PPH-1503/1503D

Programmable High Precision D.C. Power Supply

FEATURES

- 3.5 inch TFT LCD Display
- Built-in DVM Measurement Function
- High Measurement Resolution (1mV/0.1μA for 5mA Range)
- Recovery Time (<40μs within 100mV; <80μs within 20mV)
- Current Sink Function
- Pulse Current Measurement (Pulse width min. : 33μs)
- Long Integration Current Measurement
- Sequence Function (Sequential Power Output)
- Built-in Battery Simulation Function
- OVP, OCP, OTP & Temperature Display for Heat Sink
- Support USB (Device & Host)/GPIB/LAN
- 5 Groups of Save/Recall Setting
- External Relay Control

GW INSTEK
Simply Reliable

Swift Responses with Accurate Measurement

The PPH-1503/1503D are equipped with the excellent transient recovery time, which can, in less than 40us, recover the output voltage to within 100mV of the previous voltage output when the current level changes from 10% to 100% of the full scale. Furthermore, conventional power supplies do not have sufficient response speed to promptly respond to set voltage value once the set voltage is changed. PPH-1503D has a rise time of 0.2ms (PPH-1503 : 0.15ms) and a fall time of 0.3ms (PPH-1503 : 0.65ms), which are 100 times faster than that of conventional power supplies. Therefore, the PPH-1503/1503D can provide DUT with a stable output voltage even when DUT is operating under large transient current output. The internal high-speed sampling circuit design of the PPH-1503D, with the sample rate of 64K (PPH-1503: 60K), can conduct pulse current measurement without using a current probe and oscilloscope. The current read back accuracy is 0.2% + 1μA (equals to 11μA) at 5mA range, and the read back resolution is 0.1μA that allow DUT to be measured with a high accuracy level. Unlike battery, general power supplies, which do not have the characteristics of fast transient recovery time, can not maintain a stable power supply for cellular phone, wireless device, and wearable device which produce large transient pulse current load for hundreds of μs to dozens of ms when in use. PPH-1503D, different from general power supplies, has the characteristics of fast transient recovery time. While simulating battery to output pulse current, PPH-1503D can quickly compensate the voltage drop caused by pulse current. PPH-1503D's CH1 has the built-in battery simulation function, which can define output impedance settings so as to accurately simulate battery's impedance characteristics during battery discharge. Fast transient recovery time and built-in battery simulation function together facilitate PPH-1503D to accurately simulate battery's real behavior pattern so as to conduct product tests.

PPH-1503D is not only suitable for simulating battery, charger and supplying power to DUT, but also ideal for simulating an electronic load to conduct discharge tests with its sink current capability. The sink current function allows the PPH-1503/1503D to simulate a voltage source with the sink current capability. Long integration current measurement can be utilized to conduct average current measurement for periodical pulse current in a long period of time that is applied to analyze power consumption for a period of time. One of the applications is to measure the average power consumption of a cellular phone in use so as to conduct the internal RF module parameter analysis. The built-in sequence function of PPH-1503D's CH1 provides users with 1000 steps to edit sequential outputs, including voltage, current and execution time. The built-in DVM function of CH2 has a voltage range from 0 to +20VDC that saves users the cost of purchasing an additional voltage meter.

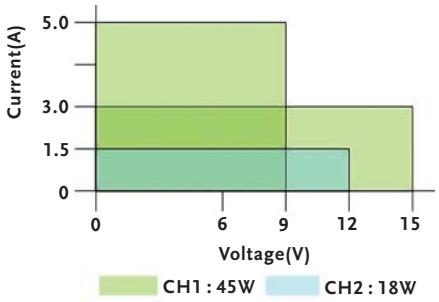
PPH-1503/1503D are ideal power sources for production line, R&D laboratory, device inspection, maintenance center or applications with the requirements of a fast and accurate power supply with DVM. PPH-1503/1503D support test requirements of Profile1, Profile2 and Profile3 from USB Power Delivery(PD) constructed by USB-IF association.

