Function) to enter function menu interface.
2. Use left and right keys or rotate the knob to select **List** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **Edit List** and press **[Enter]** key to confirm.
4. Use knob to set the list name and press **[Enter]** key to confirm.
5. Use left and right keys or rotate the knob to select **List Setup** and press **[Enter]** key to confirm.
 - a. Select **Mode** to set list mode: CC/ CV.
 - b. Select **End State** to set running state after the list program is running over.
 - Normal: keep outputting the voltage and current setting in main interface when the dwell time is over.
 - Last: keep outputting the last step when the dwell time is over.
 - c. Select **Repeat** to set the number of list repetitions.
6. Select **Edit Step** and press **[Enter]** key to confirm.
7. Use knob to set the desired list step number and press **[Enter]** key to confirm.

To the left of the slash is the desired step number to be edited and to the right of the slash is the total steps number of the list program. The total number of steps changes by the addition of the number of steps in the editing process.

- a. Select **Current** or **Voltage** to set the current or voltage value.
 - b. Select **Slope** to set the slope of the step.
 - c. Select **Time** to set the dwell time of the step.
 - d. Select **Next** to set whether to edit the next step. If set to **Yes**, repeat steps a through c to set the parameters for next step. If set to **No**, the list step parameters setting is over.
8. If you need to continue to adjust the list step, you can use the following settings to insert, add or delete steps.
- If you need to insert steps, select **Insert Step** and press **[Enter]** key to confirm. Use knob to set the insert location and press **[Enter]** key. Repeat steps 7a through 7d to set the parameters for the inserted step. The inserted step is before each specified step and you can insert multiple steps continuously.
 - If you need to add steps, select **Add Step** and press **[Enter]** key to confirm. Use knob to set the add location and press **[Enter]** key. Repeat steps 7a through 7d to set the parameters for the added step. The added step is after each specified step and you can add multiple steps continuously.
 - If you need to delete steps, select **Delete Step** and press **[Enter]** key to confirm. Use knob to set the delete location and press **[Enter]** key.
 - If you need to delete all steps, select **Delete all** and press **[Enter]** key to confirm. Use knob to select **Yes** and press **[Enter]** key.

4.4.2 Copy List Program

For an existed list program, you can copy and name it a new list program. Then you can edit the new list program, insert steps or delete steps. This function simplifies the edit operation for similar list program. The operation steps are as follows.

1. Press **[Shift]+[I-set]** (Function) to enter function menu interface.
2. Use left and right keys or rotate the knob to select **List** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **Edit List** and press **[Enter]** key to confirm.
4. Use knob to set the list program name and press **[Enter]** key to confirm.
5. Select **Copy File X to X** and press **[Enter]** key to confirm.
6. Use knob to select setting source List program name and target List program name and press **[Enter]** key to confirm.

4.4.3 View List Program

Before selecting and running the list program, you can view the related parameters and each step of the existed list program. The operation steps to view the list program are as follows.

1. Press **[Shift]+[I-set]** (Function) to enter function menu interface.
2. Use left and right keys or rotate the knob to select **List** and press **[Enter]** key to confirm.
3. Use left and right keys or rotate the knob to select **Recall List** and press **[Enter]** key to confirm.
4. Use knob to select the list program to view and press **[Enter]** key to confirm.
5. Select **List Setup** and press **[Enter]** key to enter the view page of list file. Use left and right keys or rotate the knob to view the following parameters.
 - Mode: the operation mode for list program.
 - End State: the running state after the list program is running over.
 - Repeat: the number of list repetitions.
6. Select **View Step** and press **[Enter]** key to confirm.
7. Use knob to select the list step to view and press **[Enter]** key to confirm.

To the left of the slash is the desired step number to view and to the right of the slash is the total steps number of the list program. At this point, the interface displays all steps and automatically locates at the selected step.
8. Use knob or left and right keys to view all steps.

4.4.4 Run List Program

The user can run the existed list program as needed to enable outputting of corresponding waveform sequence by the power supply. Detailed operation steps are as below:

1. Press **[Shift]+[I-set]** (Function) to enter function menu interface.
2. Use left and right keys or rotate the knob to select **List** and press **[Enter]** key to enter the set interface of list mode.
3. Select the desired list program.
 - Method 1: Select **Recall List** and press **[Enter]** key. Use knob to select the desired list program and press **[Enter]** key to confirm.
 - Method 2: To simplify the operation, you can directly run the list program after editing it in the **Edit List** menu item. Skip the step in the **Recall List** menu item.
4. Select **Run List** and press **[Enter]** key to confirm.
5. Use the knob to set **Run List** to **On** and press **[Enter]** key to confirm.
6. Press **[On/Off]** key to turn the output on.
7. Based on the trigger method, perform the trigger operation. When the trigger signal is received, the power supply outputs the waveform sequences.

Stop running: During the running of List, you can press **[Shift]+[I-set]** (Function) to enter the Function menu and set the **Run List** as **Off** to stop running. Otherwise, the List waveform cannot be edited while the List is running.

4.5 Analogue Function (Ext-Program) (Optional)

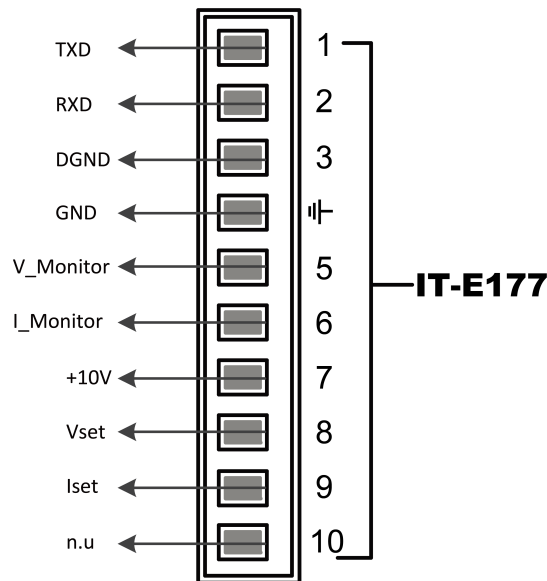
The external analog quantity function means that the user can input an analog signal in the range of 0V to 10V through the analog quantity input interface for remote setting of the instrument's input setting value. The external analog quantity function is not the standard-equipped function for the instrument. It is only available when the user selects the IT-E177 interface card.

The rear panel of this series of instrument provides an optional interface card integrating the RS232 and analog quantity function. The interface card provides the following capability:

- Remotely control voltage and current values.
- Remote monitoring of output voltage/current measurement.
- RS232 communication interface, please refer to [2.6.4 RS232 Interface](#) for detailed description about the interface.

