Faith费思®

Programmable DC Power Supply User's Manual

(FTP3000 Series)

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Preface

Dear Sirs,

Thank you for purchasing Faithtech FTP3000 series programmable DC power supplies. This manual contains detailed information about FTP3000 Series' installation, operation, and specifications, etc.. Please read this manual carefully for using this product safely and correctly, especially safety precautions. Please keep this manual properly for future use.

Notice

All rights are reserved by Faithtech. This manual is only for reference. Information may be revised without prior notice. Faithtech shall not be liable for possible errors or damages caused by using this manual. Please visit our website http://www.faithtech.cn for latest information.

Product Warranty

Faithtech promises that specifications and features of FTP3000 Series power supplies have completely met all technical indexes claimed in this manual. We strictly check raw materials and manufacturing technology to ensure the stability and credulity of products.

Warranty Service

From the date of purchase warranty, within the one-year warranty period, Faithtech will provide free repair for all faults in the normal usage and maintenance of the product. The user need prepay one-way freight for sending the product to the service department. The return freight will be paid by Faithtech. If products are returned from other countries for maintenance service, then you should pay all freight, duties and other taxes.

Warranty Limitation

The warranty is only limited to the power supply host. Faithtech will not provide free repair if the product is damaged by misuse, negligence, unauthorized modifications, abnormal application environment or force majeure, instead Faithtech shall provide estimated maintenance cost before the repair.

This warranty is in lieu of all other warranties. Faithtech does not make any other warranties, expressed or implied, including guarantees of merchantability, reasonableness and applicability of certain specific applications, which might arise in the contract, civil negligence or others.

Faithtech assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. High voltage used in some instruments may be dangerous if misused. Special disclaimers apply to these instruments. Faithtech assumes no liability for any special, incidental or indirect damages.

Safety Abstract

Please observe important safety instructions strictly in the process of operating and using the power supply. Not observing safety precautions or warnings in this manual will probably weaken protective functions provided by the power supply. Faithtech will not assume any liability for damages if the user does not observe those safety precautions.

Important Safety Instructions

Ensure proper grounding. Before turning on the power supply, please make sure that the power supply is reliably grounded to prevent electric shock.

- **Single phase 220VAC input**. Make sure the input wire meets the specified standards, and a protective cover must be installed to prevent electric shock.
- **Output cable connection**. Make sure the output wire meets the specified standards, and a protective cover must be installed to prevent electric shock.
- **Do not open the instrument case**. Operators are not allowed to open the shell of the power supply. Non-professionals are not allowed to repair or adjust.
- **Do not use in a hazardous or dangerous manner** either alone or in conjunction with other equipment. Operating in inflammable or explosive environment is strictly forbidden.

Safety Symbols

Please see the following table for meanings of international symbols applied in the mainframe or the user's manual.



WARNING: To avoid injury, death of personnel, or damage to the instrument, the operator must refer to the explanation in the instruction manual.



High temperature: This symbol indicates the temperature is hazardous to human beings. Do not touch it to avoid any personal injury.



DANGER: High voltage.



Protective grounding terminal: This symbol indicates that the terminal must be connected to ground before operation of the equipment to protect against electrical shock in case of a fault.



AWARNING	The WARNING sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury to, or death of personnel or long term heath hazards.
CAUTION	The CAUTION sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of equipment.
Notice	The Notice sign highlights an essential operating or maintenance procedure, condition, or statement.

More safety symbols table

Symbol	Meaning	Symbol	Meaning
====	Direct Current (DC)	N	Neutral Line
\sim	Alternating Current (AC)	L	Live Line
\sim	Alternating and Direct Current	PE	Protective Earth Line
3~	3 Phase AC Current	10	On / Off (Power)
Ŧ	Earth	Φ	Back up (Power)
Ţ	Signal Earth	д	Press (Button switch)
4	Mainframe or Chassis	Д	Pop (Button switch)

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1. General Description

1.1 Overview

FTP3000 series programmable DC power supply is a power supply with super practicality and versatility developed by Faith after years of experience in the design and development of DC switching power supplies. FTP3000 series power output range 900W/1500W, output voltage up to 600V, current up to 80A. It can be widely used in various test environment such as laboratory test, vehicle equipment test, solar inverter test, DC/DC converter and inverter test, engine start test, automatic battery charging, and electronic product life cycle test.

1.2 Main features

- Output voltages: 40 V, 80 V, 150 V, 300 V, 600 V;
- Output current: 5 A, 10 A, 20 A, 40 A, 80 A;
- Output power: 900 W, 1500 W;
- Constant power output;
- Precision V & I measurement;
- High speed programming;
- 1ms typical transient response;
- Programmable sequence;
- Voltage & current slew rate control;
- CV / CC priority start;
- Foldback protection;
- Wide operating region for output;
- Internal resistance simulating;
- Remote sense compensation;
- Optional analog programming & monitoring interface;
- ±OVP, ±OCP, ±OPP, OTP, ±LVP;
- Voltage limit, current limit;
- Standard RS232, LAN, optional GPIB and CAN ports;
- SCPI and ModBus RTU protocol
- TFT color LCD display.



1.3 Dimension diagram



1.4 Model Naming



1.5 Specification sheet

Specification table-1						
Model	FTP3009-40-80	FTP3009-80-40	FTP3009-150-20 FTP3009-300-10		FTP3009-600-5	
Voltage	0~40V	0~80V	0~150V	0~300V	0~600V	
Current	0~80A	0~40A	0~20A	0~10A	0~5A	
Power			900W			
Model	FTP3015-40-80	FTP3015-80-40	FTP3015-150-20	FTP3015-300-10	FTP3015-600-5	
Voltage	0~40V	0~80V	0~150V	0~300V	0~600V	
Current	0~80A	0~40A	0~20A	0~10A	0~5A	
Power	1500W					
	Voltage programming					
Resolution	16Bits					
Accuracy	0.1%+0.1%F.S.					
		Current pro	gramming			
Resolution			16Bits			
Accuracy	0.1%+0.2% F.S.					
External analog programming						
Control voltage		$0\sim$ 5V corresponds to $0\sim$ 100%F.S.				
Voltage accuracy	0.2%F.S.					
Current accuracy			0.5%F.S.			