A. OPERATION OF PPH-1503 & PPH-1503D

Dual Operating Range for PPH-1503/1503D

PPH-1503	CH1	PPH-1503D	CH1	CH2
POWER	45W	POWER	45W	18W
Range 1	0~15V/0~3A	Range 1	0~15V/0~3A	0~12V/0~1.5A
Range 2	0~9V/0~5A	Range 2	0~9V/0~5A	NA

PPH-1503/1503D Operating Area



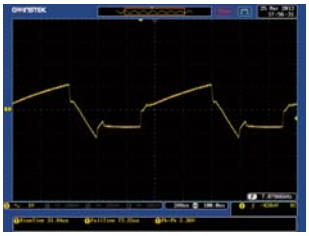
B. ACCURATE LOW CURRENT MEASUREMENT

0.1μA Resolution for PPH-1503/1503D

PPH-1503/1503D provide 0.2%+1μA readback accuracy and 0.1μA resolution for high precision of current measurement. For example, when portable device works in the sleep or standby mode, the current is drawn at a low level. The low current consumption under standby or sleep mode can be measured accurately.

C. FAST RESPONSE TO LOAD AND VOLTAGE CHANGES

PPH-1503



Conventional Power Supply

When DUT such as cellular phone switches to idling, receiving or transmitting mode, the current drawn from power supply changes over tenfold. The sudden current change will cause the supplied voltage to drop as well. The conventional power supply is considered a dull device since it will take several milliseconds for the dropped voltage to return to the original level. PPH-1503/1503D are designed to simulate battery response when a significant voltage drop occurs. Recovery time of 40μs or less is guaranteed when the maximum voltage drop is within 100mV. Moreover, when users change the voltage level and conventional power supply does not have sufficient speed to reach the set level, PPH-1503/1503D provides rise time of (PPH-1503 : 0.15ms/PPH-1503D : 0.2ms) and fall time of (PPH-1503 : 0.65ms/PPH-1503D : 0.3ms), which are hundreds times faster than that of the conventional power supplies.

D. MEASUREMENTS FOR POWER CONSUMPTION ANALYSIS

Voltage and Current Waveforms of the Receiving Signals of a Cellular Phone

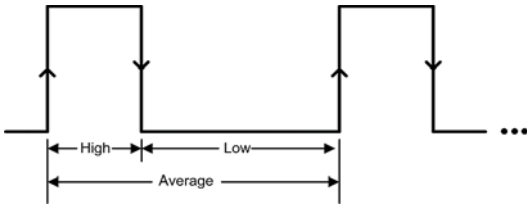
One particular requirement of power consumption for portable wireless communications devices is Pulse Current. Portable devices such as cellular phones must transmit and receive (detect) signal periodically by drawing pulse current instead of constant current from battery to ensure devices' sound connection in network. To analyze the transient power consumption of a DUT, the peak of short pulse current and average current measurements over a long period of time are crucial. PPH-1503/1503D provide pulse current and long integration functions, the former can measure the peak value of a pulse, the latter can measure the average value of pulses. PPH-1503/1503D provide DUT with pulse current measurement and analyzes the transient power consumption to qualify the device for specified power consumption requirements.

E. LONG INTEGRATION CURRENT MEASUREMENT

Long Integration Measurement for PPH-1503D

Long integration is an average current measurement of one or more pulses. A pulse edge can be used to trigger the start of a measurement. Measurements can be taken from pulse's positive edge trigger or negative edge trigger. Users can also take measurements from the beginning of power output. The long integration time period must be a full period or integer multiples of a complete period of the measured pulse current and can be set to a maximum of 60 seconds. Long integration analyzes products' overall power consumption at a certain period of time, for instance, measuring the power consumed from beginning to the end of a phone call for a cellular phone so as to analyze all parameters of RF module.