Analog Card Interface Introduction

The analog function interface is located on the optional IT-E177. The pins description is as below.



Pins	Name	Type	Description
1, 2, 3	TXD, RXD, DGND	Commu- nication terminal	RS232 interface connection terminal.
4	GND	Ground	Ground for analog inputs and outputs.
5	V-Monitor	Analog out	Voltage monitor signal.

Pins	Name	Type	Description
6	I-Monitor	Analog out	Current monitor signal.
7	+10V	Analog out	The +10V reference voltage output by the power supply can be connected to a resistance subdivision for analog control.
8	Vset	Analog in	The setting for the output voltage value corresponds to Ch1 in the menu.
9	Iset	Analog in	The setting for the output current value corresponds to Ch2 in the menu.
10	n.u	—	not used

Analog quantity menu description

When the analog quantity function is optionally equipped, the system menu displays the analog quantity menu. The analog quantity menu items and parameters are described below:

Ext-Program	External analog function menu	
	On / Off	Function switch: <ul style="list-style-type: none"> On: Turns on the external analog function. In this state, the channel parameters can be set. Off: Turns off the external analog function. In this state, the channel parameters cannot be set.
	Ch1	Set the parameters of channel 1 (Vset).
	Mx	Indicates the slope factor of channel 1.
	Mb	Indicates the offset of channel 1.
	Ch2	Set the parameters of channel 2 (Iset).
	Mx	Indicates the slope factor of channel 2.
	Mb	Indicates the offset of channel 2.

Analog Conversion Relationship Introduction

When the analog quantity control function of this series of instrument is used, the user needs to set the conversion relationship of the analog quantity expected value based on requirements. The analog quantity values in each channel all follow the calculation relationship of $y=Mx+b$. The user needs to set the M_x (slope coefficient) and M_b (offset) values in different channels in the analog quantity menu. For calculation of the analog quantity value. The user can calculate the M and b values based on the analog requirements in accordance with the formula below.

The user needs to convert the values of M_x and M_b according to the following formulas, and then set the two values through the front panel keys or SCPI remote commands.

Name	Description
V_{in1}	Indicates the minimum voltage input to pin 8. The setting range is from 0 to 10.
V_{in2}	Indicates the maximum voltage input to pin 8. The setting range is from 0 to 10, and $V_{in2}>V_{in1}$.
V_{out1}	The minimum value of the output voltage.
V_{out2}	The maximum value of the output voltage, and $V_{out2}>V_{out1}$.
I_{out1}	The minimum value of the output current.
I_{out2}	The maximum value of the output current, and $I_{out2}>I_{out1}$.

- **Vset**

$$M_x = \frac{(V_{out2} - V_{out1})}{(V_{in2} - V_{in1})}$$

$$M_b = V_{out2} - V_{in2} \times M_x$$

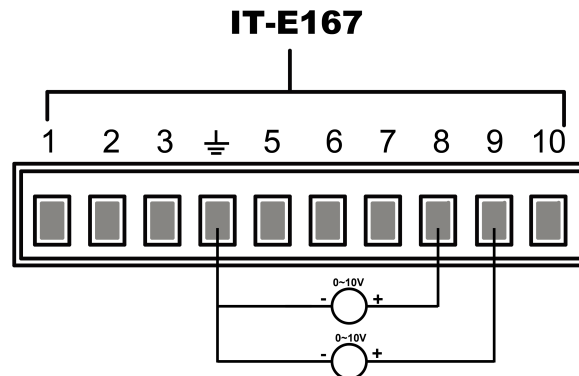
- **Iset**

$$M_x = \frac{(I_{out2} - I_{out1})}{(V_{in2} - V_{in1})}$$

$$M_b = I_{out2} - V_{in2} \times M_x$$

Analog Control

1. Refer to the figure below to complete the pin connection.



2. Calculate the **Mx** and **Mb** under the Ch1, Ch2 menus according to the above formulas. The sample data used in this manual is shown in the table below.

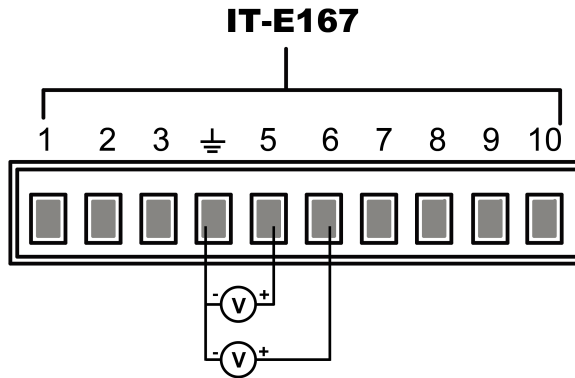
Pins	Input Voltage	Output Voltage / Current	Mx	Mb	Description
8	$V_{in1} = 2$	$V_{out1} = 0$	50	-100	By inputting a voltage of 2V to 8V to pin 8, the actual output voltage Vset is controlled from 0 to 300V.
	$V_{in2} = 8$	$V_{out2} = 300$			
9	$V_{in1} = 3$	$I_{out1} = 0$	2	-6	By inputting a voltage of 3V to 8V to pin 9, the actual output current Iset is controlled from 0 to 10A.
	$V_{in2} = 8$	$I_{out2} = 10$			

3. Set Mx and Mb of the corresponding pins.
 - a. Press **[Shift]+[V-set]** (Config) to enter into the configuration menu interface.
 - b. Use knob or Up/Down key to select **Ext-Program** and press **[Enter]**.
 - c. According to step 2, set **Mx** and **Mb** of the corresponding pins.
 - d. Set the **Ext-Program**→**On / Off** to **On** to turn on the analog function.

4. When the input voltage of Pin 8 is 5V, the setting value of the output voltage V-set of this instrument is 150V. The corresponding relationship meets the calculation relationship of $y=Mx+b$.
5. When the input voltage of Pin 9 is 4V, the setting value of the current I-set of this instrument is 2A.

Voltage Monitoring and Current Monitoring

The analog interface can monitor the existing output voltage and output current. Connect a digital voltmeter between Pin 5 and Pin 6 of the analog interface and ground wire 4. The connection method is as shown below. The voltage reading from 0 to 10V corresponds to the zero to full-scale voltage/current measuring of the instrument. The connection diagram is as shown below.



5 Technical Specification

This chapter will introduce the main technical parameters of this power, such as rated voltage/current/power and so on. Besides, we will introduce the working environment and storage temperature.

