# **Chroma**

# Programmable Bidirectional DC Power Supply 62000D Series Operating and Programming Manual





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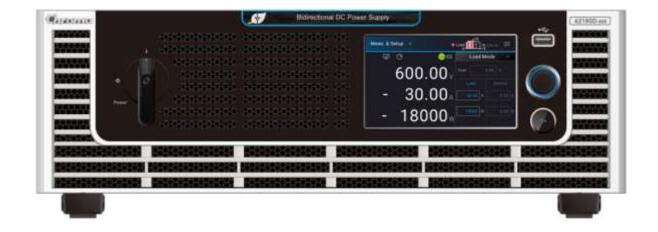








# Programmable Bidirectional DC Power Supply 62000D Series Operating and Programming Manual



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88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

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www.chromaate.com

# **Material Contents Declaration**

The recycling label shown on the product indicates the Hazardous Substances contained in the product as the table listed below.









See **<Table 2>**.

### <Table 1>

	Hazardous Substances						
Part Name	Lead	Mercury	Cadmium	Hexavalent Chromium		Selected Phthalates Group	
	Pb	Hg	Cd	Cr <sup>6+</sup>	PBB/PBDE	DEHP/BBP/DBP/DIBP	
PCBA	0	0	0	0	0	0	
CHASSIS	0	0	0	0	0	0	
ACCESSORY	0	0	0	0	0	0	
PACKAGE	0	0	0	0	0	0	

<sup>&</sup>quot;O" indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

### Remarks:

- 1. The CE marking on product is a declaration of product compliance with EU Directive 2011/65/EU and 2015/863/EU.
- 2. This product is complied with EU REACH regulation and no SVHC in use.

### Disposal

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and wellbeing. When replacing old appliances with new one, the retailer is legally obligated to take back your old appliances for disposal at least for free of charge.





<sup>&</sup>quot;×" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

### <Table 2>

	Hazardous Substances					
Part Name	Lead	Mercury	Cadmium	Hexavalent Chromium	_	Selected Phthalates Group
	Pb	Hg	Cd	Cr <sup>6+</sup>	PBB/PBDE	DEHP/BBP/DBP/DIBP
PCBA	×	0	0	0	0	0
CHASSIS	×	0	0	0	0	0
ACCESSORY	×	0	0	0	0	0
PACKAGE	0	0	0	0	0	0

<sup>&</sup>quot;O" indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

- "×" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.
- 1. Chroma is not fully transitioned to lead-free solder assembly at this moment; however, most of the components used are RoHS compliant.
- 2. The environment-friendly usage period of the product is assumed under the operating environment specified in each product's specification.
- 3. This product is complied with EU REACH regulation and no SVHC in use.

### Disposal

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and wellbeing. When replacing old appliances with new one, the retailer is legally obligated to take back your old appliances for disposal at least for free of charge.







# **Declaration of Conformity**

For the following equipment:

### Programmable Bidirectional DC Power Supply

(Product Name/ Trade Name)

62180D-600, 62120D-600, 62060D-600, A620037, 62180H-600P, 62120H-600P, 62060H-

(Model Designation)

### CHROMA ATE INC.

(Manufacturer Name)

### 88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Manufacturer Address)

Is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2014/30/EU) and Low Voltage Directive (2014/35/EU). For the evaluation regarding the Directives, the following standards were applied:

### EN 61326-1:2013 Class A, EN 61326-2-1:2013

### EN 61000-3-12:2011, EN 61000-3-11:2000

### EN 61326-1:2013 (industrial locations)

EN 61000-4-2:2009, EN 61000-4-3:2006+A1:2008+A2:2010,

EN 61000-4-4:2012, EN 61000-4-5:2014+A1:2017, EN 61000-4-6:2014,

EN 61000-4-8:2010, EN 61000-4-34:2007+A1:2009

### IEC 61010-1:2010+A1:2016(Edition 3.1), EN 61010-1:2010+A1:2019

The equipment describe above is in conformity with Directive 2011/65/EU and 2015/863/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The following importer/manufacturer or authorized representative established within the EUT is responsible for this declaration :

### CHROMA ATE INC.

(Company Name)

### 88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Company Address)

Person responsible for this declaration:

### Mr. Vincent Wu

(Name, Sumame)

### T&M BU Vice President

(Position/Title)

Taiwan 2021.3.17 Vnut Wn (Place) (Date) (Legal Signature)





# **Declaration of Conformity**

For the following equipment:

### Programmable Bidirectional DC Power Supply

(Product Name/ Trade Name)

62180D-100, 62120D-100, 62060D-100, A620035, 62180H-100P, 62120H-100P, 62060H-100P, A620051

(Model Designation)

### CHROMA ATE INC.

(Manufacturer Name)

### 88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Manufacturer Address)

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### EN 61000-3-12:2011, EN 61000-3-11:2000

### EN 61326-1:2013 (industrial electromagnetic environment)

EN 61000-4-2:2009, EN 61000-4-3:2006+A1:2008+A2:2010,

EN 61000-4-4:2012, EN 61000-4-5:2014+A1:2017, EN 61000-4-6:2014,

EN 61000-4-8:2010, EN 61000-4-34:2007+A1:2009

### IEC 61010-1:2010+A1:2016(Edition 3.1), EN 61010-1:2010+A1:2019

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### 88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Company Address)

Person responsible for this declaration:

### Mr. Vincent Wu

(Name, Surname)

### **T&M BU Vice President**

(Position/Title)

Taiwan 2021.1.15 V MUT WW (Place) (Date) (Legal Signature)





# **Declaration of Conformity**

For the following equipment:

### Programmable Bidirectional DC Power Supply

(Product Name/ Trade Name)

62180D-1800, 62180D-1200, 62120D-1200, A620038, 62180H-1800P, 62120H-1200P, A620054

(Model Designation)

### CHROMA ATE INC.

(Manufacturer Name)

### 88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Manufacturer Address)

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### 88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

(Company Address)

Person responsible for this declaration:

### Mr. Vincent Wu

(Name, Surname)

### T&M BU Vice President

(Position/Title)

Taiwan 2021.1.15 Vinut Win (Place) (Date) (Legal Signature)

# **Safety Summary**

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate safety standards of design, manufacture, and intended use of the instrument. *Chroma* assumes no liability for the customer's failure to comply with these requirements.



### **BEFORE APPLYING POWER**

Verify that the power is set to match the rated input of this power supply.



### PROTECTIVE GROUNDING

Make sure to connect the protective grounding to prevent an electric shock before turning on the power.



### **NECESSITY OF PROTECTIVE GROUNDING**

Never cut off the internal or external protective grounding wire, or disconnect the wiring of protective grounding terminal. Doing so will cause a potential shock hazard that may bring injury to a person.



### **FUSES**

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.



### DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. The instrument should be used in an environment of good ventilation.



### DO NOT REMOVE THE COVER OF THE INSTRUMENT

Operating personnel must not remove the cover of the instrument. Component replacement and internal adjustment can be done only by qualified service personnel.



When the voltage and current are set and outputting, the output terminal on the rear panel has dangerous voltage, touching it may result in death.

# **Safety Symbols**

4	DANGER – High voltage.
<u> </u>	<b>Explanation:</b> To avoid injury, death of personnel, or damage to the instrument, the operator must refer to the explanation in the instruction manual.
<u>(11)</u>	<b>High temperature:</b> This symbol indicates the temperature is hazardous. Do not touch to avoid personal injury.
	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.
<u></u>	<b>Functional grounding:</b> To identify an earth (ground) terminal in cases where the protective ground is not explicitly stated. This symbol indicates the power connector does not provide grounding.
<i></i>	Frame or chassis: To identify a frame or chassis terminal.
$\sim$	Alternating Current (AC)
$\overline{\sim}$	Direct Current (DC) / Alternating Current (AC)
===	Direct Current (DC)
•	Rotating Power Switch
<b>∆WARNING</b>	The <b>WARNING</b> 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 health hazards.
<b>CAUTION</b>	The <b>CAUTION</b> 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 <b>Notice</b> sign highlights an essential operating or maintenance procedure, condition, or statement.

# **Revision History**

The following lists the additions, deletions and modifications in this manual at each revision.

Date	Version	Revised Sections
Oct. 2020	1.0	Complete this manual.
Mar. 2021	1.1	Add 100V, 1200V, and 1800V models of 62000D Series.

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# 1. Overview

### 1.1 Introduction

The Chroma 62000D Series are high power density, bidirectional DC power supplies. These supplies have regenerative load characteristics with dual quadrant operation allowing energy feed back to the grid from UUT. They are suitable for testing modern energy storage systems, providing stable DC output and accurate measurement for regenerative power applications.

The features of 62000D Series DC power supplies are:

- Voltage mode & Current Mode with two control loops → able to provide stable and quick response time performance. Instruments also provide the ability to program the slew rate of output voltage and current.
- High power density output → the maximum output power can up to 18kW under 3U height.
- 3. 16-bit ADC/16-bit DAC → provides excellent resolution for measurement and output.
- 4. Lower transient spike and transient response time → Provides for a stable output and the best protection under load variations.
- 5. Editing mode (Programming Mode) for output waveform → provides multiple output voltage and current combinations in real time for long period tests.
- 6. Rotary knob control on the front panel → to set the output voltage and current.
- Touch panel → provides users a high brightness and wide viewing angle interface for manual operation.
- 8. Via GPIB/CAN (option), USB, Ethernet or APG (analog programmable interface) interface → to do remote control.
- 9. Active PFC design → the PF value of 62000D series DC power supplies is >0.99. The high PF value increases the distribution capacity and wiring utilization.
- 10. CP (Constant Power Operating Envelope) → provides for a wide voltage and current operation. Customers do not need to add additional power supplies to cover low voltage/high current test requirements.