		Analog	output		
Output voltage		0~100)%F.S. corresponds t	o 0∼5V.	
Voltage accuracy			0.5%F.S.		
Current accuracy			0.5%F.S.		
		Line reg	Julation		
Voltage			0.01%+0.01%F.S.		
Current			0.02%+0.01%F.S.		
		Load reg	gulation		
Voltage			0.01%+0.05%F.S.		
Current			0.02%+0.1%F.S.		
		Voltage me	asurement		
Resolution			16Bits		
Accuracy			0.1%+0.1%F.S.		
		Current me	asurement		
Resolution			16Bits		
Accuracy	0.1%+0.2%F.S.				
		Output noi:	se & ripple		_
Ripple Vpp	40mV	60mV	80mV	150mV	300mV
Ripple Vrms	10mV	20mV	20mV	30mV	60mV
Slew rate					
Voltage		5V/ms(max)			
Current			2A/ms(max)		
		OVP s	etting		
Range			0~110%F.S.		
Accuracy			1%F.S.		
Transient response	Typical 1ms	voltage recover t	o the designed accu	iracy after a 50% ch	ange of load
Efficiency	0.9(Typical)				
Communication	RS232, LAN				
INPUT		190VAC~265VAC, 47Hz~63Hz, PF: 0.99(Typical)			
Working temp			0°C~40°C		
Storage temp			-20℃~70℃		
Altitude			<2000m		
Size		215	(W)×88(H)×452.5(D))mm	
Weight			7kg		

2. Quick Guide

2.1 Checking Goods

Upon reception of the power supply, please examine the equipment according to procedures stipulated as below.

(1) Check if there is damage during transportation.

Contact authorized dealer or Faithtech after-sale service immediately if the packing or protective cushion is severely damaged.

Notice Do not return the instrument without obtaining prior approval from Faithtech.

(2) Check for the accessories.

Make sure you have received the following accessories along with the power supply:

Accessory	QTY	Explanation
AC input power cable	1 PCS	220VAC input power cable
RS232 communication cable	1 PCS	For connecting PC and RS232 port
LAN communication cable	1 PCS	For connecting PC and LAN port
User Manual	1 PCS	Installing and operation info
CD Disk	1 PCS	Tech info
Warranty and after-sale info	1 PCS	Warranty and after-sale info

Table 2-1 Accessories Explanation

Contact authorized dealer or Faithtech after-sale service immediately if there is damage or miss.

(3) Check for the power supply unit.

Contact authorized dealer or Faithtech after-sale service immediately if the power supply case is damaged or working abnormally.

(4) Cleaning.

If you need to clean the casing of the machine, please wipe it gently with a dry cloth or a slightly damp cloth. Do not wipe the inside of the machine.

WARNING Turn off the power supply before cleaning.

2.2 Front Panel



Figure 2-1 FTP3000 Front Panel

- 1 Power switch
- 2 Multi-function key
- \circledast TFT color screen
- ④ Numeric number key and decimal point key (input data or work with "shift" key for compound operation.
- 5 Cursor Move Direction key and Enter key
- ⁽⁶⁾ Power supply Output terminal
- 7 V-sense terminal
- ⑧ Adjusting rotary knob

2.3 Keyboard



Figure 2-2 FTP3000 keyboard



Button	Description			
	Multi-function key, the corresponding key function is displayed in screen above the key			
0~0	Input numeric numbers, or work with "Shift" key to perform the functions underneath			
\odot	Decimal point key			
Esc	Exit edit state or current menu.			
\checkmark	Cursor move up			
$\langle \mathbf{v} \rangle$	Cursor move down			
\bullet	Cursor move left			
(\cdot)	Cursor move right			
Enter	Enter into sub item, or enter into edit state, or confirm input parameter.			

Table 2-2 Key Function Descriptions

Table	2-3	Compound	Operation	Descriptions

Button	Description
Shift + (4)	Save present parameter setting into internal memory location
Shift + (5)	Recall the saved parameters
Shift + 6	Clear protection state and information
Shift + 7	Select advance test function
Shift + (8)	Enter into menu setting
Shift + 9	Lock/unlock the keyboard
Shift + .	Trigger

2.4 Screen Display



Figure 2-3 MAIN PAGE Display

- ① Status prompt area; ② Readback voltage, current, etc. parameters display area;
- ③ Parameter setting area; ④ Multi-function key indication;

About Status prompt area:

- Output mode: CV, CC
- Analog programming: Blank (analog program is Off), P-U, P-I, P-UI
- V-SENSE: Blank (local sensing), Sense (Remote sensing)
- Protection: Blank (no protection occurred), PFCF, SDF, OT, OCP, OPP, LVP, AMP, E01, E02, OC, OP, OV, OVP, OCVP, RVP, COMF
- Output indicator: Off (output turned off), On (output turned on)

About readback V, I parameters display area:

Displays readback voltage, current, power, measurement result etc.. However, the actual displayed information varies, for example, in voltage/current static output mode, the area displays output voltage, current and power; in sequence test mode, the area displays output voltage, current, sequence current steps and sequence cycle times.

About parameters setting area:

- 1. Rotate the rotary knob or press the direction key to move the cursor to the parameter to be edited;
- 2. Press "Enter" key to enter into parameter edit state;
- 3. Press numeric number key or rotate the rotary knob to input value;
- 4. Press "Enter" to validate the input and exit editing state.

About multi-function key indication:

(V-set): switch to VI (constant voltage/current) output mode, cursor is in voltage parameter;

(I-set) : switch to VI (constant voltage/current) output mode, cursor is in current parameter;

(Shift): work with number key together for performing functions written underneath;

(0n/0ff): Turn on/off power supply output.

2.5 Rear Panel



Figure 2-4 FTP3000 Rear Panel

Item	Name	Description
1	CAN (optional)	The remote controller uses the CAN connector to connect to a PC for remote operation.
2	RS232	The remote controller uses the RS232 connector to connect to a PC for remote operation.
3	Ventilation port	Ventilation
4	Analog interface (optional)	This interface has the functions of analog programming input, voltage/current monitoring output, external control, power supply status and work mode digital signal output.
5	LAN	The remote controller uses the LAN connector to connect to a PC for remote operation.
6	AC INPUT	Single phase AC input: 190VAC~265VAC, 47~63Hz;
7	Ventilation port	Ventilation

2.6 Installing

2.6.1 Preparation For Use

(1) Ensure the Power Supply is connected to the AC line input that meets the specification.