- ◆ Main Specification
- ◆ Supplemental Characteristics

5.1 Main Specification

5.1.1 IT-M3141

Parameter		IT-M3141
Rated value	Voltage	0 ~ 30V
	Current	0 ~ 150A
	Power	0 ~ 3000W
Line Regulation \pm (% of Output+Offset)	Voltage	0.005%+2mV
	Current	$\leq 50\text{mA}$
Load Regulation \pm (% of Output+Offset)	Voltage	0.005%+2mV
	Current	$\leq 70\text{mA}$
Setup Resolution	Voltage	1mV
	Current	10mA
	Power	0.1W
Read Back Resolution	Voltage	1mV
	Current	10mA
Setup Accuracy	Voltage	$\leq 0.03\% + 0.02\% \text{F.S.}$
	Current	$\leq 0.1\% + 0.1\% \text{F.S.}$
	Power	$\leq 0.5\% \text{F.S.}$
Read Back Accuracy	Voltage	$\leq 0.03\% + 0.02\% \text{F.S.}$
	Current	$\leq 0.1\% + 0.1\% \text{F.S.}$
	Power	$\leq 0.5\% \text{F.S.}$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 70\text{mV}$ (MAX: $\leq 70\text{mV}$)
	Irms	typical value $\leq 150\text{mA}$ (MAX: $\leq 150\text{mA}$)

Parameter		IT-M3141
Setting Temperature Coefficient (%of Output+Offset)/ °C	Voltage	≤20PPM/°C
	Current	≤50PPM/°C
Readback Temperature Coefficient (%of Output+Offset)/ °C	Voltage	≤20PPM/°C
	Current	≤50PPM/°C
Rise Time(no load)	Voltage	≤60mS
Rise Time(full load)	Voltage	≤150mS
Fall Time(no load)	Voltage	≤2S
Fall Time(full load)	Voltage	≤200mS
Transient Response Time	Voltage	≤1mS
AC Input	Voltage	220V±20% (3000W)
		110V±10% (derating to 1500W)
	Frequency	47-63Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+1mV
	Current	0.03%+50mA
Setup stability-8h (%of Output +Offset)	Voltage	0.01%+2mV
	Current	0.03%+55mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+1mV
	Current	0.03%+50mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+2mV
	Current	0.03%+55mA
Efficiency		90%
Remote Sense Compensation Voltage		≤3V
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		20A
Maximum Input Apparent Power		3700VA
Storage Temperature		-10°C ~ 70°C
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection
Standard Interface		Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)		600VDC
Isolation (input to ground)		2200VDC

Parameter	IT-M3141
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.2 IT-M3142

Parameter		IT-M3142
Rated value	Voltage	0 ~ 80V
	Current	0 ~ 80A
	Power	0 ~ 3000W
Line Regulation ±(% of Output+Offset)	Voltage	0.001%+5mV
	Current	≤30mA
Load Regulation ±(% of Output+Offset)	Voltage	0.004%+5mV
	Current	≤40mA
Setup Resolution	Voltage	10mV
	Current	10mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	10mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Ripple (20hz-20Mhz)	Vp-p	typical value≤140 mV(MAX: ≤140mV)

Parameter		IT-M3142
	Irms	typical value≤80mA(MAX: ≤80mA)
Setting Temperature Coefficient (%of Output+Offset)/°C	Voltage	≤20PPM/°C
	Current	≤50PPM/°C
Readback Temperature Coefficient (%of Output+Offset)/°C	Voltage	≤20PPM/°C
	Current	≤50PPM/°C
Rise Time(no load)	Voltage	≤60mS
Rise Time(full load)	Voltage	≤150mS
Fall Time(no load)	Voltage	≤2S
Fall Time(full load)	Voltage	≤200mS
Transient Response Time	Voltage	≤1mS
AC Input	Voltage	220V±20% (3000W)
		110V±10% (derating to 1500W)
	Frequency	47-63Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+8mV
	Current	0.04%+20mA
Setup stability-8h (%of Output +Offset)	Voltage	0.01%+10mV
	Current	0.04%+25mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+8mV
	Current	0.04%+20mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+10mV
	Current	0.04%+25mA
Efficiency		91%
Remote Sense Compensation Voltage		≤3V
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		20A
Maximum Input Apparent Power		3700VA
Storage Temperature		-10°C ~ 70°C
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection
Standard Interface		Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)		600VDC

Parameter	IT-M3142
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.3 IT-M3143

Parameter	IT-M3143	
Rated value	Voltage	0 ~ 150V
	Current	0 ~ 40A
	Power	0 ~ 3000W
Line Regulation ±(% of Output+Offset)	Voltage	0.001%+6mV
	Current	≤20mA
Load Regulation ±(% of Output+Offset)	Voltage	0.004%+8mV
	Current	≤35mA
Setup Resolution	Voltage	10mV
	Current	10mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	10mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.

Parameter		IT-M3143
Ripple (20hz-20Mhz)	Vp-p	typical value \leq 150 mV(MAX: \leq 150mV)
	Irms	typical value \leq 40mA(MAX: \leq 40mA)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}$ C	Voltage	\leq 20PPM/ $^{\circ}$ C
	Current	\leq 50PPM/ $^{\circ}$ C
Readback Temperature Coefficient (%of Output +Offset)/ $^{\circ}$ C	Voltage	\leq 20PPM/ $^{\circ}$ C
	Current	\leq 50PPM/ $^{\circ}$ C
Rise Time(no load)	Voltage	\leq 60mS
Rise Time(full load)	Voltage	\leq 150mS
Fall Time(no load)	Voltage	\leq 4S
Fall Time(full load)	Voltage	\leq 200mS
Transient Response Time	Voltage	\leq 1mS
AC Input	Voltage	220V \pm 20% (3000W)
		110V \pm 10% (derating to 1500W)
	Frequency	47-63Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+16mV
	Current	0.04%+10mA
Setup stability-8h (%of Output +Offset)	Voltage	0.01%+20mV
	Current	0.04%+12mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+16mV
	Current	0.04%+10mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+20mV
	Current	0.04%+12mA
Efficiency		91%
Remote Sense Compensation Voltage		\leq 3V
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		20A
Maximum Input Apparent Power		3700VA
Storage Temperature		-10 $^{\circ}$ C ~ 70 $^{\circ}$ C
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection
Standard Interface		Standard: USB, LAN Optional: RS232&analog, GPIB

Parameter	IT-M3143
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.4 IT-M3144

Parameter	IT-M3144	
Rated value	Voltage	0 ~ 300V
	Current	0 ~ 20A
	Power	0 ~ 3000W
Line Regulation ±(%of Output+Offset)	Voltage	0.001%+10mV
	Current	≤8mA
Load Regulation ±(%of Output+Offset)	Voltage	0.004%+20mV
	Current	≤10mA
Setup Resolution	Voltage	10mV
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.