# 1.2 System Functions

# 1.2.1 Operation Mode

- 1. Local operation is performed by the touch panel and rotary knob on the front panel.
- 2. Remote control is done via GPIB/CAN (option), USB or Ethernet interface.
- 3. Through the APG input to control output via analog signal.

### 1.2.2 Protection

1. Protections for voltage phase loss, input over-voltage or under-voltage, output over-voltage, over-current, over-power, over-temperature, fan fail, CV/CC foldback and etc. are available.

2. Smart fan control: Turn the fan speed from low to high based on the device temperature, output current and output power to reduce the audible noise.

# 1.2.3 Output and Indicators

- 1. Analog outputs are provided to monitor (V/I Monitor) output voltage and current instantaneously. This allows signals to be easily measured by external instruments (DMM, Oscilloscope, etc.). The analog monitoring points are stored in the buffer for protection
- 2. Output indicator (DC ON) signal.
- 3. Protection state indication (OVP/AD OCP/DD OCP/OPP/FAN LOCK/AC FAULT, etc.).
- 4. Over temperature (OTP) protection signal.
- 5. CV/CC status indicators.
- 6. Output status indicators.

# 1.2.4 Control Signals for Input

- 1. Remote sense input for voltage drop compensation.
- 2. Analog programming signal allowing the output program and current to be sent using an analog reference signal.
- 3. Remote inhibit control signal (TTL)

# 1.2.5 Measuring and Editing

- 1. Measurement for voltage, current and power.
- 2. 10 programs and 100 sequences to edit voltage/current waveform output.
- 3. Run time voltage program that can be set for up to an hour.

# 1.3 Specifications

Chroma 62000D Series high power density and bidirectional DC power supplies include three types of models; 6kW (62060D), 12kW (62120D), and 18kW (62180D). Table 1-1 lists the output specifications of these models. It is suggested to warm up the instruments for more than 10 minutes before performing verification tests. The test condition is 25  $\pm$  5°C and under a resistance load.

Table 1-1 Specifications

1		pecifications	<del>-</del>		
Chroma Model Name	62060D-100	62120D-100	62180D-100		
Output Ratings					
Output Voltage <sup>1</sup>		0-100V			
Output Current <sup>2</sup>	±180A	±360A	±540A		
Output Power	±6,000W	±12,000W	±18,000W		
Min. Load Voltage		4V			
(@ I Load Max)		<del>4</del> V			
Line Regulation <sup>3</sup>					
Voltage		+/- 0.01% F.S.			
Current		+/- 0.05% F.S.			
Load Regulation⁴					
Voltage		+/- 0.02% F.S.			
Current		+/- 0.1% F.S.			
Voltage Measurement					
Range		20V / 100V			
Accuracy		0.05% + 0.05%F.S.			
Current Measurement					
Range	36A / 180A	72A / 360A	108A / 540A		
Accuracy		0.1% + 0.1%F.S.			
Output Noise & Ripple					
P-P (20MHz) <sup>11</sup>		150mV			
rms (Voltage)11		25mV			
rms (Current <sup>5)</sup>	150mA	300mA	450mA		
OVP Adjustment					
Range					
Range		0-110% programmable			
Accuracy	+	-/- 1% of full-scale outpu			
Programming					
Response Time					
Rise Time (Full Load)		10ms			
Rise Time (No Load)		10ms			
Fall Time (Full Load)		10ms			
Fall Time (No Load)	10ms				
Slew Rate Control					
Voltage slew rate		0.004)///22 4.0)///22			
range <sup>10</sup>		0.001V/ms - 10V/ms			
Current slew rate range	0.001A/ms - 10A/ms	0.001A/ms - 20A/ms	0.001A/ms - 30A/ms		
Minimum transition time		0.5 ms			
Efficiency <sup>6</sup>	Source > 0.91	Source > 0.91	Source > 0.91		
Linciency	Sink > 0.90	Sink > 0.90	Sink > 0.90		
Transient Response		s to +/- 0.75% of steady-			
Time	to 100% or	100% to 50% load cha	nge(1A/µs)		
Drift (30 minutes) <sup>7</sup>					
Voltage	0.04% of Vmax				
Current	0.06% of Imax				
Drift (8 hours) <sup>8</sup>					
Voltage	0.02% of Vmax				
Current		0.04% of Imax			
Temperature Coefficient <sup>9</sup>					
Voltage		0.04% of Vmax/°C			
Current		0.06% of Imax/°C			

Programming	
&Measurement	
Resolution	
Voltage (Front Panel)	10mV
Current (Front Panel)	10mA
Voltage (Digital	
Interface)	0.002% of Vmax
Current (Digital	
Interface)	0.004% of Imax
Voltage (Analog	
Interface)	0.04% of Vmax
Current (Analog	
Interface)	0.04% of Imax
Remote Interface	
Analog programming	Standard
USB	Standard
GPIB	Optional
CAN	Optional
LXI Compliant LAN	Optional
Interface	Standard
Programming	
Accuracy	
Voltage (Front Panel	
and Digital Interface)	0.05% of Vmax
Current (Front Panel and	
Digital Interface )	0.2% of Imax
Power (Front Panel and	
Digital Interface)	0.3% of Pmax
Voltage (Analog	
Interface)	0.2% of Vmax
Current (Analog	
Interface)	0.3% of Imax
APG Measure	
Accuracy	
Voltage (Analog	
Interface)	0.5% of Vmax
Current (Analog	
Interface)	0.75% of Imax
GPIB Command	
Response Time	
Vout setting	GPIB send command to DC source receiver <20ms
Measure Volt & Current	Under GPIB command using Measure <25ms
Analog Interface (I/O)	22 2 20
Voltage and Current	Voltage: 0 - 10Vdc of F.S.
Programming inputs	Current: Source I = 0 - 10Vdc of F.S.
(I/P)	Load I = 0 - 10Vdc of F.S.
Voltage and Current	Voltage: 0 - 10Vdc of F.S.
monitor output (O/P)	Current : -10 - 10Vdc of F.S.
External ON/OFF (I/P)	TTL: Active Low or High (Selective)
DC_ON Signal (O/P)	Level by user defined. (Time delay= 1ms at voltage slew rate of
. , ,	10V/ms.)
CV or CC mode	TTL Level High=CV mode;
Indicator (O/P)	TTL Level Low=CC mode
OTP Indicator (O/P)	TTL: Active Low

System Fault indicator	TTL: Active Low				
(O/P)					
Safety interlock (I/P) Remote inhibit (I/P)	Time accuracy: <100ms TTL: Active Low				
Series & Parallel	Moot	er / Slave control for 10	) unito		
operation		es: 2 units / Parallel: 10			
Auto Sequencing (List	(Selle	25. Z uriils / Parallel. Tu	o units)		
mode)					
Number of program		10			
Number of sequence		100			
Dwell time Range		2ms – 15,000s			
Trig. Source		Manual / Auto / Externa	al		
Auto Sequencing (Step		Maridar/ Adio / Externi	ai		
mode)					
Start voltage		0 to Full scale			
End voltage		0 to Full scale			
Run time	hh · mm · ss ss	s ( 00 : 00 : 00.001 to 9	99 · 59 · 59 999 )		
Trig. Source	1111 : 111111 : 00:00	Auto	00 : 00 : 00:000 )		
Input Specification		71010			
присороспісаноп	3Ф 200Vac - 220Vac ±	3Ф 200Vac - 220Vac	3Ф 200Vac - 220Vac ±		
AC input voltage 3phase, 3wire + ground  AC frequency range  Power factor	10% 3Φ 380Vac - 480Vac ± 10% (Output=4kW@200- 220 Vac input, Output=6kW@380- 480 Vac input) w/o Neutral  Source PF>0.97 @220Vac PF>0.97 @380Vac PF>0.95 @480Vac Regn PF>0.97 @220Vac PF>0.95 @380Vac	± 10% 3Φ 380Vac - 480Vac ± 10% (Output=8kW@200- 220 Vac input, Output=12kW@380- 480 Vac input) w/o Neutral 47 - 63 Hz Source PF>0.97 @220Vac PF>0.97 @380Vac PF>0.95 @480Vac Regn PF>0.97 @220Vac PF>0.97 @220Vac	10% 3Ф 380Vac - 480Vac ± 10% (Output=12kW@200- 220 Vac input, Output=18kW@380- 480 Vac input) w/o Neutral  Source PF>0.97 @220Vac PF>0.95 @480Vac Regn PF>0.97 @220Vac PF>0.97 @220Vac PF>0.95 @380Vac		
	PF>0.92 @480Vac	PF>0.92 @480Vac	PF>0.92 @480Vac		
General Specification					
Maximum Remote			(40( ) )		
Sense Line Drop	2% of fu	ıll scale voltage per line	e(4% total)		
Compensation <sup>12</sup>					
Operating Temperature Rage	0°C ~ +40°C				
Storage Temperature Rage	-25°C ~ +70°C				
Dimension Size (HxWxD)mm	133 x 428 x 730 mm / 5.23 x 16.85 x 28.74 inch				
Weight (kg)	27kg / 60lbs	36kg / 80lbs	45kg / 100lbs		