(2) The instrument must be installed in an area with good air circulation to avoid the internal temperature getting too high.

(3) For indoor use only, ambient temperature 0°C to 40°C.

2.6.2 Requirements of Input Power

Please pay attention to the following items for FTP3000 series power supply input connection:

① Single phase AC input: 190VAC~265VAC, 47~63Hz;

⁽²⁾ The AC input power cord is a 3-core cable with grounding connection, DO NOT operate the instrument if there is no proper socket;

③ There is 1PCS AC input power cable included with the accessories, which should be compatible with your local electric voltage. Contact Faithtech agent or after-sale service immediately if you find the input cable is not matching with the power supply AC input terminal.

The instrument provides mainframe grounding connection via 3-core power cable. Make sure there is proper ground connection in applying socket before operation. Under no circumstances shall this DC Power Supply be operated without an adequate ground connection.

2.6.3 Power ON Self Check

When powered on, the power supply will conduct self check, the check process and results will be displayed on the screen, such as below:



Figure 2-5 FTP3000 Power ON Self Check

The power supply will enter MAIN PAGE if all checking results are OK, otherwise it will wait for 3 seconds before entering MAIN PAGE.

If there is FAULT during power supply power on self check, please refer to "Table 5-2 Power On Self-Check Fault".

2.7 Connection

2.7.1 Output Connection

The device under test positive and negative input terminal is connected to the "+" and "-" output terminals on the front panel of the power supply respectively. When connecting, pay attention to the wire diameter, length and polarity of the output cable. To prevent the wire diameter from being too small to affect the test accuracy and generate large heat to cause safety accidents, please refer to "Table 6-1 Recommended Wire Diameters for Cables" for wire diameter selection.



Figure 2-6 Power Supply Output Connection

CAUTION The diameter of the wire connected to the load must be adequate so as to carry the maximum applied current.

2.7.2 V-Sensing Connection

There are two kinds of V-sensing: local V-sensing and remote V-sensing.

FTP3000 series power supplies are able to compensate for the voltage drop caused by output connecting cables. For remote sensing, be sure to connect the power supply's remote sense connector "+S" to the load's positive input terminal and the "-S" connector to the load's negative input terminal. **Do not reverse the connections.**



Figure 2-7 Power Supply Remote V-Sense Connection

2.7.3 Analog Interface

FTP3000 series power supply provides optional analog Interface at its rear panel. This interface has the functions of analog programming input, voltage/current monitoring output, external digital signal input, power supply status and work mode digital signal output.



Figure 2-8 Analog Interface

Table	2-5	Analog	Interface	PIN	Function	Description

PIN	Name	I/O	Description		
1	VSET-	Input	Power supply voltage analog programming port negative terminal, input signal range $0{\sim}5V$		
2	VSET+	Input	Power supply voltage analog programming port positive terminal, input signal range $0{\sim}5V$		
3	ISET-	Input	Power supply current analog programming port negative terminal, input signal range 0~5V		
4	ISET+	Input	Power supply current analog programming port positive terminal, input signal range 0~5V		
5	GND		Reference ground		
6	IMON	Output	Power supply output current monitoring port, monitor output range 0~5V		
7	GND		Reference ground		
8	VMON	Output	Power supply output voltage monitoring port, monitor output range 0~5V		
9	MODE	Output	Output mode indicating port. The port outputs low level signal under CV mode, high level signal under CC mode		
10	GND		Reference ground		
11	INHIBIT	Input	External control, used as trigger signal or output on/off control signal		
12	READY	Output	Power supply working state indicator, the port outputs High level signal if working normally, low level signal if fault or protection		

The digital signal level is 0~5V.
 CAUTION 2. The analog interface terminal is electrically isolated from the power supply output terminal.

3. Function Introduction

This chapter describes the main functions and characteristics of the power supply. Reading this chapter, you will have a deeper understanding of FTP3000 series power supplies.

3.1 Local & remote operation mode

The power supply provides two operation modes: local operation and remote operation. In the local operation mode, the user mainly operates through the keyboard and knob on the front panel, and checks the power status through the LCD display; in the remote operation mode, the user mainly performs settings and operations via the communication interface and programming commands.

Local operation mode

When the power supply is turned on, it operates in local operation mode by default. In this mode, the user operates the power supply through the front panel keyboard and rotary knob. The LCD screen provides users with display functions such as parameter viewing, measurement display and status indication.

Some parameters can only be set in local mode, including:

- System language
- Serial port baud rate and parity method
- Key sound
- IP address and subnet mask
- Communication protocol

Remote operation mode

To enter the remote operation mode, please use the proper communication cable to connect the PC with the power supply. The communication configuration parameters must be consistent with the control device settings. Upon receiving the programming command, the power supply automatically switches to the remote operation mode from local control mode.

In remote control mode, all other keys are disabled except (Enter) key, and the power supply can only be

controlled by programming commands. Press (Enter) on the front panel to return to local operation mode.

3.2 Menu Layout

3.2.1 Set Menu

(Shift) + (Menu) to enter into main menu, then select "Set" and press



sub menu as below:

Press

Table 3-1	Set Menu Layo	Dut
	IP	Default 192.168.1.123
	S-Mask	Default 255.255.255.0
	Baud	Serial port baud rate, 4800/9600/19200/38400/115200, default: 9600.
	Parity	None/odd parity/even parity, default: None
System	Sound	Keyboard sound ON/OFF. Default: ON
	Power Save	Power down save function ON/OFF. Default: ON
	Language	Simplified Chinese/Traditional Chinese/English. Default: English.
	Shortcut	Fast recall function ON/OFF. Default: Off
	Power On	Define power supply output On/Off state at its power on moment. Default: Off
	V_MAX	Upper limit of static VI output voltage set , default 100%F.S. output voltage
	V_MIN	Lower limit of static VI output voltage set, default 0
	I_MAX	Upper limit of static VI output current set, default 100%F.S. output current
Output	I_MIN	Lower limit of static VI output current set, default 0
	V_SLEW	Set Voltage slew rate for static VI output, range: 0.001V/s~5000V/s, default 5000V/s
	I_SLEW	Set current slew rate for static VI output, range: 0.001A/s~2000A/s, default 2000A/s
	OVP	Set overvoltage protection threshold, set 0 to turn off this protection, default 0
	ОСР	Set overcurrent protection threshold, set 0 to turn off this protection, default 0
	OPP	Set overpower protection threshold, set 0 to turn off this protection, , default 0
	FoldBack	Monitor output mode, protection is triggered when mode changes, settable among choices: OFF / CC-to-CV / CV-to-CC, default set OFF
Protect	Fold-Time	Output mode changes must last for a set time for protection to be triggered. Time range: 0.1s to 600.0s
	LVP	Set low voltage protection threshold, default set 0 to turn off this protection.
	Reverse	Turn on/off reverse voltage protection, default value: OFF
	Comm_Dog	Set communication time out protection, range: 0.0~3600.0s, set 0 to turn off this protection;
	Prio_Slt	Choice for CV or CC priority start. Default value: Volt (CV Priority)
	EXT-Single	Choose external control signal behavior, Trigger/Toggle/Hold, default: Trigger
	APG	Choose external programming mode, Off/U/I/U+I, default: Off.
APP Set	Response	Choose response speed in CP output mode, range 1~100%, default 50%
	Sense	Choose V-sense type, local/remote, default local
	Comm Pro	Choose communication protocol, SCPI/Modbus, default Modbus
	DevAddr	Set device address in Modbus protocol, range 0~254
Factory		Reset to factory setting. Restart the instrument for changes to take effect.

Table	3-1	Set	Menu	Layout
-------	-----	-----	------	--------



3.2.2 Edit Menu

Press (Shift) + (Menu) to enter into main menu, then select "Edit" and press "Enter" to pop up

sub menu as below:

Table	3-2	Edit	Menu	Layout

Edit	Sequence	Select sequence file number, range 1~10
	Back	Exit

3.2.3 About Menu

Press (Shift) + (Menu) to enter main menu, then select "About" and press "Enter" to pop up sub menu such as HMI, MAIN, COMM program version information etc..

3.3 VI (CV/CC) Output Function

Press (V-set) or (I-set) function key, the power supply enters into CV/CC output mode, display as below:



Figure 3-1 VI Output Function Interface

Setting output voltage

- Press (V-set) to enter into VI output page, the cursor is in "V-Set", press to go to edit state.
 Rotate the rotary knob to adjust the value, or press number key and decimal point key to enter voltage value.
- 3. Press (Enter) to validate the input.

Setting output current

- 1. Press (I-set) to enter into VI output interface, the cursor is in "I-Set", press to go to edit state.
 - 2. Rotate the rotary knob to adjust the value, or press number key and decimal point key to enter current value.
 - 3. Press (Enter) to validate the input.

Setting voltage and current upper & lower limit

The power supply provides a function for limiting the setting range of static output voltage and current. When the upper and lower limit is set to non-zero, the allowed setting range of static output voltage, current is limited between the upper and lower limit. It is useful for preventing misoperation from damaging the user's DUT. The limit function will be canceled if upper and lower limit both are set to 0.

1. Press

(Shift) + (Menu) to enter into main menu interface;

Enter 2. Select "Output" sub menu under "Set" menu, press

to enter into output set interface as following:

Set	Edit	About	
V_MAX	80.000 V		
V_MIN	0.000 V		
I_MAX	40.000 A		
I_MIN	0.000 A		
V_SLEW	5000.0 V/s		
I_SLEW	2000.0 A/s		
		Shift	

Figure 3-2 Upper & Lower Limit for V/I Setting

3. Select "V_MAX", "V_MIN", "I_MAX", "I_MIN" to set the voltage/current upper and lower limits.

3.4 Voltage Slew Rate & Current Slew Rate

FTP3000 series DC power supply supports adjustable voltage slew rate and current slew rate.

(Shift) + (Menu) to enter into main menu set interface; 1. Press

Sof

2. Select "Output" sub menu under "Set", press

Edit

to enter into output set interface as following: About

Enter

	Lun		
V_MAX	80.000 V		
V_MIN	0.000 V		
I_MAX	40.000 A		
I_MIN	0.000 A		
V_SLEW	5000.0 V/s		
LSLEW	2000.0 A/s		
	-		
		Shift	

Figure 3-3 Set Voltage/Current Slew Rate

3. Select "V_SLEW" and "I_SLEW" for setting the desired value.



3.5 CV/CC Priority Start function

FTP3000 series power supply provides CC priority and CV priority start function, which forces the power supply to operate in CC or CV mode at the moment the output is turned on, effectively avoids the current or voltage overshoot resulted from capacitive or inductive load.



- 1. Press (Shift) + (Menu) to enter main menu set interface;
- 2. Select "Output" sub menu under "Set", press (Enter) to enter into output set interface as below:

Set	Edit	About	
Prio_Slt	Volt	DevAddr	0
EXT-Signal	Trigger		
APG	OFF		
Response	50%		
Sense	Local		
Comm Pro	Modbus		
0			
		Shift	

Figure 3-5 CV, CC Priority Start Set

- 3. Select "Prio_Slt" to set the value. "Volt" stands for CV priority start. "Curr" stands for CC priority start.
- 4. Press to validate the configuration.

3.6 Output On/Off Control

When power supply is powered on, its output if Off by default. Users can control on/off state of the power supply

- via the front panel (0n/0ff) key.
- (0n/0ff) lighted up, means the output is turned on, the TFT screen displays V/I information in real time,
 - (0n/0ff) lighted off, means the output is turned off, "Off" is displayed at the screen status prompt area.

3.7 Analog Programming

FTP3000 series DC power supply provides optional analog interface at its rear panel. Users are able to control the power supply's output voltage, output current through external 0 ~ 5V DC voltage.



Figure 3-6 Analog Programming Wiring

When analog programming function is enabled, the relationship of power supply output and programming signal is as follows:



Figure 3-7 Input programming signal and output V/I relationship



- 1. Press (Shift) + (Menu) to enter into main menu set interface;
- 2. Select "APP Set" under "Set", press (Enter) to enter into APP set

to enter into APP set interface as follows:

Set		Edit	About	
Prio_Slt EXT-Signal APG		Volt Trigger OFF	DevAddr	0
Respo Sense Comn	onse e n Pro	50% Local Modbus		
Ċ.			Shift	

Figure 3-8 Analog Programming Set

3. Select "APG" to set the desired programming method, selectable among OFF, U, I, U+I

4. Press Enter t	o validate the selection
5. Press (0n/	^(0ff) to start output.
CAUTION	Modifications of the analog programming configuration are allowed only when the output of the power supply is turned OFF.