Parameter		IT-M3144
	Power	$\leq 0.5\% \text{F.S.}$
Ripple (20hz-20Mhz)	Vp-p	typical value ≤ 300 mV(MAX: $\leq 300\text{mV}$)
	Irms	typical value $\leq 20\text{mA}$ (MAX: $\leq 20\text{mA}$)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}\text{C}$	Voltage	$\leq 20\text{PPM}/^{\circ}\text{C}$
	Current	$\leq 50\text{PPM}/^{\circ}\text{C}$
Readback Temperature Coefficient (%of Output+Offset)/ $^{\circ}\text{C}$	Voltage	$\leq 20\text{PPM}/^{\circ}\text{C}$
	Current	$\leq 50\text{PPM}/^{\circ}\text{C}$
Rise Time(no load)	Voltage	$\leq 60\text{mS}$
Rise Time(full load)	Voltage	$\leq 150\text{mS}$
Fall Time(no load)	Voltage	$\leq 5\text{S}$
Fall Time(full load)	Voltage	$\leq 200\text{mS}$
Transient Response Time	Voltage	$\leq 1\text{mS}$
AC Input	Voltage	220V $\pm 20\%$ (3000W)
		110V $\pm 10\%$ (derating to 1500W)
	Frequency	50/60Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+60mV
	Current	0.04%+5mA
Setup stability-8h (%of Output +Offset)	Voltage	0.01%+75mV
	Current	0.04%+6mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+60mV
	Current	0.04%+5mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+75mV
	Current	0.04%+6mA
Efficiency		91%
Remote Sense Compensation Voltage		$\leq 3\text{V}$
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		20A
Maximum Input Apparent Power		3700VA
Storage Temperature		$-10^{\circ}\text{C} \sim 70^{\circ}\text{C}$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3144
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.5 IT-M3145

Parameter	IT-M3145	
Rated value	Voltage	0 ~ 600V
	Current	0 ~ 10A
	Power	0 ~ 3000W
Line Regulation ±(% of Out-put+Offset)	Voltage	0.001%+20mV
	Current	≤4mA
Load Regulation ±(% of Out-put+Offset)	Voltage	0.004%+30mV
	Current	≤7mA
Setup Resolution	Voltage	10mV
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3145
	Current	$\leq 0.1\% + 0.1\%F.S.$
	Power	$\leq 0.5\%F.S.$
Ripple (20hz-20Mhz)	Vp-p	typical value ≤ 600 mV(MAX: ≤ 600 mV)
	Irms	typical value ≤ 10 mA(MAX: ≤ 10 mA)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	≤ 20 PPM/ $^{\circ}C$
	Current	≤ 50 PPM/ $^{\circ}C$
Readback Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	≤ 20 PPM/ $^{\circ}C$
	Current	≤ 50 PPM/ $^{\circ}C$
Rise Time(no load)	Voltage	≤ 60 ms
Rise Time(full load)	Voltage	≤ 150 ms
Fall Time(no load)	Voltage	≤ 5 s
Fall Time(full load)	Voltage	≤ 200 ms
Transient Response Time	Voltage	≤ 1 ms
AC Input	Voltage	220V $\pm 20\%$ (3000W)
		110V $\pm 10\%$ (derating to 1500W)
	Frequency	47-63Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+80mV
	Current	0.04%+2mA
Setup stability-8h (%of Output +Offset)	Voltage	0.01%+100mV
	Current	0.04%+3mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+80mV
	Current	0.04%+2mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+100mV
	Current	0.04%+3mA
Efficiency		91%
Remote Sense Compensation Voltage		≤ 6 V
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		20A
Maximum Input Apparent Power		3700VA
Storage Temperature		-10 $^{\circ}C$ ~ 70 $^{\circ}C$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3145
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.6 IT-M3146

Parameter		IT-M3146
Rated value	Voltage	0 ~ 1000V
	Current	0 ~ 6A
	Power	0 ~ 3000W
Line Regulation ±(% of Output+Offset)	Voltage	0.002%+20mV
	Current	≤2mA
Load Regulation ±(% of Output+Offset)	Voltage	0.005%+50mV
	Current	≤4mA
Setup Resolution	Voltage	0.1V
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	0.1V
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3146
	Current	$\leq 0.1\% + 0.1\%F.S.$
	Power	$\leq 0.5\%F.S.$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 1V$ (MAX: $\leq 1V$)
	Irms	typical value $\leq 6mA$ (MAX: $\leq 6mA$)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Readback Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Rise Time(no load)	Voltage	$\leq 60mS$
Rise Time(full load)	Voltage	$\leq 150mS$
Fall Time(no load)	Voltage	$\leq 5S$
Fall Time(full load)	Voltage	$\leq 200mS$
Transient Response Time	Voltage	$\leq 1mS$
AC Input	Voltage	$220V\pm 20\%$ (3000W)
		$110V\pm 10\%$ (derating to 1500W)
	Frequency	50/60Hz
Setup stability-30min (%of Output +Offset)	Voltage	$0.01\%+60mV$
	Current	$0.04\%+2mA$
Setup stability-8h (%of Output +Offset)	Voltage	$0.01\%+100mV$
	Current	$0.04\%+3mA$
Readback stability-30min (%of Output +Offset)	Voltage	$0.01\%+60mV$
	Current	$0.04\%+2mA$
Readback stability-8h (%of Output +Offset)	Voltage	$0.01\%+100mV$
	Current	$0.04\%+3mA$
Efficiency		91%
Remote Sense Compensation Voltage		$\leq 6V$
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		20A
Maximum Input Apparent Power		3700VA
Storage Temperature		$-10^{\circ}C \sim 70^{\circ}C$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3146
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	1000VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.7 IT-M3147