Chroma Model Name	62060D-600	62120D-600	62180D-600
Output Ratings			
Output Voltage <sup>1</sup>		0-600V	
Output Current <sup>2</sup>	±40A	±80A	±120A
Output Power	±6,000W	±12,000W	±18,000W
Min. Load voltage (@ I	,	201/	
Load Max)		30V	
Line Regulation <sup>3</sup>			
Voltage		+/- 0.01% F.S.	
Current		+/- 0.05% F.S.	
Load Regulation⁴			
Voltage		+/- 0.02% F.S.	
Current		+/- 0.1% F.S.	
Voltage Measurement			
Range		120V / 600V	
Accuracy		0.05% + 0.05%F.S.	
Current Measurement			
Range	8A / 40A	16A / 80A	24A / 120A
Accuracy		0.1% + 0.1%F.S.	
Output Noise & Ripple			
P-P (20MHz) <sup>11</sup>		420mV	
rms (Voltage)11	85mV		
rms (Current <sup>5)</sup>	30mA	60mA	90mA
OVP Adjustment			
Range			
Range	0-110% programmable		
Accuracy	+/- 1% of full-scale output		
Programming			
Response Time			
Rise Time (Full Load)	20ms		
Rise Time (No Load)	10ms		
Fall Time (Full Load)	20ms		
Fall Time (No Load)		10ms	
Slew Rate Control			
Voltage slew rate	0.001V/ms – 60V/ms		
range <sup>10</sup>			
Current slew rate range	0.001A/ms - 20A/ms	0.001A/ms – 40A/ms	0.001A/ms – 60A/ms
Minimum transition time	2.27	0.5ms	
Efficiency <sup>6</sup>	Source > 91% Sink > 92%	Source > 92% Sink > 93%	Source > 92% Sink > 93%
Transient Response		s to +/- 0.75% of steady	
Time		· 100% to 50% load cha	
Drift (30 minutes) <sup>7</sup>			3 ( 1 /
Voltage	0.04% of Vmax		
Current	0.06% of Imax		
Drift (8 hours)8			
Voltage	0.02% of Vmax		
Current		0.04% of Imax	
Temperature Coefficient <sup>9</sup>			
Voltage	0.04% of Vmax/°C		
Current		0.06% of Imax/°C	

## Amesourement Resolution  Voltage (Front Panel)  Current (Front Panel)  Current (Front Panel)  Outlage (Iront Panel)  Outlage (Analog Interface)  Current (Analog Interface)  Analog programming  USB Standard  GPIB Optional  LXI Compliant LAN Interface  System bus(CAN)  Programming  Accuracy  Voltage (Front Panel and Digital Interface)  Current (Front Panel and Digital Interface)  Power (Front Panel and Digital Interface)  Current (Analog Interface)  Outlage (Analog Interface)  Outlage (Analog Interface)  Outlage (Analog Interface)  Outlage (Analog Interface)  Current (Analog Interface)  Outlage (Analog Interface)  Current (Analog Interface)  Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  Curre	<u> </u>		
Resolution  Current (Front Panel )  Current (Front Panel )  Current (Digital Interface)  Current (Digital Interface)  Current (Analog Interface)  Current (Front Panel and Digital Interface)  Current (Front Panel and Digital Interface)  Voltage (Front Panel and Digital Interface)  Voltage (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)  C	Programming		
Voltage (Front Panel )			
Current (Front Panel)		40\/	
Voltage (Digital Interface)			
Interface	` '	10mA	
Interface)  Outrent (Analog Interface)  Outrent (Analog Interface)  Remote Interface  Analog programming  USB  GPIB  Optional  LXI Compliant LAN Interface  System bus(CAN)  Programming  Accuracy  Voltage (Front Panel and Digital Interface)  Outrent (Front Panel and Digital Interface)  Voltage (Analog Interfac	Interface)	0.002% of Vmax	
Interface ) Current (Analog Interface) Remote Interface Analog programming USB Standard USB Optional LXI Compliant LAN Interface System bus(CAN) Standard for Master/slave control Programming Accuracy Voltage (Front Panel and Digital Interface) Current (Front Panel and Digital Interface) Power (Front Panel and Digital Interface) Voltage (Analog Interface) Voltage (Analog Interface) Current (Analog Interface) Current (Analog Interface) Current (Analog Interface) Current (Analog Interface) Voltage (Analog Interface) Voltage (Analog Interface) Current (Analo	Current (Digital Interface)	0.002% of Imax	
Current (Ánalog Interface)  Remote Interface Analog programming USB GPIB UXI Compliant LAN Interface System bus(CAN)  Programming Accuracy Voltage (Front Panel and Digital Interface) Digital Interface) Current (Front Panel and Digital Interface) Power (Front Panel and Digital Interface) Current (Analog Interface) Cur	Voltage (Analog	0.04% of Vmax	
Remote Interface Analog programming USB Standard GPIB Optional LXI Compliant LAN Interface System bus(CAN) Programming Accuracy Voltage (Front Panel and Digital Interface) Current (Front Panel and Digital Interface) Power (Front Panel and Digital Interface) Current (Analog Interface) Current (Analog Interface) Voltage (Analog Interface) Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage and Current Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of	Current (Ánalog	0.04% of Imax	
Analog programming	,		
Standard		0(1)	
GPIB LXI Compliant LAN Interface System bus(CAN) Programming Accuracy Voltage (Front Panel and Digital Interface) Current (Front Panel and Digital Interface) Power (Front Panel and Digital Interface) Current (Front Panel and Digital Interface) Power (Front Panel and Digital Interface) Current (Analog			
LXI Compliant LAN Interface System bus(CAN)  Programming Accuracy  Voltage (Front Panel and Digital Interface) Current (Front Panel and Digital Interface) Power (Front Panel and Digital Interface)  Voltage (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)			
Interface System bus(CAN) Standard for Master/slave control Programming Accuracy Voltage (Front Panel and Digital Interface) Power (Front Panel and Digital Interface)  Current (Analog Interface) Power (Front Panel and Digital Interface) Power (Front Panel and Digital Interface)  O.2% of Imax  APG Measure Accuracy Voltage (Analog Interface) Power (Analog Interface) P		Optional	
System bus(CAN)  Programming Accuracy  Voltage (Front Panel and Digital Interface )  Current (Front Panel and Digital Interface)  Power (Front Panel and Digital Interface)  Voltage (Analog Interface)  Current (Analog Interface)  Voltage (Analog Interface)  Voltage (Analog Interface)  Voltage (Analog Interface)  O.2% of Imax  APG Measure Accuracy  Voltage (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  GPIB send command to DC source receiver <20ms  Measure Voltage (Analog Interface)  Voltage and Current Programming inputs  (I/P)  Voltage and Current Monitor output (O/P)  External ON/OFF (I/P)  DC_ON Signal (O/P)  Voltage Standard for Master/slave control  Analog Master/slave control  O.2% of Imax  O.5% of Vmax  Current (Analog Interface)  O.5% of Vmax  Current Source receiver <20ms  Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  DC_ON Signal (O/P)  TTL Level High=CV mode;	<u> </u>	Standard	
Programming Accuracy Voltage (Front Panel and Digital Interface ) Current (Front Panel and Digital Interface ) Power (Front Panel and Digital Interface ) Power (Front Panel and Digital Interface) Voltage (Analog Interface)  GPIB Command Response Time Vout setting Measure Volt & Current Analog Interface (I/O) Voltage and Current Programming inputs (I/P) Voltage and Current Programming inputs (I/P) Voltage and Current Monitor output (O/P) External ON/OFF (I/P) DC_ON Signal (O/P)  TTL Level High=CV mode;  Voltage: O + 10Vdc; TTL Level High=CV mode;  TTL Level High=CV mode;		Standard for Master/clave control	
Accuracy Voltage (Front Panel and Digital Interface ) Current (Front Panel and Digital Interface ) Power (Front Panel and Digital Interface) Voltage (Analog Interface) Current (Analog Interface) APG Measure Accuracy Voltage (Analog Interface) Current (Analog Interface) Voltage Command Response Time Vout setting GPIB send command to DC source receiver <20ms Measure Volt & Current Analog Interface (I/O) Voltage and Current Programming inputs Current: Source I = 0 - 10Vdc of F.S. Load I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: -10 - 10Vdc of F.S. Current: -10 - 10Vdc of F.S. Current: -10 - 10Vdc of F.S. External ON/OFF (I/P) TTL: Active Low or High (Selective) TTL Level High=CV mode;		Standard for Master/stave Control	
Voltage (Front Panel and Digital Interface )  Current (Front Panel and Digital Interface)  Power (Front Panel and Digital Interface)  Power (Front Panel and Digital Interface)  Voltage (Analog Interface)  Current (Analog Interface)  APG Measure Accuracy  Voltage (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting GPIB send command to DC source receiver <20ms  Measure Volt & Current Under GPIB command using Measure <25ms  Analog Interface (I/O)  Voltage and Current Programming inputs Current: Source I = 0 - 10Vdc of F.S.  Programming inputs (Current: Source I = 0 - 10Vdc of F.S.  Voltage and Current Voltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  External ON/OFF (I/P)  Current: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  TTL Level High=CV mode;			
and Digital Interface )  Current (Front Panel and Digital Interface)  Power (Front Panel and Digital Interface)  Voltage (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)  APG Measure  Accuracy  Voltage (Analog Interface)  Voltage (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  GPIB Command  Response Time  Vout setting  GPIB send command to DC source receiver <20ms  Measure Volt & Current  Analog Interface (I/O)  Voltage and Current  Programming inputs  (I/P)  Voltage and Current  Moltage a			
Current (Front Panel and Digital Interface )  Power (Front Panel and Digital Interface)  Voltage (Analog Interface)  Current (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)  Voltage Command Under GPIB command using Measure <25ms  Analog Interface (I/O)  Voltage and Current  Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;		0.05% of Vmax	
Digital Interface ) Power (Front Panel and Digital Interface) Voltage (Analog Interface)  O.2% of Vmax  Current (Analog Interface)  APG Measure Accuracy Voltage (Analog Interface)  O.5% of Vmax  Current (Analog Interface)  O.5% of Vmax  O.5% of Vmax  Current (Analog Interface)  GPIB Command Response Time Vout setting  GPIB send command to DC source receiver <20ms  Measure Volt & Current  Analog Interface (I/O) Voltage and Current Programming inputs (I/P) Voltage and Current Mount of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  TTL Level High=CV mode;			
Power (Front Panel and Digital Interface)  Voltage (Analog Interface)  Current (Analog Interface)  APG Measure Accuracy  Voltage (Analog Interface)  Voltage (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  GPIB send command to DC source receiver <20ms  Measure Volt & Current  Analog Interface (I/O)  Voltage and Current  Programming inputs  (I/P)  Voltage and Current  Programming inputs  Voltage and Current  Programming inputs  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage and Current  Ovoltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  TTL Level High=CV mode;		0.2% of Imax	
Voltage (Analog Interface)  Voltage (Analog Interface)  Current (Analog Interface)  APG Measure Accuracy  Voltage (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  GPIB send command to DC source receiver <20ms  Measure Volt & Current  Under GPIB command using Measure <25ms  Analog Interface (I/O)  Voltage and Current  Programming inputs  (I/P)  Voltage and Current  Noltage and Current  Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  DC_ON Signal (O/P)  CV or CC mode  TTL Level High=CV mode;	Power (Front Panel and	0.20/ af Dragy	
Interface)  Current (Analog Interface)  APG Measure Accuracy  Voltage (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  GPIB send command to DC source receiver <20ms  Measure Volt & Current  Under GPIB command using Measure <25ms  Analog Interface (I/O)  Voltage and Current  Programming inputs  (I/P)  Voltage and Current  Moltage and Current  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage and Current  Turent: Source I = 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  TTL Level High=CV mode;	Digital Interface)	0.3% of Pillax	
Current (Analog Interface)  APG Measure Accuracy  Voltage (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  GPIB send command to DC source receiver <20ms  Measure Volt & Current  Analog Interface (I/O)  Voltage and Current  Programming inputs  (I/P)  Voltage and Current  Moltage and Current  Noltage and Current  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	Voltage (Analog	0.29/ of Vmay	
Interface)  APG Measure Accuracy  Voltage (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  Measure Volt & Current  Analog Interface (I/O)  Voltage and Current  Programming inputs  (I/P)  Voltage and Current  Moltage and Current  Voltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	Interface)	0.278 OF VIIIAX	
APG Measure Accuracy  Voltage (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  Measure Volt & Current  Analog Interface (I/O)  Voltage and Current Programming inputs (I/P)  Voltage and Current Moltage and Current Programming inputs (I/P)  Voltage and Current Moltage and Current Moltage and Current Current: Source I = 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S.  Voltage and Current Moltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	` •	0.2% of Imax	
Accuracy Voltage (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time Vout setting  Measure Volt & Current  Analog Interface (I/O)  Voltage and Current Programming inputs (I/P)  Voltage and Current Moltage and Current Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage and Current Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Voltage and Current Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	,		
Voltage (Analog Interface)  Current (Analog Interface)  GPIB Command Response Time  Vout setting  Measure Volt & Current  Analog Interface (I/O)  Voltage and Current Programming inputs (I/P)  Voltage and Current monitor output (O/P)  External ON/OFF (I/P)  CV or CC mode  ORIB send command to DC source receiver <20ms Under GPIB command using Measure <25ms  Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  TTL Level High=CV mode;			
Current (Analog Interface)  GPIB Command Response Time  Vout setting GPIB send command to DC source receiver <20ms  Measure Volt & Current Under GPIB command using Measure <25ms  Analog Interface (I/O)  Voltage and Current Voltage: 0 - 10Vdc of F.S.  Programming inputs (LiP) Current: Source I = 0 - 10Vdc of F.S.  Voltage and Current Voltage: 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage and Current Voltage: 0 - 10Vdc of F.S.  External ON/OFF (I/P) TTL: Active Low or High (Selective)  DC_ON Signal (O/P) Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode TTL Level High=CV mode;	Voltage (Analog	0.5% of Vmax	
Interface)  GPIB Command Response Time  Vout setting  GPIB send command to DC source receiver <20ms  Measure Volt & Current  Inder GPIB command using Measure <25ms  Analog Interface (I/O)  Voltage and Current  Programming inputs (I/P)  Voltage and Current  Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage and Current  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	Current (Analog	0.75% -61	
Vout setting   GPIB send command to DC source receiver <20ms	Interface)	0.75% of imax	
Wout setting  Measure Volt & Current  Measure Volt & Current  Under GPIB command using Measure <25ms  Voltage and Current  Programming inputs (I/P)  Voltage and Current  Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage and Current  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;			
Measure Volt & Current  Analog Interface (I/O)  Voltage and Current Programming inputs (I/P)  Voltage and Current Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  Under GPIB command using Measure <25ms  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)		ODID 1 10 DO	
Analog Interface (I/O)  Voltage and Current Programming inputs (I/P)  Voltage: 0 - 10Vdc of F.S.  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage and Current Voltage: 0 - 10Vdc of F.S.  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  External ON/OFF (I/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	ŭ		
Voltage and Current Programming inputs (I/P) Voltage: 0 - 10Vdc of F.S. Current: Source I = 0 - 10Vdc of F.S. Voltage and Current Voltage: 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Voltage: 0 - 10Vdc of F.S. Current: -10 - 10Vdc of F.S. External ON/OFF (I/P) TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode TTL Level High=CV mode;		Under GPIB command using Measure <25ms	
Programming inputs  (I/P)  Current: Source I = 0 - 10Vdc of F.S.  Load I = 0 - 10Vdc of F.S.  Voltage and Current  Woltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  TTL: Active Low or High (Selective)  DC_ON Signal (O/P)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	• , ,	\/-\\\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	
(I/P)     Load I = 0 - 10Vdc of F.S.       Voltage and Current monitor output (O/P)     Voltage: 0 - 10Vdc of F.S.       External ON/OFF (I/P)     Current: -10 - 10Vdc of F.S.       External ON/OFF (I/P)     TTL: Active Low or High (Selective)       DC_ON Signal (O/P)     Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)       CV or CC mode     TTL Level High=CV mode;			
Voltage: 0 - 10Vdc of F.S. monitor output (O/P)  External ON/OFF (I/P)  DC_ON Signal (O/P)  CV or CC mode  Voltage: 0 - 10Vdc of F.S.  Current: -10 - 10Vdc of F.S.  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  TTL Level High=CV mode;			
monitor output (O/P)  External ON/OFF (I/P)  DC_ON Signal (O/P)  Current: -10 - 10Vdc of F.S.  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;	, ,		
External ON/OFF (I/P)  DC_ON Signal (O/P)  TTL: Active Low or High (Selective)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  TTL Level High=CV mode;			
DC_ON Signal (O/P)  Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)  CV or CC mode  TTL Level High=CV mode;			
CV or CC mode TTL Level High=CV mode;	DC_ON Signal (O/P)	Level by user defined. (Time delay= 1ms at voltage slew rate of	
· · · · · · · · · · · · · · · · · · ·	CV or CC mode		
	Indicator (O/P)		
OTP Indicator (O/P) TTL: Active Low	OTP Indicator (O/P)	TTL: Active Low	