3.8 Trigger

FTP3000 series power supply provides three triggering sources:

- Keyboard trigger, press
- (Shift) + (Trigger) to implement a trigger;
- External trigger, analog interface PIN 11 can be configured as trigger signal input ("APG" menu set as "Trigger"),
- a lower level pulse input at PIN 11 can trigger, see "3.12 External Control"
- Bus trigger, triggered if power supply receives a trigger command



3.9 Protection

FTP3000 series power supply provides comprehensive protection functions, some of them are user adjustable protection functions and it is possible to set an protection threshold, while others are not. The adjustable protection functions includes protections against overvoltage (OVP), overcurrent (OCP), overpower (OPP), foldback, reverse voltage (RVP), low voltage (LVP), communication time out (Over time). Non-adjustable protections are triggered by hardware protection circuit, including overtemperature protection (OTP), over compensate voltage protection (OCVP), module fault protection (FAULT), etc..

When a protection occurs, the power supply will turn off output, sounds an alarm, and prompt corresponding protection information on display.

2. Select "Protection" sub menu under "Set", press (Enter), you will see following page for protection set:

Set	Edit	About	
OVP	0.000 V	Reverse	Off
OCP	0.000 A	Comm_Dog	0 s
OPP	0.000 w		
FoldBack	OFF		
Fold-Time	0.1 s		
LVP	0.000 V		
		Shift	

Figure 3-9 Protection Set

3. Rotate the rotary knob to select the protection to be adjusted, press "Enter" to enter into edit status;

4. Use the numeric keys and decimal point key to input data, also you can rotate the rotary knob to increase / decrease the value, or use the rotary knob to choose from different selections;

5. Press "Enter" to validate the input parameters;

6. When protection occurred, to clear the protection state, please press $(\text{Shift}) + (\text{CLR})_{\text{key.}}$

Overvoltage protection (OV/OVP)

It has two kinds of overvoltage protection: hardware overvoltage (OV) and software overvoltage (OVP).

• Hardware overvoltage protection (OV): It is triggered once the output voltage exceeds 105% rated output voltage, and "OV" is prompted on display.

• Software overvoltage protection (OVP): It is programmable as shown in "Figure 3-9 Protection Set". Users are able to set the OVP threshold, set to 0 means to turn off OVP. OVP is triggered once the output voltage exceeds OVP set, and "OVP" is prompted on display.

Over Compensate Voltage Protection (OCVP)

When using remote V-Sense, the power supply automatically compensate the voltage drop resulted from line loss, OCVP is triggered if the compensate voltage is too high and OCVP is prompted on screen.



Overcurrent protection (OC/OCP)

It has two kinds of overcurrent protection: hardware overcurrent (OC) and software overcurrent (OCP).

• Hardware overcurrent protection (OC): It is triggered once the output current exceeds 110% rated output current, and "OC" is prompted on display.

• Software overcurrent protection (OCP): It is programmable as shown in "Figure 3-9 Protection Set". Users are able to set the OCP threshold, set to 0 means to turn off OCP. OCP is triggered once the output current exceeds OCP set, and "OCP" is prompted on display.

Overpower protection (OP/OPP)

It has two kinds of overpower protection: hardware overpower (OP) and software overpower (OPP).

• Hardware overpower protection (OP): It is triggered once the output power exceeds 110% rated output power, and "OP" is prompted on display.

• Software overpower protection (OPP): It is programmable as shown in "Figure 3-9 Protection Set". Users are able to set the OPP threshold, set to 0 means to turn off OPP. OPP is triggered once the output power exceeds OPP set, and "OPP" is prompted on display.

Overtemperature protection

It is triggered once the temperature of inner power components exceeds allowed temperature range (80 $^{\circ}$ C), "OT" is prompted on display.

Reverse voltage warning (RVP)

It is triggered once the output polarities are reverse connected, and "RVP" is prompted on display.

Low voltage protection (LVP)

It is programmable as shown in "Figure 3-9 Protection Set". Users are able to set the low voltage protection threshold, set to 0 means to turn off this protection. Low voltage protection is triggered once the output voltage is below the set value, and "LVP" is prompted on display.

Foldback Protection (Fold)

This function turns off power supply output if power supply output mode is changed (CV to CC or CC to CV). You can configure the "Foldback" setting in "Protection" sub menu under "Set" menu. It has three choices:

- OFF, this turns off foldback protection;
- CV to CC, power supply is allowed to output under CV only, it automatically turns off output if switch to CC;

• CC to CV, power supply is allowed to output under CC only, it automatically turns off output if switch to CV. Furthermore, there is a "Fold_Time" item for users to set the foldback protection delay time, range is 0.1 seconds up to 600 seconds. When foldback protection occurred, the screen will prompt "FOLD".



Figure 3-10 F_Time (Foldback Protection Delay Time)



Note: If DELAY TIME (F_Time) is set to t seconds, the FOLDBACK will not be activated until t seconds after a mode change is detected. If the actual mode change time is less than t seconds and then it return to its original state, in this situation FOLDBACK protection will not occur.

Communication timed out protection (COMF)

When power supply is controlled remotely, you can turn on this protection. It is triggered if the host computer did not send communication command to the power supply for a certain period, the power supply output will be turned off and "COMF" is prompted on display. The protection triggering time can be set as in "Figure 3-12 Protection Set", range 0.0 ~ 60.0 seconds.

3.10 Save and Recall

FTP3000 series provides users with up to 20 memory locations for saving parameters used in CV/CC output mode, users are able to save output voltage, output current, voltage slew rate, current slew rate, OVP threshold into specified locations for future recall and usage. If shortcut recall function is enabled, users just press a number key to shortcut recall saved parameters, this reduces operation procedures and improves test efficiency.