Parameter	IT-M3147	
Rated value	Voltage	0 ~ 1200V
	Current	0 ~ 5A
	Power	0 ~ 3000W
Line Regulation ±(% of Output+Offset)	Voltage	0.002%+20mV
	Current	≤2mA
Load Regulation ±(% of Output+Offset)	Voltage	0.005%+50mV
	Current	≤4mA
Setup Resolution	Voltage	0.1V
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	0.1V
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3147
	Current	$\leq 0.1\% + 0.1\%F.S.$
	Power	$\leq 0.5\%F.S.$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 1V$ (MAX: $\leq 1V$)
	Irms	typical value $\leq 6mA$ (MAX: $\leq 6mA$)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Readback Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Rise Time(no load)	Voltage	$\leq 60mS$
Rise Time(full load)	Voltage	$\leq 150mS$
Fall Time(no load)	Voltage	$\leq 5S$
Fall Time(full load)	Voltage	$\leq 200mS$
Transient Response Time	Voltage	$\leq 1mS$
AC Input	Voltage	$220V \pm 20\%$ (3000W)
		$110V \pm 10\%$ (derating to 1500W)
	Frequency	50/60Hz
Setup stability-30min (%of Output +Offset)	Voltage	$0.01\% + 60mV$
	Current	$0.04\% + 1mA$
Setup stability-8h (%of Output +Offset)	Voltage	$0.01\% + 100mV$
	Current	$0.04\% + 2mA$
Readback stability-30min (%of Output +Offset)	Voltage	$0.01\% + 60mV$
	Current	$0.04\% + 1mA$
Readback stability-8h (%of Output +Offset)	Voltage	$0.01\% + 100mV$
	Current	$0.04\% + 2mA$
Efficiency		91%
Remote Sense Compensation Voltage		$\leq 6V$
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		20A
Maximum Input Apparent Power		3700VA
Storage Temperature		$-10^{\circ}C \sim 70^{\circ}C$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3147
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	1000VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.8 IT-M3131E

Parameter	IT-M3131E	
Rated value	Voltage	0 ~ 30V
	Current	0 ~ 150A
	Power	0 ~ 1850W
Line Regulation ±(% of Output+Offset)	Voltage	0.005%+2mV
	Current	≤50mA
Load Regulation ±(% of Output+Offset)	Voltage	0.005%+2mV
	Current	≤70mA
Setup Resolution	Voltage	1mV
	Current	10mA
	Power	0.1W
Read Back Resolution	Voltage	1mV
	Current	10mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3131E
	Current	$\leq 0.1\% + 0.1\%F.S.$
	Power	$\leq 0.5\%F.S.$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 70mV$ (MAX: $\leq 70mV$)
	Irms	typical value $\leq 150mA$ (MAX: $\leq 150mA$)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Readback Temperature Coefficient (%of Output +Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Rise Time(no load)	Voltage	$\leq 60mS$
Rise Time(full load)	Voltage	$\leq 150mS$
Fall Time(no load)	Voltage	$\leq 2S$
Fall Time(full load)	Voltage	$\leq 200mS$
Transient Response Time	Voltage	$\leq 1mS$
AC Input	Voltage	$220V \pm 20\%$ (1850W)
		$110V \pm 10\%$ (derating to 1500W)
	Frequency	47-63Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+1mV
	Current	0.03%+50mA
Setup stability-8h (%of Output +Offset)	Voltage	0.01%+2mV
	Current	0.03%+55mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+1mV
	Current	0.03%+50mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+2mV
	Current	0.03%+55mA
Efficiency		90%
Remote Sense Compensation Voltage		$\leq 3V$
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		18A
Maximum Input Apparent Power		2300VA
Storage Temperature		$-10^{\circ}C \sim 70^{\circ}C$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3131E
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.9 IT-M3132E

Parameter	IT-M3132E	
Rated value	Voltage	0 ~ 80V
	Current	0 ~ 80A
	Power	0 ~ 1850W
Line Regulation ±(% of Output+Offset)	Voltage	0.001%+5mV
	Current	≤30mA
Load Regulation ±(% of Output+Offset)	Voltage	0.004%+5mV
	Current	≤40mA
Setup Resolution	Voltage	10mV
	Current	10mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	10mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3132E
	Current	$\leq 0.1\% + 0.1\% \text{F.S.}$
	Power	$\leq 0.5\% \text{F.S.}$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 140 \text{ mV}$ (MAX: $\leq 140 \text{mV}$)
	Irms	typical value $\leq 80 \text{mA}$ (MAX: $\leq 80 \text{mA}$)
Setting Temperature Coefficient (% of Output + Offset) / °C	Voltage	$\leq 20 \text{PPM}/^\circ\text{C}$
	Current	$\leq 50 \text{PPM}/^\circ\text{C}$
Readback Temperature Coefficient (% of Output + Offset) / °C	Voltage	$\leq 20 \text{PPM}/^\circ\text{C}$
	Current	$\leq 50 \text{PPM}/^\circ\text{C}$
Rise Time(no load)	Voltage	$\leq 60 \text{ms}$
Rise Time(full load)	Voltage	$\leq 150 \text{ms}$
Fall Time(no load)	Voltage	$\leq 2 \text{s}$
Fall Time(full load)	Voltage	$\leq 200 \text{ms}$
Transient Response Time	Voltage	$\leq 1 \text{ms}$
AC Input	Voltage	$220 \text{V} \pm 20\%$ (1850W)
		$110 \text{V} \pm 10\%$ (derating to 1500W)
	Frequency	47-63Hz
Setup stability-30min (% of Output + Offset)	Voltage	$0.01\% + 8 \text{mV}$
	Current	$0.04\% + 20 \text{mA}$
Setup stability-8h (% of Output + Offset)	Voltage	$0.01\% + 10 \text{mV}$
	Current	$0.04\% + 25 \text{mA}$
Readback stability-30min (% of Output + Offset)	Voltage	$0.01\% + 8 \text{mV}$
	Current	$0.04\% + 20 \text{mA}$
Readback stability-8h (% of Output + Offset)	Voltage	$0.01\% + 10 \text{mV}$
	Current	$0.04\% + 25 \text{mA}$
Efficiency		91%
Remote Sense Compensation Voltage		$\leq 3 \text{V}$
Command Response Time		5ms
Power Factor		0.98
Maximum Input Current		18A
Maximum Input Apparent Power		2300VA
Storage Temperature		$-10^\circ\text{C} \sim 70^\circ\text{C}$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3132E
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.10 IT-M3133E