System Fault indicator (O/P)		TTL: Active Low		
Safety interlock (I/P)		Time accuracy: <100ms		
Remote inhibit (I/P)		TTL: Active Low	-	
Series & Parallel	1	Master / Slave control f	or	
operation	Serie	es: 2 units / Parallel: 10	) units	
Auto Sequencing (List				
mode)				
Number of program		10		
Number of sequence		100		
Dwell time Range		2ms - 15,000s		
Trig. Source		Manual / Auto / Externa	al	
Auto Sequencing (Step				
mode)				
Start voltage		0 to Full scale		
End voltage		0 to Full scale		
Run time		00.001Sec to 100hr		
Trig. Source		Auto		
Input Specification				
AC input voltage 3phase, 3wire + ground AC frequency range	3Φ 200Vac - 220Vac ± 10% 3Φ 380Vac - 480Vac ± 10% (Output=4kW@200- 220 Vac input, Output=6kW@380- 480 Vac input) w/o Neutral	± 10% 3Φ 380Vac - 480Vac ± 10% (Output=8kW@200- 220 Vac input, Output=12kW@380- 480 Vac input) w/o Neutral 47 – 63 Hz	3Φ 200Vac - 220Vac ± 10% 3Φ 380Vac - 480Vac ± 10% (Output=12kW@200- 220 Vac input, Output=18kW@380- 480 Vac input) w/o Neutral	
r io iio quoiio) ionigo	Source	Source	Source	
Power factor	PF>0.97 @220Vac PF>0.97 @380Vac PF>0.95 @480Vac Regn PF>0.97 @220Vac PF>0.95 @380Vac PF>0.92 @480Vac	PF>0.97 @220Vac PF>0.97 @380Vac PF>0.95 @480Vac Regn PF>0.97 @220Vac PF>0.95 @380Vac PF>0.92 @480Vac	PF>0.97 @220Vac PF>0.97 @380Vac PF>0.95 @480Vac Regn PF>0.97 @220Vac PF>0.95 @380Vac PF>0.92 @480Vac	
General Specification				
Maximum Remote Sense Line Drop Compensation <sup>12</sup>	2% of full scale voltage per line(4% total)			
Operating Temperature Rage	0°C ~ +40°C			
Storage Temperature Rage	-25°C ~ +70°C			
Dimension Size (HxWxD)mm	133 x 428 x 730 mm / 5.23 x 16.85 x 28.74 inch			
Weight (kg)	25kg / 55.1lbs	32kg / 70.5lbs	39kg / 86.0lbs	