F. PULSE CURRENT MEASUREMENTS



The Time Specified for the Measurement

Pulse Current Measurement for PPH-1503D

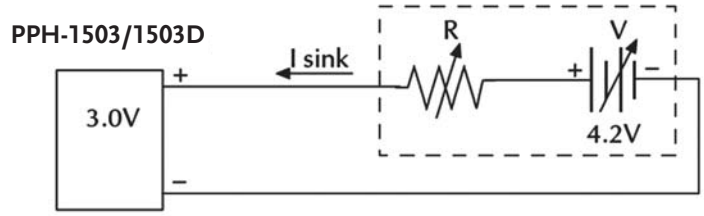
PPH-1503/1503D DC power supply can perform current measurements for pulsing loads. Its several built-in measurement modes include :

- High Measured Current-measure the peak current of the pulse train.
- Low Measured Current-measure the low current of the pulse train.
- Average Transmit Current-measure the average current of the pulse train.

The high, low, and average measurements of a pulse are illustrated as above : To avoid false pulse detection, users can use a trigger level of up to 5A(Ch1). All pulses, noise or other transients that are less than set trigger level will be ignored. The manual integration time range setting is 33 us to 833,333 us.

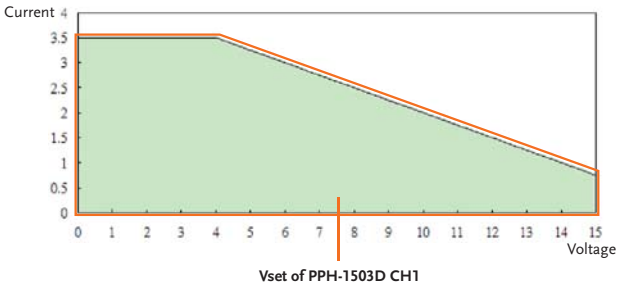
Pulse current measurement can measure transient current consumption to provide the information for the allocation of power supply system for products' preliminary design, i.e. power supply circuits, battery selections for clients' product analyses. Portable communications products, i.e. RF modules and designs based upon blue tooth system can better use pulse current measurement function.

G. SINK CURRENT FUNCTION

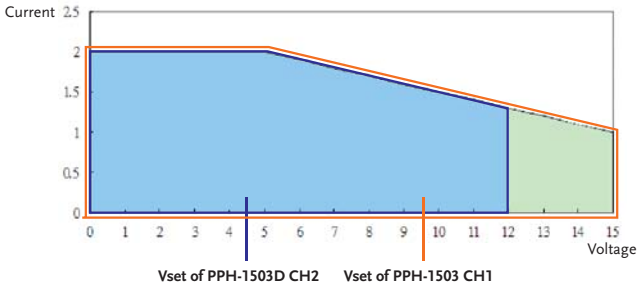


Connection Diagram for PPH-1503/1503D and an Electrical Potential Circuit

Allowable Sink Current for 3.5A



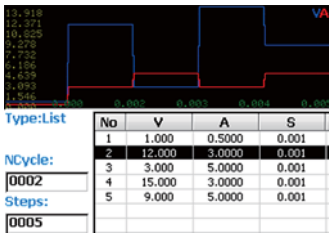
Allowable Sink Current for 2A



The Diagrams Show Voltage Setting Values and Allowable Sink Current for 3.5A and 2A of PPH-1503/PPH-1503D

When connecting with an electric potential circuit and the output voltage of the tested electric potential circuit is greater than that of PPH-1503/PPH-1503D by approximately 0.3V to 2.5V, PPH-1503/1503D will automatically convert its power supply role to the sink current role acting as a load of voltage source. At this time, the voltage setting of PPH-1503/1503D can be regarded as the CV setting of an electronic load. A single PPH-1503/1503D can be used to charge battery and to simulate battery's load to consume power without extra instruments. It is ideal for tests on battery and portable charger.