Parameter		IT-M3133E
Rated value	Voltage	0 ~ 150V
	Current	0 ~ 40A
	Power	0 ~ 1850W
Line Regulation ±(% of Out-put+Offset)	Voltage	0.001%+6mV
	Current	≤20mA
Load Regulation ±(% of Output+Offset)	Voltage	0.004%+8mV
	Current	≤35mA
Setup Resolution	Voltage	10mV
	Current	10mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	10mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3133E
	Current	$\leq 0.1\% + 0.1\% \text{F.S.}$
	Power	$\leq 0.5\% \text{F.S.}$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 150 \text{ mV}$ (MAX: $\leq 150 \text{mV}$)
	Irms	typical value $\leq 40 \text{mA}$ (MAX: $\leq 40 \text{mA}$)
Setting Temperature Coefficient (% of Output + Offset) / °C	Voltage	$\leq 20 \text{PPM}/^\circ\text{C}$
	Current	$\leq 50 \text{PPM}/^\circ\text{C}$
Readback Temperature Coefficient (% of Output + Offset) / °C	Voltage	$\leq 20 \text{PPM}/^\circ\text{C}$
	Current	$\leq 50 \text{PPM}/^\circ\text{C}$
Rise Time(no load)	Voltage	$\leq 60 \text{ms}$
Rise Time(full load)	Voltage	$\leq 150 \text{ms}$
Fall Time(no load)	Voltage	$\leq 4 \text{s}$
Fall Time(full load)	Voltage	$\leq 200 \text{ms}$
Transient Response Time	Voltage	$\leq 1 \text{ms}$
AC Input	Voltage	$220 \text{V} \pm 20\% (1850 \text{W})$
		$110 \text{V} \pm 10\% (\text{derating to } 1500 \text{W})$
	Frequency	47-63Hz
Setup stability-30min (% of Output + Offset)	Voltage	0.01% + 16mV
	Current	0.04% + 10mA
Setup stability-8h (% of Output + Offset)	Voltage	0.01% + 20mV
	Current	0.04% + 12mA
Readback stability-30min (% of Output + Offset)	Voltage	0.01% + 16mV
	Current	0.04% + 10mA
Readback stability-8h (% of Output + Offset)	Voltage	0.01% + 20mV
	Current	0.04% + 12mA
Efficiency		91%
Remote Sense Compensation Voltage		$\leq 3 \text{V}$
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		18A
Maximum Input Apparent Power		2300VA
Storage Temperature		$-10^\circ\text{C} \sim 70^\circ\text{C}$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3133E
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.11 IT-M3134E

Parameter		IT-M3134E
Rated value	Voltage	0 ~ 300V
	Current	0 ~ 20A
	Power	0 ~ 1850W
Line Regulation ±(% of Output+Offset)	Voltage	0.001%+10mV
	Current	≤8mA
Load Regulation ±(% of Output+Offset)	Voltage	0.004%+20mV
	Current	≤10mA
Setup Resolution	Voltage	10mV
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3134E
	Current	$\leq 0.1\% + 0.1\%F.S.$
	Power	$\leq 0.5\%F.S.$
Ripple (20hz-20Mhz)	Vp-p	typical value ≤ 300 mV(MAX: ≤ 300 mV)
	Irms	typical value ≤ 20 mA(MAX: ≤ 20 mA)
Setting Temperature Coef- ficient (%of Output+Offset)/ °C	Voltage	≤ 20 PPM/°C
	Current	≤ 50 PPM/°C
Readback Temperature Coefficient (%of Output +Offset)/°C	Voltage	≤ 20 PPM/°C
	Current	≤ 50 PPM/°C
Rise Time(no load)	Voltage	≤ 60 ms
Rise Time(full load)	Voltage	≤ 150 ms
Fall Time(no load)	Voltage	≤ 5 s
Fall Time(full load)	Voltage	≤ 200 ms
Transient Response Time	Voltage	≤ 1 ms
AC Input	Voltage	$220V \pm 20\%$ (1850W)
		$110V \pm 10\%$ (derating to 1500W)
	Frequency	50/60Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+60mV
	Current	0.04%+5mA
Setup stability-8h (%of Out- put +Offset)	Voltage	0.01%+75mV
	Current	0.04%+6mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+60mV
	Current	0.04%+5mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+75mV
	Current	0.04%+6mA
Efficiency		91%
Remote Sense Compensation Voltage		≤ 3 V
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		18A
Maximum Input Apparent Power		2300VA
Storage Temperature		-10°C ~ 70°C
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense re- verse connection protection

Parameter	IT-M3134E
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.12 IT-M3135E

Parameter		IT-M3135E
Rated value	Voltage	0 ~ 600V
	Current	0 ~ 10A
	Power	0 ~ 1850W
Line Regulation ±(% of Output+Offset)	Voltage	0.001%+20mV
	Current	≤4mA
Load Regulation ±(% of Output+Offset)	Voltage	0.004%+30mV
	Current	≤7mA
Setup Resolution	Voltage	10mV
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	10mV
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3135E
	Current	$\leq 0.1\% + 0.1\%F.S.$
	Power	$\leq 0.5\%F.S.$
Ripple (20hz-20Mhz)	Vp-p	typical value ≤ 600 mV(MAX: ≤ 600 mV)
	Irms	typical value ≤ 10 mA(MAX: ≤ 10 mA)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	≤ 20 PPM/ $^{\circ}C$
	Current	≤ 50 PPM/ $^{\circ}C$
Readback Temperature Coefficient (%of Output +Offset)/ $^{\circ}C$	Voltage	≤ 20 PPM/ $^{\circ}C$
	Current	≤ 50 PPM/ $^{\circ}C$
Rise Time(no load)	Voltage	≤ 60 ms
Rise Time(full load)	Voltage	≤ 150 ms
Fall Time(no load)	Voltage	≤ 5 S
Fall Time(full load)	Voltage	≤ 200 ms
Transient Response Time	Voltage	≤ 1 ms
AC Input	Voltage	$220V \pm 20\%$ (1850W)
		$110V \pm 10\%$ (derating to 1500W)
	Frequency	47-63Hz
Setup stability-30min (%of Output +Offset)	Voltage	0.01%+80mV
	Current	0.04%+2mA
Setup stability-8h (%of Output +Offset)	Voltage	0.01%+100mV
	Current	0.04%+3mA
Readback stability-30min (%of Output +Offset)	Voltage	0.01%+80mV
	Current	0.04%+2mA
Readback stability-8h (%of Output +Offset)	Voltage	0.01%+100mV
	Current	0.04%+3mA
Efficiency		91%
Remote Sense Compensation Voltage		≤ 6 V
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		18A
Maximum Input Apparent Power		2300VA
Storage Temperature		$-10^{\circ}C \sim 70^{\circ}C$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3135E
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	600VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.13 IT-M3136E