Chroma Model Name	62120D-1200	62180D-1200	62180D-1800
Output Ratings			
Output Voltage <sup>1</sup>	0-1,200V 0-1,800V		0-1,800V
Output Current <sup>2</sup>		±40A	
Output Power	±12,000W	±18,	000W
Min. Load voltage (@ I		001/	
Load Max)		90V	
Line Regulation <sup>3</sup>			
Voltage		+/- 0.01% F.S.	
Current		+/- 0.05% F.S.	
Load Regulation⁴			
Voltage		+/- 0.02% F.S.	
Current		+/- 0.1% F.S.	
Voltage Measurement			
Range	240V /	1,200V	360V / 1,800V
Accuracy <sup>14</sup>		0.05% + 0.05%F.S.	,
Current Measurement			
Range		8A / 40A	
Accuracy <sup>14</sup>		0.1% + 0.1%F.S.	
Output Noise & Ripple			
P-P (20MHz) <sup>11</sup>	840mV	1,26	0mV
rms (Voltage) <sup>11</sup>	170mV		5mV
rms (Current <sup>5)</sup>		30mA	
OVP Adjustment			
Range			
Range	0-110% programmable		
Accuracy	+/- 1% of full-scale output		
Programming		<u> </u>	
Response Time			
Rise Time (Full Load)		20ms	
Rise Time (No Load)		10ms	
Fall Time (Full Load)		20ms	
Fall Time (No Load)	10ms		
Slew Rate Control			
Voltage slew rate	0.004\//ma 420\//ma	0.004\//ma	- 180V/ms
range <sup>10</sup>	0.001V/ms - 120V/ms	0.00 i v/ms	5 – 180V/IIIS
Current slew rate range		0.001A/ms - 20A/ms	
Minimum transition time		0.5ms	
Efficiency <sup>6</sup>	Source > 91%	Source > 91%	Source > 92%
Efficiency	Sink > 92%	Sink > 92%	Sink > 93%
Transient Response			-state output for a 50%
Time <sup>15</sup>	to 100% or	100% to 50% load cha	inge(1A/μs)
Drift (30 minutes) <sup>7</sup>			
Voltage	0.04% of Vmax		
Current	0.06% of Imax		
Drift (8 hours) <sup>8</sup>			
Voltage	0.02% of Vmax		
Current	0.04% of Imax		
Temperature			
Coefficient <sup>9</sup>			
Voltage		0.04% of Vmax/°C	
Current		0.06% of Imax/°C	

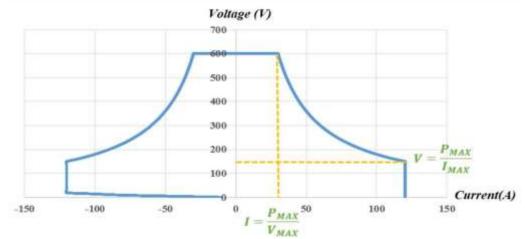
Programming		
&Measurement		
Resolution		
Voltage (Front Panel)	100mV	
Current (Front Panel)	10mA	
Voltage (Digital		
Interface)	0.002% of Vmax	
Current (Digital		
Interface)	0.002% of Imax	
Voltage (Analog		
Interface)	0.04% of Vmax	
Current (Analog		
Interface)	0.04% of Imax	
Remote Interface		
Analog programming	Standard	
USB	Standard	
GPIB	Optional	
CAN	Optional	
LXI Compliant LAN	•	
Interface	Standard	
Programming		
Accuracy		
Voltage (Front Panel		
and Digital Interface)	0.05% of Vmax	
Current (Front Panel and		
Digital Interface )	0.2% of Imax	
Power (Front Panel and		
Digital Interface)	0.3% of Pmax	
Voltage (Analog	0.00/_ (1/	
Interface)	0.2% of Vmax	
Current (Analog	0.00% (1)	
Interface)	0.2% of Imax	
APG Measure		
Accuracy		
Voltage (Analog	0.EW of Vmov	
Interface)	0.5% of Vmax	
Current (Analog	0.75% of Imax	
Interface)	0.75% OF IIIIAX	
GPIB Command		
Response Time		
Vout setting	GPIB send command to DC source receiver <20ms	
Measure Volt & Current	Under GPIB command using Measure <25ms	
Analog Interface (I/O)		
Voltage and Current	Voltage: 0 - 10Vdc of F.S.	
Programming inputs	Current: Source I = 0 - 10Vdc of F.S.	
(I/P)	Load $I = 0 - 10Vdc$ of F.S.	
Voltage and Current	Voltage: 0 - 10Vdc of F.S.	
monitor output (O/P)	Current: -10 - 10Vdc of F.S.	
External ON/OFF (I/P)	TTL: Active Low or High (Selective)	
DC_ON Signal (O/P)	Level by user defined. (Time delay= 1ms at voltage slew rate of 10V/ms.)	
CV or CC mode	TTL Level High=CV mode;	
Indicator (O/P)	TTL Level Low=CC mode	
OTP Indicator (O/P)	TTL: Active Low	
\/		

Cyctom Foult indicator		_	
System Fault indicator (O/P)	TTL: Active Low		
Safety interlock (I/P)	Time accuracy: <100mc		
Remote inhibit (I/P)	Time accuracy: <100ms TTL: Active Low		
Series & Parallel		TTE. Active Low	
operation	Master / S	Slave control for Parallel: 10 units	
Auto Sequencing (List			
mode)			
Number of program		10	
Number of sequence		100	
Dwell time Range		2ms – 15,000s	
Trig. Source		Manual / Auto / External	
Auto Sequencing (Step		Mariaar, Aato / External	
mode)			
Start voltage		0 to Full scale	
End voltage		0 to Full scale	
Run time		00.001Sec to 100hr	
Trig. Source		Auto	
Input Specification		Auto	
	3Ф 200Vac - 220Vac ±		
AC input voltage 3phase, 3wire + ground	10% 3Φ 380Vac - 480Vac ± 10% (Output=8kW @200- 220 Vac input, Output=12kW @380- 480 Vac input) w/o Neutral	3Ф 200Vac - 220Vac ± 10% 3Ф 380Vac - 480Vac ± 10% (Output=12kW@200-220 Vac input, Output=18kW@380-480 Vac input) w/o Neutral	
AC frequency range		47 – 63 Hz	
Power factor	Source PF>0.97 @220Vac PF>0.97 @380Vac PF>0.95 @480Vac Regn PF>0.97 @220Vac PF>0.95 @380Vac PF>0.95 @380Vac PF>0.92 @480Vac		
General Specification			
Maximum Remote Sense Line Drop Compensation <sup>12</sup>	2% of full scale voltage per line(4% total)		
Operating Temperature Rage	0°C ~ +40°C		
Storage Temperature Rage		-25°C ~ +70°C	
Dimension Size (HxWxD)mm	133 x 428 x 730 mm / 5.23 x 16.85 x 28.74 inch		
Weight (kg)	32kg / 70.5lbs	39kg / 86.0lbs	
VII amaaifiaatiama aua aulaid	ect to change without pri	ior potico	

All specifications are subject to change without prior notice.

- Note 1. 2. Minimum output voltage is <0.5% of rate voltage at zero output setting. Minimum output current is<0.2% of rate current at zero output setting when measured with rated load resistance.
  - 3. For input voltage variation over the AC input voltage range with constant rated load.

- 4. For 0-100% load variation with constant nominal line voltage.
- Current mode ripple is measured from 10% to 100% of rated output voltage full current
- 6. Efficiency at 480Vac input Voltage and Full load output (Vo Max).
- 7. Maximum drift over 30 minutes with constant line, load, and temperature after power on.
- 8. Maximum drift over 8 hours with constant line, load, and temperature after 30 minute warm-up.
- 9. Change in output per 0C change in ambient temperature with constant line and load.
- 10. The fall rate will be affected by the discharge rate of the output capacitors especially under no load condition. (For 220Vac No load VS.R(max) = 50V/ms, Full load VS.R(max) = 25V/ms)
- 11. From 20 Hz to 20 MHz for peak-to-peak noise; from 20 Hz to 300 kHz for rms noise. (\* 62180D-100 \ 62180D-600 Measured across a 44nF & 104.7μF capacitor at the output terminal.) (Reference TN board Capacitor)
- 12. VO & IO Output range(ex: 62180D-600)



Constant Power: Equipped with wide voltage and wide current range for use

- 13. Efficiency at 220Vac & 380Vac input Voltage and Full load output (Vo Max).
- 14. Use SCPI Commands to get values.
- 15. Transient Response Time < 0.5ms at ≥ 450Vdc output Voltage.

Model: 62180D-600 \ 62180D-1200 \ 62180D-1800 Model: 62180D-100

	220 Vac	380 Vac
Source eff.	>0.90	>0.91
Load eff.	>0.91	>0.92

Source eff.	>0.88	>0.90
Load eff.	>0.88	>0.89

220 Vac

380 Vac

Model: 62120D-600 . 62120D-1200

MOUCH: OZIZOD OOG OZIZOD IZ		
	220Vac	380Vac
Source eff.	>0.90	>0.91
Load eff.	>0.91	>0.92

Model: 62120D-100			
	220Vac	380Vac	
Source eff.	>0.88	>0.90	
Load eff.	>0.88	>0.89	

Model: 62060D-600

	220Vac	380Vac
Source eff.	>0.90	>0.91
Load eff.	>0.91	>0.92

Model: 62060D-100

	220Vac	380Vac
Source eff.	>0.88	>0.90
Load eff.	>0.88	>0.89

\* Specifications apply from >2% to 100% of the rated voltage and from >2% to 100% of the rated current.