3.10.1 Save Operation

It is necessary to configure CV/CC output parameters first before performing save operation. When these operations are completed, then proceed as follows:

1. Press (Shift) + 4 (Save) to enter into save interface;

2. Press number key or rotate the rotary knob to input a save location, press "Enter" to confirm.



Figure 3-11 Save Interface

3.10.2 Recall Operation

1. Press (Shift) + (Nenu) to enter into recall interface;

2. Press number key or rotate the rotary knob to input a recall location, press "Enter" to confirm.

cv 0	.0000) v ^{Recal}	<u>-</u>
O	.0000. 0.0) A) w	
V-set	I-set	Shift	On/Off

Figure 3-12 Recall Interface

3.10.3 Shortcut Recall

To recall the saved V/I parameters, there is furthermore a shortcut recall function (On the condition that "Shortcut" menu item is enabled).

(Shift) + (Menu) to enter into menu set interface; 1. Press Enter 2. Select "System" sub menu under "Set", press to pop up system parameter set interface; 3. Select "Shortcut" item to set as "ON", to enable shortcut recall function; to return to MAIN PAGE: 4. Press 5. In CV/CC output mode, output is "OFF", when parameter is not in edit state, simply press number key

to shortcut recall the corresponding saved parameter (O corresponds to location 10).

3.11 Power Save & Power On Auto Output

FTP3000 series provides power save function, this feature determines the initializing parameters when power supply is powered on, there are two choices:

- On, use the parameter setting in last power-off;
- Off, use the system default parameter

1. Press

(Shift) + (Menu) to enter menu set interface;

Enter 2. Select "System" sub menu under "Set", press to enter into system parameter set page;

Set	Edit	About	
IP	192. 168 .	1. 123	
S-Mask	255. 255. 2	255. 0	
Baud	9600	Language	English
Parity	None	Shortcut	Off
Sound	On	Power On	Off
Power Save	On		
		Shift	

Figure 3-13 Power Save Set

3. Select "Power Save" item as "On", to enable power save function.

Power On Auto Output

When "Power Save" function is enabled, users are able to turn on the function of power supply auto output when it is powered on. The default set is "Off", which means when power supply is powered on, the output is "Off".

1. Press (Shift) + (Menu) to enter menu set interface;

2. Select "System" sub menu under "Set", press (Enter) to enter into system parameter set page;

Set	Edit	About	
IP	192. 168. f	1. 123	
S-Mask	255. 255. 25	5. 0	
Baud	9600	Language	English
Parity	None	Shortcut	Off
Sound	On	Power On	On
Power Save	On		
2		Shift	

Figure 3-14 Enable Power On Auto Output Function

3. Select and set "Power On" item as "On", to enable power on auto output function: when power supply is powered on, the output is "On".



3.12 External Control

FTP3000 series power supply analog interface PIN11 provides an input "INHIBIT" for external control signal, the port receives 5V TTL level signal, low level effective, filter time is about 20 milliseconds.



Figure 3-15 External Control Wiring



External control signal behavior can be set to Trigger, Toggle, Hold three different behaviors.

- **Trigger**: Default setting. Used as trigger signal. The port detects a valid low-level pulse, that is, a trigger signal is received.
- Toggle: Used as power supply output ON/OFF control signal. The output ON/OFF is switched once when the

port detects a valid low-level pulse. Same effect as you press (0n/0ff) once on the front panel.

• **Hold**: Used as power supply output ON/OFF control signal. Output is turned ON when the port detects a valid low-level signal; turned off when the port detects a valid high-level signal.

Operation procedures:

1. Press (Shift) + (Menu) to enter the main menu.

2. Select "APP Set" sub menu under "Set" and press (Enter) to enter into external control set as shown in below.

Set	Edit	About	
Prio_Slt	Volt	DevAddr	0
EXT-Signal	Trigger		
APG	OFF		
Response	50%		
Sense	Local		
Comm Pro	Modbus		
	-		
		Shift	

Figure 3-16 External Control Set

3. Select "EXT-Signal", you can configure among "Trigger", "Toggle", or "Hold". Default setting is "Trigger".

4. Press to validate the selection.

3.13 Output Mode & Status Digital Signal Output

FTP3000 series optional analog interface provides power supply output mode and working status digital signal output. The port outputs TTL level signal.

• Output mode signal port, PIN9. The port outputs low level TTL signal if power supply work under CV mode, high level TTL signal if under CC mode;

• Working status signal port, PIN12. The port outputs low level TTL signal if power supply work normally, high level TTL signal if there is abnormal or there is protection occurred and not cleared.

3.14 Lock and unlock

(Shift) + (Lock) to lock the power supply. To unlock, press

once again.

Press

 $\bigcirc_{\text{(Shift)}}$ + $\bigcirc_{\text{(Lock)}}$

(Shift) + (Lock) key is valid, all other keys are disabled, at the same time,

parameter setting area background color is gray.

In locked state, only

3.15 SEQ (Sequence) Test Setting

For sequence test function, the corresponding set menu option is "Sequence". The sequence feature allows users to program a list of steps into the power supply's internal memory and execute them. A total of 20 steps can be allocated to each internal memory location, up to a maximum of 20 locations (sequences files). Voltage, current and delay can be set in each step. Sequence file supports "cycle" and "link" attributes. "cycle" controls the sequence file to run cyclically for a specified times, set to 0 means infinite loop. "Link" can add other sequence file into test, set to 0 means no linked sequence file.

When SEQ output is turned on, the highest voltage and current slew rate are used by default.

Parameter	Explanation
Length	SEQ file running total steps, range 1 ~ 20
Cycle	Set SEQ file running cycle times, range 0 \sim 60000, value 0 means infinite cycle. Default value 1
Link	Range 0 \sim 20, call specified SEQ file to run at this step, value 0 means no linked file
SEQ Step	Choose the specified step to edit. Range 1 ~ 20
V_Set	Output voltage for current step, Range MIN ~ MAX
I_Set	Output current for current step, Range MIN ~ MAX
Step-Time	Delay for current step, range 0.001 \sim 86400s. The delay time is counting from the moment that
	the current step V/I reaches the setting value.