Parameter	IT-M3136E	
Rated value	Voltage	0 ~ 1000V
	Current	0 ~ 6A
	Power	0 ~ 1850W
Line Regulation ±(% of Output+Offset)	Voltage	0.002%+20mV
	Current	≤2mA
Load Regulation ±(% of Output+Offset)	Voltage	0.005%+50mV
	Current	≤4mA
Setup Resolution	Voltage	0.1V
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	0.1V
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3136E
	Current	$\leq 0.1\% + 0.1\% \text{F.S.}$
	Power	$\leq 0.5\% \text{F.S.}$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 1\text{V}$ (MAX: $\leq 1\text{V}$)
	Irms	typical value $\leq 6\text{mA}$ (MAX: $\leq 6\text{mA}$)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}\text{C}$	Voltage	$\leq 20\text{PPM}/^{\circ}\text{C}$
	Current	$\leq 50\text{PPM}/^{\circ}\text{C}$
Readback Temperature Coefficient (%of Output +Offset)/ $^{\circ}\text{C}$	Voltage	$\leq 20\text{PPM}/^{\circ}\text{C}$
	Current	$\leq 50\text{PPM}/^{\circ}\text{C}$
Rise Time(no load)	Voltage	$\leq 60\text{mS}$
Rise Time(full load)	Voltage	$\leq 150\text{mS}$
Fall Time(no load)	Voltage	$\leq 5\text{S}$
Fall Time(full load)	Voltage	$\leq 200\text{mS}$
Transient Response Time	Voltage	$\leq 1\text{mS}$
AC Input	Voltage	$220\text{V} \pm 20\%$ (1850W)
		$110\text{V} \pm 10\%$ (derating to 1500W)
	Frequency	50/60Hz
Setup stability-30min (%of Output +Offset)	Voltage	$0.01\% + 60\text{mV}$
	Current	$0.04\% + 2\text{mA}$
Setup stability-8h (%of Output +Offset)	Voltage	$0.01\% + 100\text{mV}$
	Current	$0.04\% + 3\text{mA}$
Readback stability-30min (%of Output +Offset)	Voltage	$0.01\% + 60\text{mV}$
	Current	$0.04\% + 2\text{mA}$
Readback stability-8h (%of Output +Offset)	Voltage	$0.01\% + 100\text{mV}$
	Current	$0.04\% + 3\text{mA}$
Efficiency		91%
Remote Sense Compensation Voltage		$\leq 6\text{V}$
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		18A
Maximum Input Apparent Power		2300VA
Storage Temperature		$-10^{\circ}\text{C} \sim 70^{\circ}\text{C}$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3136E
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	1000VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.1.14 IT-M3137E

Parameter	IT-M3137E	
Rated value	Voltage	0 ~ 1200V
	Current	0 ~ 5A
	Power	0 ~ 1850W
Line Regulation ±(% of Output+Offset)	Voltage	0.002%+20mV
	Current	≤2mA
Load Regulation ±(% of Output+Offset)	Voltage	0.005%+50mV
	Current	≤4mA
Setup Resolution	Voltage	0.1V
	Current	1mA
	Power	0.1W
Read Back Resolution	Voltage	0.1V
	Current	1mA
Setup Accuracy	Voltage	≤0.03% + 0.02%F.S.
	Current	≤0.1% + 0.1%F.S.
	Power	≤0.5%F.S.
Read Back Accuracy	Voltage	≤0.03% + 0.02%F.S.

Parameter		IT-M3137E
	Current	$\leq 0.1\% + 0.1\%F.S.$
	Power	$\leq 0.5\%F.S.$
Ripple (20hz-20Mhz)	Vp-p	typical value $\leq 1V$ (MAX: $\leq 1V$)
	Irms	typical value $\leq 6mA$ (MAX: $\leq 6mA$)
Setting Temperature Coefficient (%of Output+Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Readback Temperature Coefficient (%of Output +Offset)/ $^{\circ}C$	Voltage	$\leq 20PPM/^{\circ}C$
	Current	$\leq 50PPM/^{\circ}C$
Rise Time(no load)	Voltage	$\leq 60mS$
Rise Time(full load)	Voltage	$\leq 150mS$
Fall Time(no load)	Voltage	$\leq 5S$
Fall Time(full load)	Voltage	$\leq 200mS$
Transient Response Time	Voltage	$\leq 1mS$
AC Input	Voltage	$220V \pm 20\%$ (1850W)
		$110V \pm 10\%$ (derating to 1500W)
	Frequency	50/60Hz
Setup stability-30min (%of Output +Offset)	Voltage	$0.01\% + 60mV$
	Current	$0.04\% + 1mA$
Setup stability-8h (%of Output +Offset)	Voltage	$0.01\% + 100mV$
	Current	$0.04\% + 2mA$
Readback stability-30min (%of Output +Offset)	Voltage	$0.01\% + 60mV$
	Current	$0.04\% + 1mA$
Readback stability-8h (%of Output +Offset)	Voltage	$0.01\% + 100mV$
	Current	$0.04\% + 2mA$
Efficiency		91%
Remote Sense Compensation Voltage		$\leq 6V$
Command Response Time		5ms
Power Factor		0.99
Maximum Input Current		18A
Maximum Input Apparent Power		2300VA
Storage Temperature		$-10^{\circ}C \sim 70^{\circ}C$
Protective Function		OVP, OCP, OTP, OPP, UVP, UCP, Sense reverse connection protection

Parameter	IT-M3137E
Standard Interface	Standard: USB, LAN Optional: RS232&analog, GPIB
Isolation (output to ground)	1000VDC
Isolation (input to ground)	2200VDC
Working Temperature	0 ~ 40°C
Parallel Number	Not support
Series Number	Not support
IP	IP20
Safety Standard	IEC 61010
Cooling	Air
Bare metal size (mm)	213W*450D*88H
Whole machine size (mm)	255W*530D*109H
Weight(net)	(8±1) kg

5.2 Supplemental Characteristics

State storage capacity: 10 sets

Recommended calibration frequency: once a year

Cooling style: fans

6 Routine Maintenance

This chapter describes the general maintenance items and maintenance methods of the DC power supply.

- ◆ Instrument Self-Test
- ◆ Cleaning and Maintenance
- ◆ Contact of ITECH Engineers
- ◆ Return for Repair

6.1 Instrument Self-Test

Self-test checks that the minimum set of logic and power mesh systems are functioning properly. Self-test does not enable the output or place any voltages on the output. Self-test can be achieved in two ways:

- Re-start the instrument. Each time the instrument is powered on, the self-test is performed. This test assumes that the instrument is running.
- SCPI command: *TST?. If the return value is 0, the self-test passes; if it is 1, the self-test fails. If the self-test fails, please send command **SYSTem:ER-Ror?** to view the self-test error. Please refer to *IT-M3140 Programming Guide* for the list of error codes.



Note

Ensure that all test cables connections are removed when self-test is performed. During self-test, errors may be induced by signals present on external wiring, such as long test leads that can act as antennae.

6.2 Cleaning and Maintenance

To ensure the safety function and performance of the instrument, please clean and maintain the instrument properly.

WARNING

- **To prevent electrical shock, disconnect the instrument from AC mains power and disconnect all test leads before cleaning.**
 - **Do not use detergent or solvents.**
 - **Do not disassemble the instrument and attempt to clean internally.**
-

Clean the outside and the front panel screen of the instrument using a soft, lint-free, cloth slightly dampened with water. Use a brush to clean the dust on the vent and cooling fans.