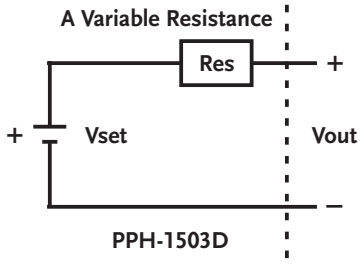
H. SEQUENCE FUNCTION(of PPH-1503D)



Functional Setting Page for Sequence Function

For the practical usage, PPH-1503D can be programmed to output a sequential voltage variation according to the requirements. There are 1000 steps for users to edit output voltage, current and execution time. Programmable execution time range is from 0.001 second to 3600 seconds and the resolution is 0.001 second. Programmable recurring frequency is from 1 to 9999 or it can be set to infinite execution (set recurring frequency to 0).

I. BATTERY SIMULATION FUNCTION



Battery Equivalent Model

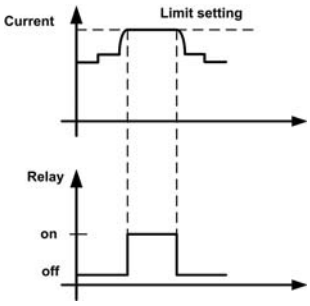
PPH-1503D's battery simulation function is equivalent to a variable resistance circuit internally connected in series to simulate battery's output impedance. The function can also be regarded as a power supply with a variable internal resistor. The variable internal resistance range is from 0.000Ω to 1.000Ω and the resolution is 1mΩ. PPH-1503D can be utilized as a battery or an ideal voltage source Vset to be connected with variable resistance Res in series. The above diagram shows battery simulation to produce output voltage Vout.

J. BUILT-IN DIGITAL VOLTMETER

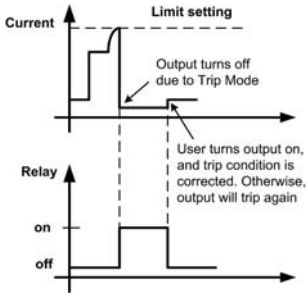
DVM Input for PPH-1503D

The PPH-1503/1503D built-in Digital Volt-Meter (DVM) have dedicated input terminal located on the front panel. With the DC voltage measurement range from 0 to +20VDC, PPH-1503/1503D not only provide power supply for DUT but also measure the voltage on DUT. The read back accuracy reaches (0.05%+3mV) and read back resolution is 1mV. Users are able to save the cost of purchasing an extra voltage meter. Furthermore, DVM measurements can be remotely controlled by SCPI commands via a PC.

K. EXTERNAL RELAY CONTROL

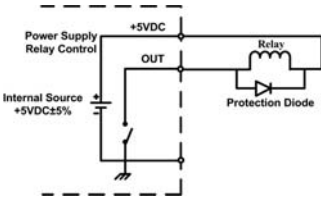


Limit Relay



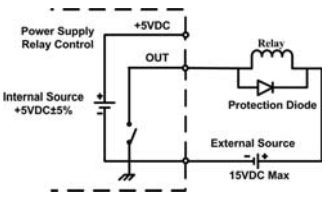
Trip Relay

Relay Can be Driven by Using Internal +5V or External Power Source :



+5VDC Relay Output

Using the +5VDC relay output to drive an external relay. Ensure the current does not exceed 150mA.



External Power Source

Using an external power source to drive the external relay. The voltage of the source can not exceed 15V and the current can not exceed 150mA.

PPH-1503/1503D provide Limit relay and Trip relay modes and are equipped with corresponding output ports, in which output signals control external relay. Under Limit relay mode and the current limit is reached, PPH-1503/1503D will switch from constant voltage to constant current automatically. Under "Trip Relay" mode and the current limit is reached, PPH-1503/1503D will turn output off. Furthermore, External Relay control can be used if users simultaneously use other devices for test system. When "Limit Relay" mode is selected and the current limit is reached, External Relay control signal will go high and will return back to the low level when the current level goes back below the constant current setting. When "Trip Relay" mode is selected and the current limit is reached, the relay control signal will go high and the output is disabled. When the output goes back on and the current is less than the current setting, the relay control signal will back to the low level. Users can use relay control signal to control other devices for test system.