- **CAUTION**
- For applications with fast switchable power loads and cable lengths greater than 20cm, it is recommended the cables be twisted and parallel capacitance be added to prevent oscillations, see Figure 1-1.
- 2. Do not wrap the external input, output, and communication cables together to avoid cross interference errors.
- 3. Be sure to place the power supply horizontally (top side up) when using or for storage Do not stand the power supply vertically for long time period to avoid internal damage to the supply.

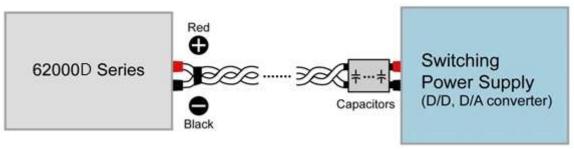


Figure 1-1

### **⚠WARNING**

Voltage from the two output terminals to earth varies with the 62000D Series models as Table 1-2 shows below:

Table 1-2

. 5.5.5					
Model	Max. Voltage (Vdc) Difference between Output Terminal and Earth				
62060D-100	•				
62120D-100	1,000				
62180D-100					
62060D-600					
62120D-600					
62180D-600	2,000				
62120D-1200	3,000				
62180D-1200					
62180D-1800					

If the voltage exceeds the above range it may result damage to the DC power supply.

# 1.4 Function Buttons

# 1.4.1 Front Panel

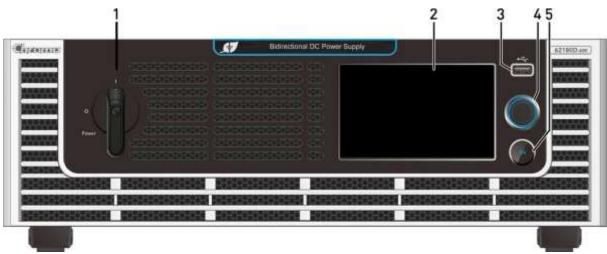


Figure 1-2 Front Panel of 62000D Series Models

Table 1-3 Front Panel Description

Item	Symbol	Description		
1		Main Power Switch: Turn on or off the power.		
2		LCD Touch Panel: Use the icons as they appear on the touch screen to set the voltage/current, measurements, control the program sequence, preview the output waveform, and display the test results.		
3		<b>USB HOST:</b> Allows for programs to be read, download data and upgrade firmware, etc.		
4		Rotary Knob: The rotary knob is used to edit the settings on the screen. When the settings are complete, press the rotary knob to confirm the input value.		
5		Output ON Button. Press the ON button, the light on means Output ON, and the light off means Output OFF.		

## 1.4.2 Rear Panel

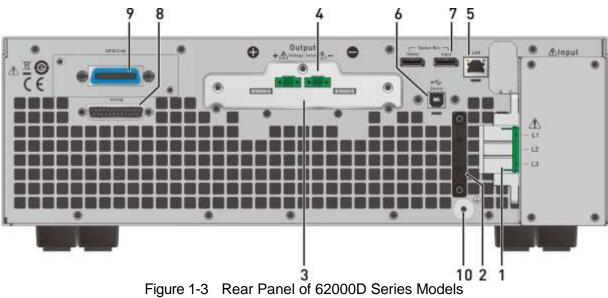
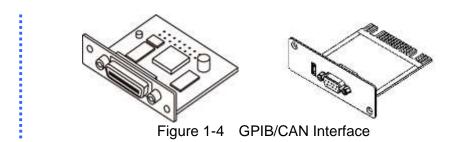


Table 1-4 Rear Panel Description

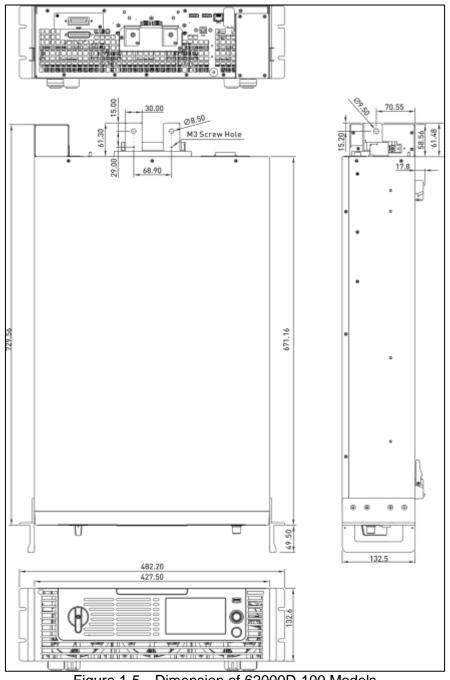
Item	Name	Description			
1	AC power	AC power input connector.			
	connector				
2	AC power cord	Connects to the AC power cord connector to prevent the cord			
	anti-pulling device	from loosening due to external force during operation.			
3	Output terminal	The output terminals of DC power supply.			
4	Voltage sense	Connecting this connector to load can compensate the voltage			
	connector	drop generated due to cable resistance. Be sure to connect the			
		remote sense connector "+" to the positive output terminal of the			
		device under test and "-" connector to the negative output			
		terminal of the device under test. Reversing these connectors			
		could cause damage to the power supply or the device under test.			
5	Ethernet connector	The remote controller uses ETHERNET bus to connect to PC for			
		remote operation.			
6	USB port	The remote controller uses USB bus to connect to PC for remote			
		operation.			
7	System bus	It is for serial/parallel data transmission. (Remove this cable if the			
		power supply is not connected in series or parallel.)			
· · · · · · · · · · · · · · · · · · ·		There are 25 pins signals that include APG input/output terminals			
		and system status signal terminals. See Appendix A for detail pin			
	terminal	assignments.			
9	` ,	Used for GPIB/CAN control via and external PC for remote			
	connector	operation.			
10	Functional Ground	This terminal is to connect the power supply to earth ground.			



Item 9 in Figure 1-3 is an optional GPIB/CAN interface of 62000D selected by the user. A blank panel will be installed if no interface is selected.



### **Dimension** 1.5



Dimension of 62000D-100 Models Figure 1-5

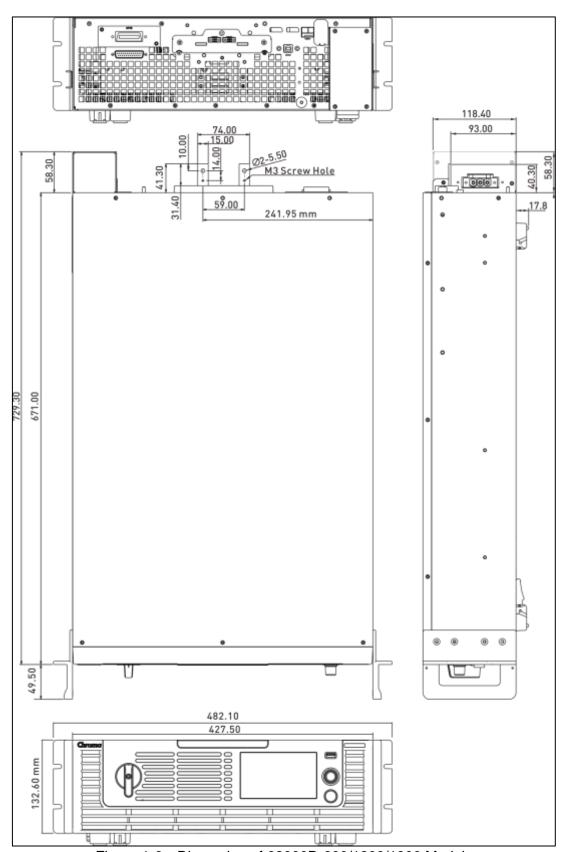


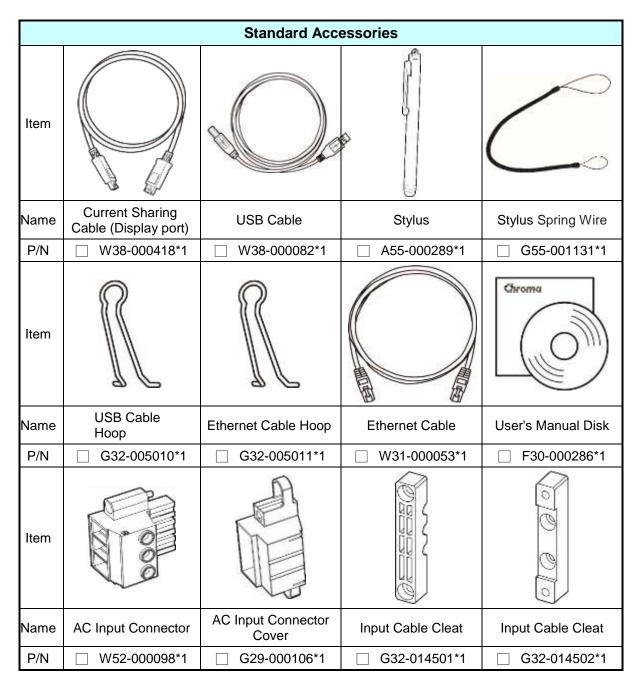
Figure 1-6 Dimension of 62000D-600/1200/1800 Models

# 2. Installation

# 2.1 Checking the Package

- 1. Check for any damage or missing accessories after unpacking.
- 2. Should any damage be found, contact shipping company and Chroma's service department immediately of the agent that the device as purchase through shipment. It is also recommended that pictures are taken of both the instrument's damage and shipping container and that the shipping container is kept for future reference.