6.3 Contact of ITECH Engineers

This section describes operations to be carried out by the user in case of failure of the instrument.

Preparation before contact

When the instrument fails, you should make the following preparations before returning the instrument to ITECH for repair or contacting engineers.

- Check all the items listed in the [Self-inspection of equipment faults](#) and confirm whether there are still some problems.
- Collect the SN of the instrument.
For details, see [Collect the SN number](#).

If there are still some problems, carefully read the **Warranty** and **Limitation of Warranty** in the preface of the manual. Confirm that your instrument complies with warranty service conditions. If after your warranty expires, ITECH offers repair services at competitive prices.

Self-inspection of equipment faults

When the instrument fails, make the following checks to ensure that the failure is in the instrument rather than any external connections. If the instrument failure can be eliminated via simple inspection, the maintenance cost and time can be saved.

- Check whether the AC power cord is securely connected to the instrument and to a powered outlet.
- Check whether the front-panel Power On switch has been pushed.
- Check whether self-inspection of the instrument is successful and whether the specifications and performance are within the indicator ranges.

- Check whether the instrument displays error information.
- Use other instruments instead of this instrument for confirmation.

Collect the SN number

ITECH will constantly improve the product performance, availability and reliability. The service personnel of ITECH will record changes of each instrument. All relevant information is marked uniquely according to the serial number of each instrument. The equipment returned for repair must adopt the SN number as the tracking ID.

When you contact the engineer, the effective SN number of the instrument will be the effective guarantee for effective service and complete information. You can obtain the SN number of the instrument by the following ways:

1. Press **[Shift]+[Save]** (System) to enter into the system menu interface.
2. Use left and right keys or rotate the knob to select **System Info** and press **[Enter]** key.
3. Use left and right keys or knob to view the SN number.

Please record the SN number and provide SN information when doing maintenance service.

How to contact ITECH engineers

Access ITECH official website www.itechate.com or call the service number 4006-025-000 for technical support and services.

6.4 Return for Repair

If your instrument fails during the warranty period, ITECH will repair or replace it under the terms of your warranty. After your warranty expires, ITECH offers repair services at competitive prices. Also you can purchase an extended maintenance service contract that exceeds the standard warranty period.

Get Repair Service

To get the service for your instrument, choose the easiest way to contact the ITECH engineers. ITECH will arrange for repair or replacement of your instrument or provide warranty and repair cost information (if applicable).

Repackaging for Shipment

CAUTION

Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the instrument or prevent it from shifting in the carton. Styrene pellets cause the instrument damage by generating static electricity and by lodging in the rear panel.

ITECH recommends that you retain the original shipping carton for return shipments and always insure shipments. To ship the unit to ITECH for service or repair:

1. Download the **ITECH maintenance service application** from our website, complete it and place it in the box with the instrument.
2. Place the unit in its original container with appropriate packaging material.

If the original shipping container is unavailable, use a container that will ensure at least 10 cm (4 in.) of compressible packaging material around the entire instrument. Use static-free packaging materials.

3. Secure the container with strong tape or metal bands.

A Appendix

◆ Specifications of Red and Black Test Cables

A.1 Specifications of Red and Black Test Cables

ITECH provides you with optional red and black test cables, which are sold individually and you can select for test. For specifications of ITECH test cables and maximum current values, refer to the table below.

Model	Specification	Length	Description
IT-E30110-AB	10A	1m	A pair of red and black test cables with an alligator clip at one end and a banana plug at the other end
IT-E30110-BB	10A	1m	A pair of red and black test cables with banana plugs at both ends
IT-E30110-BY	10A	1m	A pair of red and black test cables with a banana plug at one end and a Y-terminal at the other end
IT-E30312-YY	30A	1.2m	A pair of red and black test cables with Y-terminals at both ends
IT-E30320-YY	30A	2m	A pair of red and black test cables with Y-terminals at both ends
IT-E30615-OO	60A	1.5m	A pair of red and black test cables with round terminals at both ends
IT-E31220-OO	120A	2m	A pair of red and black test cables with round terminals at both ends

Model	Specifica- tion	Length	Description
IT-E32410-OO	240A	1m	A pair of red and black test ca- bles with round terminals at both ends
IT-E32420-OO	240A	2m	A pair of red and black test ca- bles with round terminals at both ends
IT-E33620-OO	360A	2m	A pair of red and black test ca- bles with round terminals at both ends

For maximum current of AWG copper wire, refer to table below.

AWG	8	10	12	14	16	18	20	22	24	26	28
The Maxi- mum Current Value (A)	60	40	30	20	13	10	7	5	3.5	2.5	1.7



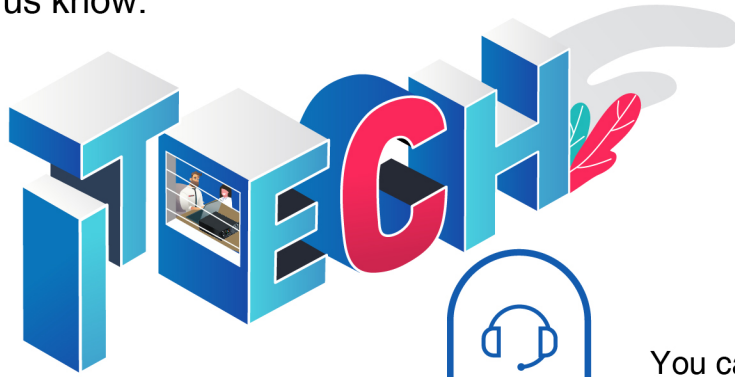
Note

- AWG (American Wire Gage), it means X wire (marked on the wire). The table above lists current capacity of single wire at working temperature of 30°C. For reference only.
- Along with temperature, you must also consider voltage drop when selecting wire sizes.

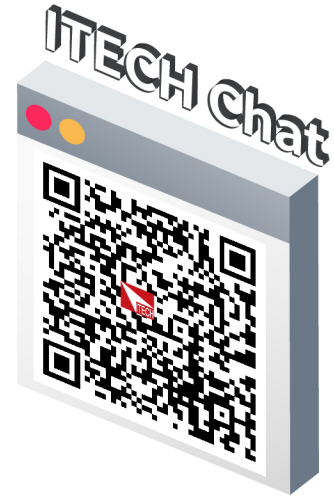
Although the instrument will compensate for the voltage in the wires, it is recommended to minimize the voltage drop as much as possible to prevent excessive power consumption from the instrument and poor dynamic response to load changes. Larger diameter wire sizes will help minimize wire voltage drops. Twisting or bundling wires will help reduce transient voltage drops.

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