SELECTION GUIDE

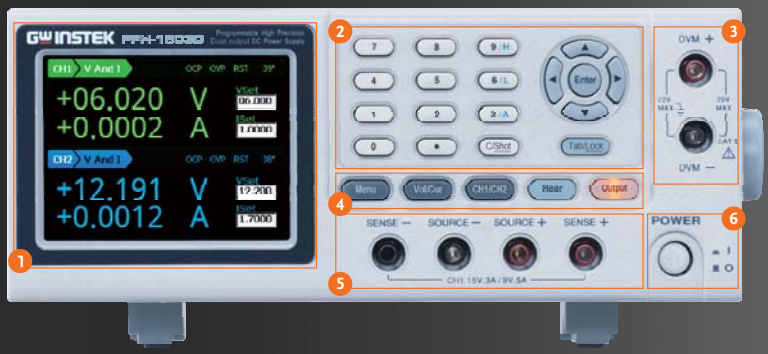
Model Name		PPH-1503	PPH-1503D
Channel		1	2
Dual Range	Channel 1	0 ~ 15V/0 ~ 3A or 0 ~ 9V/0 ~ 5A	0 ~ 15V/0 ~ 3A or 0 ~ 9V/0 ~ 5A 0 ~ 12V/0 ~ 1.5A
	Channel 2	NA	
Display		3.5 Inch TFT LCD	3.5 Inch TFT LCD
Current Measurement Range		5A/5mA	5A/500mA/5mA (CH1)
CV&CC		✓	✓
Built-in DVM Measurement Function		✓	✓ (CH2)
Pulse Current Measurement		✓	✓
Long Integration Current Measurement		✓	✓
Built-in Battery Simulation Function		NA	✓ (CH1)
Sequential Power Output		✓	✓ (CH1)
High Measurement Resolution		✓ (1mV/0.1 μA)	✓ (1mV/0.1 μA)
Sink Current Function		✓ (Max : 2A)	✓ (Max : 3.5A)
Front & Rear Output		✓	✓
External RELAY Control		✓	✓
Memory		5 Sets	5 Sets
Sample Rate(Sa/s)		60K	64K
Lock		✓	✓
Protection		OVP / OTP / OCP	OVP / OTP / OCP
Four Wire Output Open Protection		NA	✓
Heat sink Temperature Display		NA	✓
Interface	GPIB	✓	✓
	USB	✓ (CDC)	✓ (TMC)
	LAN	✓	✓

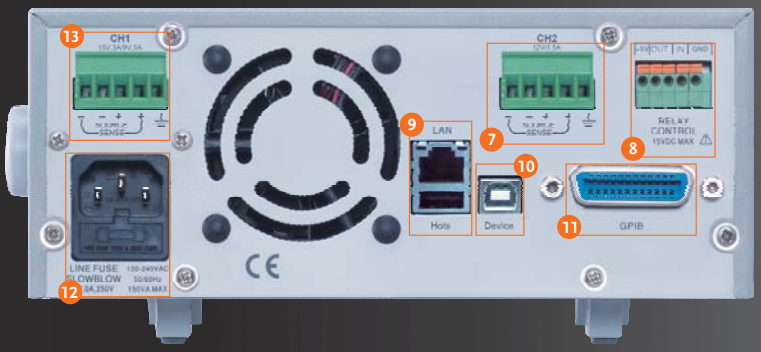
PANEL INTRODUCTION

CE | USB Device | PC Software | Front Output | LAN | GPIB | LabVIEW Driver | Rear Output

PPH-1503

1. LCD Display
2. Operation Keys
3. Voltmeter Terminals (DVM)
4. Function Keys
5. Output Terminals (SOURCE and SENSE)
6. Power On/Off Switch
7. Rear Panel Outputs and DVM Inputs
8. External Relay Control Port
9. LAN Port
10. USB Port
11. GPIB Port
12. AC Power Socket and Fuse





CE | USB Host | USB Device | Front Output | PC Software | LAN | GPIB | LabVIEW Driver | Rear Output