The standard accessories list of 62000D-100V is listed as follows:



	Standard Accessories					
Item		C. Million	9			
Name	Rack Handle	M4x10 Screw (Handle)	8   Washer	M8 Nut		
P/N	G28-000146*2	☐ H61- 401020*8	☐ H81-800000*4	☐ H71-805800*2		
Item		(3)JIII				
Name	Output Cover Set	M3x6L Flat Head Screw	SP/ Washer,8Φ	M4x8 Screw		
P/N	☐ G29-000124 *1 pcs ☐ G29-000123 *1 pcs ☐ G53-000809 *1 pcs ☐ W61-006000 *2 pcs ☐ H61-300621 *6 pcs	☐ H61- 300621*3	☐ H82-800000*2	☐ H61-400850*2		
Item						
Name	M3x6 Screw	M4x10 Screw	M4x16 Screw	M8x20 Screw		
P/N	☐ H69-300641*2	☐ H61- 401052*2	☐ H69-401550*2	☐ H61-802030*2		

The standard accessories list of 62000D-600V/1200V/1800V is as follows:

	Standard Accessories				
Item					
Name	Current Sharing Cable (Display port)	USB Cable	Stylus Current Sharing Cable (Display port)	Stylus Spring Wire	
P/N	□ W38- 000418*1	☐ W38-000082*1	☐ A55-000289*1	☐ G55-001131*1	
Item				Chroma	
Name	USB Cable Hoop	Ethernet Cable Hoop	Ethernet Cable	User's Manual Disk	
P/N	☐ G32- 005010*1	☐ G32-005011*1	☐ W31-000053*1	☐ F30-000286*1	
Item	0000			(010 010)	
Name	AC Input Connector	AC Input Connector Cover	Input Cable Cleat	Input Cable Cleat	
P/N	☐ W52- 000098*1	G29-000106*1	☐ G32-014501*1	☐ G32-014502*1	

Standard Accessories					
Item			9		
Name	Rack Handle	M4x10 Screw (Handle)	M5x13 Washer	M5-8 Nut	
P/N	G28-000146*2	☐ H61-401020*8	☐ H81-501301*2	☐ H71-000029*2	
Item					
Name	Output Cover Set	M3x6L Flat Head Screw	M4x8 Flat Head Screw	M4x8 Screw	
P/N	G29-000112 *1 pcs G29-000114 *1 pcs G53-000771 *1 pcs G53-000770 *1 pcs W61-000010 *2 pcs H61-300621 *2 pcs H69-300641 *1 pcs	☐ H61-300621*2	☐ H61-400820*2	☐ H61-400850*2	
Item					
Name	M3x6 Screw	M4x10 Screw	M4x16 Screw	M5x15 Screw	
P/N	☐ H69-300641*2	☐ H61-401052*2	☐ H69-401550*2	☐ H61-501550*2	



- 1. Please keep all of the packing materials in case the device has to be returned for repair.
- 2. Do not return the instrument to the factory without obtaining prior RMA acceptance from Chroma.
- 3. Check if all accessories that are listed in the packing list are all received.



**CAUTION** The power supply is too heavy for one person to safely lift and mount. To avoid injury, ask for assistance during installation.

#### 2.1.1 **Maintenance and Cleaning**

Remove all connected wires and cables on the instrument before cleaning. Use a brush to clean dust. If there are stains on the chassis that cannot be removed by brush, wipe with a volatile liquid (such as Cleaning Naphtha). Do not use any corrosive liquid to avoid damaging the chassis. Use a damp cloth with soap water or soft detergent to clean the VFD front panel. For internal cleaning, use a low-pressure air gun the dust inside or send it back to our agent for cleaning.

# 2.2 Preparation for Use

- 1. Be sure the power supply is connected to the AC line input that meets the specification.
- 2. The instrument must be installed in a well-ventilated area to avoid the internal temperature getting too high.
- 3. Ensure ambient air does not exceed 40 deg C.

### 2.2.1 Normal Environment Conditions

- 1. In door use.
- 2. Altitude up to 2,000 meters.
- 3. Operating Temperature 0°C to 40°C.
- 4. Maximum relative humidity is 65% at 25°C and increasing linearly to 90% relative humidity for temperature up to 40°C.
- 5. Input AC supply voltage fluctuations can up to  $\pm$  10% of the rated voltage.
- 6. Transient over voltage is impulse withstand CAT II.
- 7. Pollution degree II.

# 2.3 Requirements of Input Power

# 2.3.1 Ratings

(1) Model 62060D-100

Input voltage/frequency range: V<sub>LL</sub>: 380-480V±10% 3~ 4W / 47-63Hz

V<sub>LL</sub>: 200-220V±10% 3~ 4W / 47-63Hz

Maximum input power: 7.3kVA

5.0kVA

(2) Model 62120D-100

Input voltage/frequency range: V<sub>LL</sub>: 380-480V±10% 3~ 4W / 47-63Hz

V<sub>LL</sub>: 200-220V±10% 3~ 4W / 47-63Hz

Maximum input power: 15.2kVA

9.8kVA

(3) Model 62180D-100

Input voltage/frequency range: V<sub>LL</sub>: 380-480V±10% 3~ 4W / 47-63Hz

V<sub>LL</sub>: 200-220V±10% 3~ 4W / 47-63Hz

Maximum input power: 22.0kVA

14.9kVA

#### Max Input Current:

Model Vin	62060D-100	62120D-100	62180D-100
200Vac	16 A	32 A	50A
380Vac	13A	24A	36A
480Vac	10A	19A	27A

(4) Model 62060D-600

Input voltage/frequency range: V<sub>LL</sub>: 380-480V±10% 3~ 4W / 47-63Hz

V<sub>LL</sub>: 200-220V±10% 3~ 4W / 47-63Hz

Maximum input power: 6.66kVA

4.73kVA

(5) Model 62120D-600/1200

Input voltage/frequency range: V<sub>LL</sub>: 380-480V±10% 3~ 4W / 47-63Hz

V<sub>LL</sub>: 200-220V±10% 3~ 4W / 47-63Hz

Maximum input power: 13.3kVA

9.46kVA

(6) Model 62180D-600/1200/1800

Input voltage/frequency range: V<sub>LL</sub>: 380-480V±10% 3~ 4W / 47-63Hz

V<sub>LL</sub>: 200-220V±10% 3~ 4W / 47-63Hz

Maximum input power: 20kVA

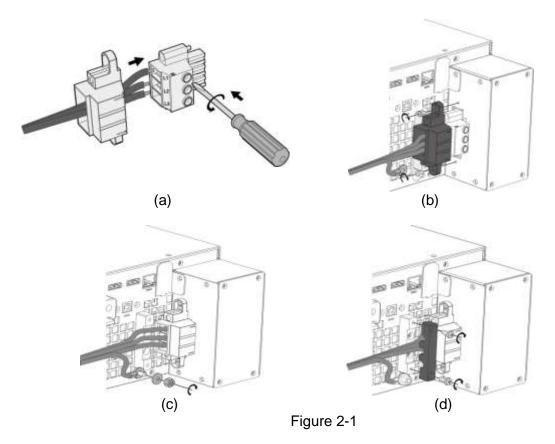
14.2kVA

#### Max Input Current:

Model Vin	62060D-600	62120D- 600/1200	62180D- 600/1200/1800
200Vac	15A	30A	45.5A
380Vac	10A	20A	30A
480Vac	8A	16A	24A

# 2.3.2 Input Connection

- (1) The input power connector is located at the right of rear panel.
- (2) The power line must be rated at least 105°C.
- (3) The power cable width must be 8AWG at least.
- (4) Assembly ⇒ see Figure 2-1 (a)~(d) and execute the following steps:
  - a. Secure the power cable and input terminal with a screwdriver.
  - b. Insert the AC power connector to the AC terminal and secure protection cover.
  - c. Secure the grounding terminal to the grounding copper stud on the chassis (use a M4\*0.7 flange nut).
  - d. Install the anti-pulling device to prevent the AC power connecting terminal from falling off.



**Notice** 

- Connect the green or green/yellow grounding wire to terminal.
- 2. Connect the red or black or blue power wire to "L1, L2, L3" terminal.

### **⚠WARNING**

- To protect the operators, the wire connected to the GND terminal
   ( ) must be connected to the earth. Under no circumstances shall this DC power supply be operated without an adequate ground connection.
  - 2. Installation of the power cord must be done by a professional and compliant with local electrical codes.



- 1. Be sure to select an appropriate withstand voltage cable based on the varied input voltage.
  - 2. To ensure the operation safety, follow the input power source during installation to select the current rated breaker that closes to each phase and connect it to the input terminal in series.
  - 3. The breaker should be installed inside the building. See Table 2-3 for the rating.

Table 2-1 lists the conductor sectional area for safe use of the input current and anti-pulling wire diameter.

Table 2-1 Suggested Cable Specification

Conductor Area Sectional Area mm²	Safe Current (A) Copper Conductor	Diameter for Anti-pulling Standard (mm)
8.0	55	6.65±0.15

Table 2-2 lists the PVC (105°C) wire specification references when the ambient temperature is 30°C.

Table 2-2 PVC (105°C) Cable Specification

Conductor Area	Safe Current (A)		
Sectional Area mm²	Copper Conductor	Aluminum conductor	
1.25	15		
2.0	20		
3.5	30	-	
5.5	40	-	
8.0	55	-	
14	70	50	
22	90	70	
30	120	90	
38	145	100	
50	175	120	
80	230	150	
100	260	200	
125	300	240	
150	350	270	
200	425	330	
250	500	380	
325	600	450	
400	700	500	
500	800	600	

Table 2-3 Breaker Rating

: a.a. = = = : a.i. : ta.ii : g			
Model	Breaker Rating(A)		
62180D-100/600/1200/1800	50A max.		
62120D-100/600/1200	35A max.		
62060D-100/600	20A max		

# 2.4 Remote Sensing

### 2.4.1 Correct Connection

- Connecting remote sensing wires correctly will ensure the output voltage is the set voltage at the end of the output cable. The DC power supply is able to compensate 4% V\_MAX line voltage drop.
- 2. Figure 2-2 shows the correct connection. Use two wires to connect the positive/negative connector of load to the remote sensing connector on the rear panel. The connecting wire diameter must be 22AWG, and its withstand voltage should meet the 3kV specification.
- 3. Though remote sensing is able to compensate the voltage drop, if the line loss is too large (see specification) it will cause protection error on remote sensing.
- 4. Remote sensing wire <u>must be</u> connected to the DC power supply's local output OR the UUT's remote input.