Enter

Table 3-6 Sequence Parameter Explanation

Program Sequence (SEQ):

1. Press

2. Select "Sequence" sub menu under "Edit", press

(Shift) + (Menu)

to enter into sequence file choosing page;

Enter

3. Rotate the rotary knob or input numbers to choose a sequence file for editing, press

to enter SEQ

editing page shown as below:

Set	Edit	About	
SEQ Step	1	Length	20
V-Set	24.000 V	Cycle	1
I-Set	10.000 A	Link	0
Step-Time	0.1 s		
÷	1		
2		Shift	

Figure 3-17 Sequence File Edit

Faith

4. Set "Length", press to validate it, the editing cursor will move to "Cycle" automatically;
5. Set "Cycle", press to validate it, the editing cursor will move to "Link" automatically;
6. Set "Link", press to validate it, the editing cursor will move to "SEQ Step" automatically;
7. Set "SEQ Step", press to validate it, the editing cursor will move to "V_Set" automatically;
8. Set "V_Set", press to validate it, the editing cursor will move to "I_Set" automatically;
9. Set "I_Set", press to validate it, the editing cursor will move to "SEQ-Delay" automatically;
10. Set "SEQ-Delay", press to validate it, the editing cursor will move to "SEQ step" and increase its value
by 1 automatically;
11. Repeat procedures of 7 ~ 10, till all sequence steps have been programmed.
12. Press (Shift) + (Save) to save the programmed sequence file.
13. Press to quit sequence editing.
Notice When power supply output is ON, sequence editing is not allowed.

Running sequence file

1. Press	\bigcirc (Shift) +	0	(Test)	to enter into test function select,
----------	----------------------	---	--------	-------------------------------------

2. Rotate the rotary knob to select "SEQ", press

Enter to call sequence test function, screen display as below



Figure 3-18 Sequence Test Display

4. Press Enter to validate the input;

5. Press (0n/0ff) to start running sequence test output. The screen will display the current sequence file, step number and cycle times. "STEP" stands for sequence current step, "Cycle" shows sequence file have run for how many cycle times.

SEQ output function can simulate complex waveforms, such as below waveform:



Figure 3-19 Sequence Output Waveform

3.16 Constant Power Output (CP) Setting

FTP3000 series power supply supports constant power output function. After the output is turned on, the power supply continuously adjusts the output voltage or output current to keep the output power constant. If the load exceeds the regulation range of the power supply, the output will remain at the maximum set value.

Notice CP output function is mainly used for loads with a response speed faster than 10ms.



Figure 3-20 CP Output Waveform

Operation procedures:





(Enter 2. Rotate the rotary knob to select "CP", press to enter into CP function as shown below:



Figure 3-20 Constant Power (CP) Output

- 3. Set the desired value base on your needs
- (0n/0ff) to start CP output. 4 Press

Table 3-6 CP function parameter explanation

Parameter	Explanation
V-MAX	CP output maximum allowed voltage, set range MIN $^{\sim}$ MAX
I-MAX	CP output maximum allowed current, set range MIN \sim MAX
P-Set	CP output set constant power, set range MIN \sim MAX

3.17 Internal Resistance Simulation (RESI)

Since a battery has internal resistance, its output voltage will decrease along with the increasing output current. FTP3000 series power supply provides internal resistance simulation feature to imitate the output characteristics of batteries, the power supply output voltage satisfy below formula:

 $V_0 = V_S - I_0 \times R_{Inner}$

V_o: Actual output voltage;

Vs: Theoretical output voltage;

Io: Output current;

R_{Inner}: simulated Inner resistance.

Operation procedure:

1. Press

(Shift) + O (Test) to enter into test modes selection interface;

2. Use "Rotary" knob to select "RESI", press (Enter), the screen displays as below:



Figure 3-21 Battery Simulating Output (RESI)

- 3. Set the corresponding test parameters;
- 4. Press (0n/0ff) to turn on battery simulating output.

	Table	3-7	RESI	Test	Parameter	Explanation
--	-------	-----	------	------	-----------	-------------

Parameter	Notes
V_MAX	RESI simulating output max voltage, range 0 ~ Vmax
I_MAX	RESI simulating output max current, range 0 ~ Imax
BAT-RES	RESI simulating battery inner resistance, range 0 ~ Vmax/Imax

3.18 RAMP Output

FTP3000 series power supply allows for output voltage ramp-up and ramp-down according to the set slew rate. RAMP test function has three different test ways: Continuous (CONT), pulse (PULS) and toggle (TOGG).





RAMP test continuous way

In continuous way, the power supply continuously switches between CV-1 and CV-2 according to the set pulse width. Unless you exit the ramp test or turn off the power supply output, the power supply will continue to execute according to the set parameters. This method is not affected by the trigger signal.





- 1. Set "Way" as CONT;
- 2. Set "CV-1" and "CV-2" output voltage value;
- 3. Set "Width-1" and "Width-2" output last time;
- 4. Set "Slew-UP" and "Slew-DN";
- 5. Set output current "CC".

6. Press (0n/0ff) to start RAMP test.

Voltage rise and fall time is determined by rise/fall slew rate, output voltage last time is determined by width time set.

RAMP test pulse way

In pulse RAMP test way, if a trigger signal is received, the power supply will immediately switch from CV-1 to CV-2, and then return to CV-1 after maintaining CV-2 for a pulse width time.



RAMP test toggle way

In toggle way, if a trigger signal is received, the power supply will switch once between CV-1 and CV-2.



Figure 3-25 RAMP Test Toggle Way

Parameter	Explanation		
Way	CONT: Continuous way, PULS: Pluse way, TOGG: Toggle way		
CV-1	RAMP test voltage 1, set range: 0 ~ Vmax		
CV-2	RAMP test voltage 2, set range: 0 ~ Vmax		
Slew-UP	Set voltage rise slew rate, range: 0.001V/s ~ 100V/s,		
Slew-DN	Set voltage fall slew rate, range: 0.001V/s ~ 100V/s,		
Width-1	Set RAMP pulse width 1, range: 0.5s ~ 60000s		
Width-2	Set RAMP pulse width 2, range: 0.5s ~ 60000s		
CC	Set RAMP test output current, range 0 ~ Imax		

Table 3-8 RAMP Function Parameter Explanation

3.19 Sound

This parameter determines the sound of key pressing. There are two choices for this parameter setting:

- Off, no sound if you press the key or rotate the rotary knob;
- On, there is beep sound if you press the key or rotate the rotary knob.

Notice There is always protection alarm sound, even if you turn off sound in parameter set.

3.20 Language

FTP3000 series display screen supports simplified Chinese, traditional Chinese, English.