PPH-1503D

1. LCD Display
2. Operation Keys
3. Voltmeter Terminals (DVM)
4. Function Keys
5. Output Terminals (SOURCE and SENSE)
6. Power On/Off Switch
7. CH2 Output
8. External Relay Control Port
9. LAN Port
10. USB Port
11. GPIB Port
12. AC Power Socket and Fuse
13. CH1 Output

SPECIFICATIONS

	Model	PPH-1503	PPH-1503D	
OUTPUT RATING	Number of output channel	Ch 1	Ch 1	Ch 2
	Voltage	0 ~ 15V or 0 ~ 9V	0 ~ 15V or 0 ~ 9V	0 ~ 12V
	Current	0 ~ 5A (9V); 0 ~ 3A (15V)	0 ~ 5A (9V); 0 ~ 3A (15V)	0 ~ 1.5A
	Power	45W	45W	18W
	Output Voltage Rising Time	0.15ms (10% ~ 90%)	0.20ms (10% ~ 90%)	0.20ms (10% ~ 90%)
	Output Voltage Falling Time	0.65ms (90% ~ 10%)	0.30ms (90% ~ 10%)	0.30ms (90% ~ 10%)
STABILITY	Voltage	0.01%+0.5mV	0.01%+3.0mV	0.01%+3.0mV
	Current	0.01%+50uA	NA	NA
REGULATION (CV)	Load	0.01%+2mV	0.01%+2mV	0.01%+2mV
	Line	0.5mV	0.5mV	0.5mV
REGULATION (CC)	Load	0.01%+1mA	0.01%+1mA	0.01%+1mA
	Line	0.5mA	0.5mA	0.5mA
RIPPLE & NOISE	CV p-p (20Hz~20MHz)	8mV	8mV	8mV
	CV rms (0~1MHz)	1mV	3mV	3mV
	CC rms	NA	NA	NA
PROGRAMMING ACCURACY	Voltage	±(0.05%+10mV)	±(0.05%+10mV)	±(0.05%+3mV)
	Current (1.5A or 5A)	±(0.16%+5mA)	±(0.16%+5mA) (5A)	±(0.16%+2mA)
	Current (500mA)	NA	±(0.16%+0.5mA)	NA
	Current (5mA)	NA	±(0.16%+5 μA)	NA
READBACK ACCURACY	Voltage	±(0.05%+3mV)	±(0.05%+3mV)	±(0.03%+3mV)
	Current (1.5A or 5A)	±(0.2%+400 μA) (5A)	±(0.2%+400 μA) (5A)	±(0.2%+400 μA) (1.5A)
	Current (500mA)	NA	±(0.2%+100 μA)	NA
	Current (5mA)	±(0.2%+1 μA)	±(0.2%+1 μA)	±(0.2%+1 μA)
RESPONSE TIME (Response to 1000% Load Change)	Transient Recovery Time	<40 μS(within 100mV) <80 μS(within 20mV)	<40 μS(within 100mV, Rear) <50 μS(within 100mV,Front);<80 μS(within 20mV)	<40 μS(within 100mV, Rear) <80 μS(within 20mV)
PROGRAMMING RESOLUTION	Voltage	2.5mV	1mV	1mV
	Current	1.25mA	0.5mA(range: 5A)	0.5mA(range: 1.5A)
	Current	NA	0.05mA(range: 500mA)	NA
	Current	NA	0.5 μA(range: 5mA)	NA
READBACK RESOLUTION	Voltage	1mV	1mV	1mV
	Current	0.1mA(range: 5A)	0.1mA(range: 5A)	0.1mA(range: 1.5A)
	Current	NA	0.01mA(range: 500mA)	NA
	Current	0.1 μA(range: 5mA)	0.1 μA(range: 5mA)	0.1 μA(range: 5mA)
PROTECTION FUNCTION	OVP Accuracy	50mV	0.8V	50mV
DVM	DC Readback Accuracy(23℃± 5℃)	±0.05%+3mV	—	±0.05%+3mV
	Readbck Resolution	1mV		1mV
	Input Voltage Range	0 ~ 20VDC		0 ~ 20VDC
	Maximum Input Voltage	NA		-3V, +22V
	Input Resistance and Capacitance	100000MΩ		20MΩ
PROGRAMMABLE OUTPUT RESISTANCE	Range	—	1 mΩ ~ +1 Ω	—
	Programming Accuracy		0.5% + 10 mΩ	
	Resolution		1mΩ	
PULSE CURRENT MEASUREMENT	Trigger Level	5mA ~ 5A, 5mA/Step	5mA ~ 5A, 5mA/Step	5mA ~ 1.5A, 5mA/Step
	High Time/low Time/Average Time	33.3 μs ~ 833ms, 33.3 μs/Step	33.3 μs ~ 833ms, 33.3 μs/Step	33.3 μs ~ 833ms, 33.3 μs/Step
	Trigger Delay	0 ~ 100ms,10 μs/Steps	0 ~ 100ms,10 μs/Steps	0 ~ 100ms,10 μs/Steps
	Average Readings	1 ~ 100	1 ~ 100	1 ~ 100
	Long Integration Pulse Timeout	1S ~ 63S	1S ~ 63S	1S ~ 63S
	Long Integration	850ms(60Hz)/840ms(50Hz)~60s,or Auto time	850ms(60Hz)/840ms(50Hz)~60s, or Auto time	850ms(60Hz)/840ms(50Hz)~60s, or Auto time
	Measurement Time	16.7ms/Steps(60Hz),20ms/Steps(50Hz)	16.7ms/Steps(60Hz), 20ms/Steps(50Hz)	16.7ms/Steps(60Hz), 20ms/Steps(50Hz)
	Long Integration Trigger Mode	Rising, Falling, Neither	Rising, Falling, Neither	Rising, Falling, Neither
CURRENT SINK CAPACITY	Sink Current Rating	2A(Vout≦5V);2A-0.1x(Vout-5) (Vout>5V)	3.5A(Vout≦4V); 3.5A-0.25x(Vout-4) (Vout>4V)	2A(Vout≦5V); 2A-0.1x(Vout-5) (Vout>5V)
OTHERS	Output Terminal	Front/Rear Panel	Front/Rear Panel	Rear Panel
	DVM Input	Front/Rear Panel	NA	Front Panel
	Relay Control Connector	150mA/15V, 5V output, 100mA	150mA/15V , 100mA/5V output	
	Operation Temperature	0 ~ 40°C	0 ~ 40°C	
	Operation Humidity	⩽ 80%	⩽ 80%	
	Storage Temperature	-20°C ~ 70°C	-20°C ~ 70°C	
	Storage Humidity	< 80%	< 80%	
PC REMOTE INTERFACES	Standard	GPIB/USB/LAN	GPIB/USB/LAN	
PC SOFTWARE & LABVIEW DRIVER	Free	PC Software/Labview Driver	PC Software/Labview Driver	
MEMORY	Save/Recall	5 Sets	5 Sets	
POWER	Input Power	90 ~ 264VAC ; 50/60Hz	90 ~ 264VAC ; 50/60Hz	
	Power Consumption	150W	160W	
DIMENSIONS & WEIGHT		222(W)x86(H)x363(D)mm;Approx 4.2kg	222(W) x 86(H) x 363(D) mm; Approx 4.5kg	

Specifications subject to change without notice. PH-1503/1503DGD1DH

ORDERING INFORMATION

PPH-1503 Programmable High Precision DC Power Supply
PPH-1503D Programmable High Precision Dual Channel Output DC Power Supply

ACCESSORIES

CD (User manual x1), Quick Start manual x1, Power cord (Region dependent), Test lead GTL-117 x1(10A Maximum), GTL-203A x1(3A Maximum), GTL-204A x1(10A Maximum)

OPTIONAL ASSESSORIES

GTL-246 USB Cable (USB 2.0, A-B Type)

Global Headquarters
GOOD WILL INSTRUMENT CO., LTD.
T +886-2-2268-0389 F +886-2-2268-0639

China Subsidiary
GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
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GOOD WILL INSTRUMENT (M) SDN. BHD.
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