4. Communication Introduction

FTP3000 series power supply provides users with standard RS232, LAN, optional CAN communication interfaces. Users can operate the power supply remotely using a PC connected to the power supply with proper wire. The communication configuration data is stored in power supply internal memory, power off or power down does not affect its configuration. Once there is modification in communication configurations, must restart the power supply for changes to take effect.

4.1 Communication Interface

4.1.1 RS232

FTP3000 series uses a default baud rate of 9600bps, parity is none, does not support flow control method. Regarding RS232 interface, only TxD and RxD PIN can transmit data, its PIN are explained as following:

Pin NO.	Input/Output	Description
1		N.C.
2	Input	RxD
3	Output	TxD
4		DSR
5		GND
6		DTR
7		CTS
8		RTS
9		N.C.

Table 4-1 RS232 PIN signal

4.1.2 LAN

The FTP3000 series power supply has an Ethernet communication interface and adopts UDP communication mode. The default IP address is 192.168.1.123, the default subnet mask is 255.255.255.0, and the default port number is 7000.



Before starting communication, make sure that the address of the PC and the power supply are **CAUTION** in the same network segment, and that there is no duplicate IP address with the power supply in this network segment, otherwise it will not be able to connect correctly.

4.1.3 CAN

The FTP3000 series CAN interface adopts 500kbps communication speed, its device address can be set in power supply.

Set	Edit	About		
Prio_Slt EXT-Signal APG Response Sense Comm Pro	Volt Trigger OFF 50% Local Modbus	DevAddr	0	
	ľ	Shift		

Figure 4-1 Set Device Address

Notice CAN interface uses CANopen protocol.

Table 4-2 CAN Interface Signal

Pin No.	Input/Output	Description	
1		Н	
2		L	
3		GND	

4.2 Communication Configuration Modification

Set	Edit	About	
IP	192. 168.	1. 123	
S-Mask	255. 255.	255. 0	
Baud	9600	Language	English
Parity	None	Shortcut	Off
Sound	On	Power On	Off
Power Save	On		
		Shift	

Figure 4-2 Communication Parameter Configuration

(Shift) + (Menu) to enter into main menu; 1. Press

Enter

2. Select "System" sub menu under "Set, press

to enter into system parameter set page as above;



3. Set "IP", press to confirm;	
4. Set "S-Mask", press to confirm;	
5. Set "Baud", select from 4800/9600/19200/38400/115200, press to confirm;	
6. Set "Parity", select from None/Odd/Even, press to confirm.	
7. Restart the power supply for changes to take effect.	
After modifying the configuration, you need to restart the power supply for change take effect.	 s to

4.3 Communication Protocol

4.3.1 SCPI Protocol

For specific content of SCPI protocol, please refer to "FTP3000 Programming Manual SCPI Edition".

4.3.2 Modbus Protocol

For specific content of Modbus protocol, please refer to "FTP3000 Programming Manual Modbus Edition"

EXAUTION FTP3000 series DC power supply support Modbus-RTU only.

4.3.3 CANopen protocol

For specific content of CANopen protocol, please refer to "FTP3000 Programming Manual CANopen Edition"

5. Troubleshooting

Follow the actions described in this chapter to inspect the instrument and troubleshoot the problem if the FTP3000 series DC Power Supply does not operate normally. Contact Faithtech authorized agent or Faithtech after-sales if the information provided in this manual does not resolve the problem.

Table 5-1 Fault Check

Problem Possible Cause		Solution	
Measurement accuracy is not	Measurement swings due to aged	Do calibration.	
within SPEC.	components.		
Output accuracy is not within	Output swings due to aged	Do calibration	
SPEC.	components.		
Overtemperature Protection (OTP)	1. The ambient temperature	1. Operate the instrument within an ambient	
	is too high.	temperature of 0 - 40°C.	
	1. Bad ventilation.	2. Ensure the instrument is well ventilated.	
	2. Fan damaged.	3. Contact Faithtech authorized agent or	
		Faithtech after-sales	
		4. Press to clear protection state.	
Overpower Protection (OPP)	The output power exceeds	1. Decrease load or increase OPP setting.	
	the OPP setting.	2. Press PROT to clear protection state.	
Overcurrent Protection (OCP)	The output current exceeds	1. Decrease load or increase OCP setting.	
	the OCP setting.	2. Press PROT to clear protection state.	
Overvoltage Protection (OVP)		1. Decrease output voltage or increase OVP	
	the OVP setting	setting.	
	the OVI setting.	2. Press PROT to clear protection state.	
Compensate Overvoltage		1. Check the output cable for possible bad	
Protection (OCVP)	Remote V-sense compensate	touching, or change for wire with smaller	
		resistance	
		2. Press PROT -CLR to clear protection state.	

Table 5-2 Power On Self-Check Fault

Problem	Possible Cause	Solution
Screen only displays below info:	Internal communication	1. Restart the instrument
(c)All rights reserved.	abnormal	2. Contact Faithtech authorized
Test sample. Error [!]	Data acquisition error	agent or Faithtech after-sales service
Loading calibration data. Error !	Fail to load calibration data	
Loading parameters. Error !	Fail to load parameter	-

6. Appendix

Туре	Cross-sectional	Different temperature conditions			
	area				
		60 [°] ℃	75 ℃	85 [°] ℃	90 ℃
AWG	mm ²	Wire type:	Wire type:	Wire type:	Wire type:
		RUW, T, UF	RHW, RH	V, MI	TA, TBS, SA, AV
		Rated Current (A)			
14	2.08	20	20	20	20
12	3.31	25	25	30	30
10	5.26	30	35	40	40
8	8.36	40	50	55	55
6	13.3	55	65	70	75
4	21.1	70	85	95	95
3	26.7	85	100	110	110
2	33.6	95	115	125	130
1	42.4	110	130	145	150
0	53.5	125	150	165	170
00	67.4	145	175	190	195
000	85	165	200	215	225
0000	107	195	230	250	260

Table 6-1 Recommended Wire Diameters for Cables

Shenzhen Faithtech CO., LTD.

ADD: 3C, Building 1, Saitu Digital Industrial Park, No.137 Bulan Road, Longgang District, Shenzhen, China Tel: (0086) 400-616-0086 Web: www.faithtech.cn