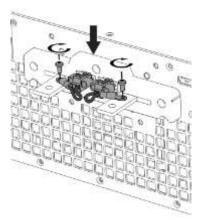


Figure 2-2

# 2.4.2 Reverse Connection of Remote Sensing Wire Polarity

The polarity of remote sensing wire must be connected correctly, the "+" terminal is connected to the "+" side of the unit under test and the "-" terminal must be connected to the "-" side of the unit under test. If the polarity is connected reversely, the output will drop to 0V and prompt an error message "SENSE FAULT" as Figure 2-3 shows.



Figure 2-3



In the event of a reverse polarity error condition, proceed as follows to reset it:

- 1. First power it off.
- 2. Connect the remote sensing wire properly.
- 3. Restart the DC power supply.



- 1. If there is voltage on the power supply output, do not reverse connect the Remote sense to it or to the UUT to avoid damaging the power supply.
- 2. The voltage of Remote Sense and local output needs to be smaller than 4% V\_MAX to avoid damaging the power supply.
- It may cause the output voltage to overshoot when the Remote sense wire is dropped. Be sure the connect the Remote sense wire correctly to the DC power supply local output or the Load UUT before operating the power supply.

# 2.5 Output Connection

The output connector of 62000D Series DC power supply is located at the upper middle area on the rear panel. The load is connected to "+" and "-" output terminal.

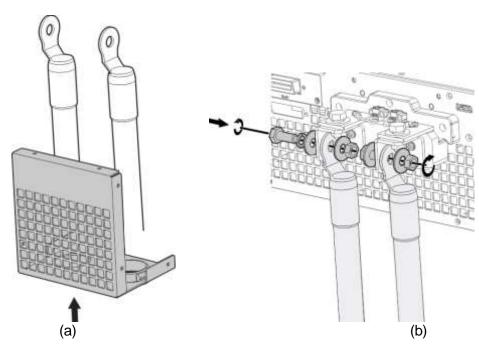
# 2.5.1 Rear Panel Output

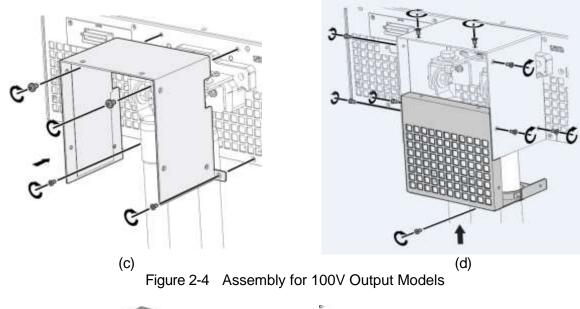
- (1) The output terminal is located at the upper middle area on the rear panel.
- (2) The output cable must be rate to at least 85°C with conductor sectional area more than 38mm<sup>2</sup>.
- (3) Assembly → follow Figure 2-4/Figure 2-5 (a)~(d) to execute the steps below:
  - Strip insulation off ends of power cable tip (the bare portion is about 1cm) and use an O type terminal to crimp it.
  - b. Secure the power cable and input terminal with a Phillips screwdriver.
  - Secure the safety cover latch and safety cover to prevent the cable from falling or the electric terminal from exposing.

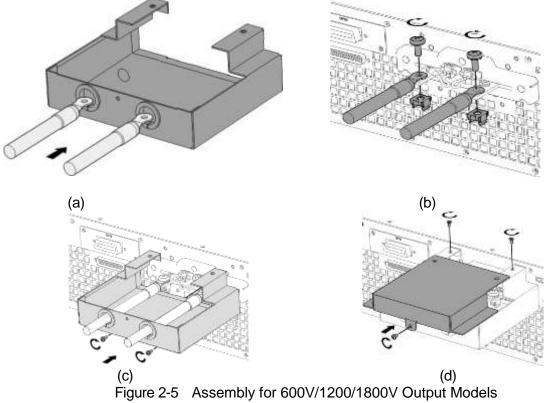
Table 2-4 Protective Cover

Protective Cover	Applicable Range	Applicable Model
	<i>Vo</i> =0~100V <i>Io</i> =1~540A	62060D-100 62120D-100 62180D-100
	<i>Vo</i> =0~1800V <i>Io</i> =1~120A	62060D-600 62120D-600 62180D-600 62120D-1200 62180D-1200 62180D-1800

For the models requiring a larger protective cover, a cable with wider diameter is needed. To ensure the output terminal is not stressed assemble it as Figure 2-4/Figure 2-5 shows. First, thread the wire through the holes on the cover as shown in Figure 2-4/Figure 2-5 (a) and then secure the cable to the output copper as shown in Figure 2-4/Figure 2-5 (b). Next, secure the protective cover to the rear panel as Figure 2-4/Figure 2-5 (c) shows. At last, follow the Figure 2-4/Figure 2-5 (d) to lock the cover plate.









- 1. To meet the safety requirement, the safety cover must be tightly secured.
- The diameter of the wire connected to load must be able to carry 2. the maximum current applied.
- 3. Be sure to select proper output wire that can withstand the voltage based on the model.

### **⚠WARNING**

For safety, do not exceed rated current (varies with 62000D series models) for the output current.

#### **Specification of Connecting Wire** 2.5.2

The maximum inductance of connecting wire to the power supply is the total inductance of two wires after twisted or processed otherwise including self-inductance and mutual inductance. Do not exceed the specifications listed in the table below.

Table 2-5

Model	Maximum Output Inductance (μΗ)
62060D-100	200
62120D-100	200
62180D-100	200
62060D-600	400
62120D-600/1200	400
62180D-600/1200/1800	400



- To ensure the system's stability, the cable inductance should not exceed the above limits.
- Do not use wire with extra thin diameter to avoid overheating and causing a hazard.

#### **Specification of Parallel Capacitance** 2.5.3

The parallel capacitance for output varies with the 62000D Series models as listed in Table 2-6.

Table 2-6

Model	Max. Parallel Capacitance for Output (µF)	
62060D-100	6,666	
62120D-100	13,333	
62180D-100	20,000	
62060D-600	1,666	
62120D-600/1200	3,333	
62180D-600/1200/1800	5,000	

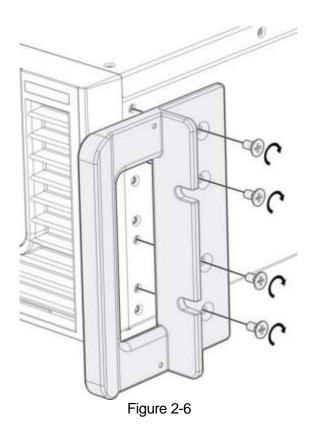


**CAUTION** To ensure the system's stability, the capacitance should not exceed the value listed in Table 2-6.

- 1. Be aware of the polarity and its withstand voltage when paralleling
- Switch to CV Slow mode if a larger parallel capacitance is required. (See section 3.2.1)

#### **Installing the Handle** 2.5.4

Use M4X12 flat head screws to secure the handle to the rack mounting kit as shown in Figure 2-6.



# 2.6 Power On Procedure

Plug in the power cord and turn on the power switch on front panel. The DC power supply will run a series of self-tests. The display on the front panel will turn on to run self-tests for CPLD (complex programmable logic device), SRAM and EEPROM memory, data and communication as Figure 2-7 shown below.



Figure 2-7

When the self tests of memory, data and communication are done, the screen turns to the MAIN page automatically as Figure 2-8 shown below:



Figure 2-8

### **⚠WARNING**

The DC power supply internal circuit may not be able to reset if it is powered off and on immediately. It is suggested to wait for 3 seconds after powered off and power it on again.



Before turning on the instrument, all protective grounding terminals, extension cord and devices must connect to earth. The hazard of potential electric shock may occur if any interrupted grounding and could cause injury or death.

# 3. Manual Operation

### 3.1 Introduction

The DC power supply can be operated manually or remotely via GPIB/CAN (option) or USB or APG interface which is described in Chapter 5 and section 3.2.4.1. Refer to the manual operation for using the front touch panel or rotary knob to input data described in this chapter.



The operation mode defaults to manual mode whenever power to the supply is turned on.

# 3.2 Menu for Setup

The Menu provides you various settings for configuring the system functions of DC power supply. The functions include:

1. Meas. & Setup : To set output voltage, current and power parameters.

2. Output Setup : To set various output parameters including voltage/current slew rate

and etc.

3. System Setup : To set the display panel, various protections, time and factory

defaults.

4. Program Seq. : To set LIST MODE & V\_STEP MODE.

5. Advance : To set advanced functions (not supported yet).

6. Configuration : To set the communication interface, serial/parallel settings, power on

status, and calibration.

The Menu screen is shown in Figure 3-1 with a complete function tree as shown in Figure 3-2.

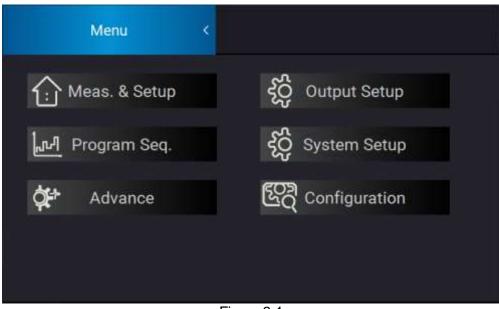
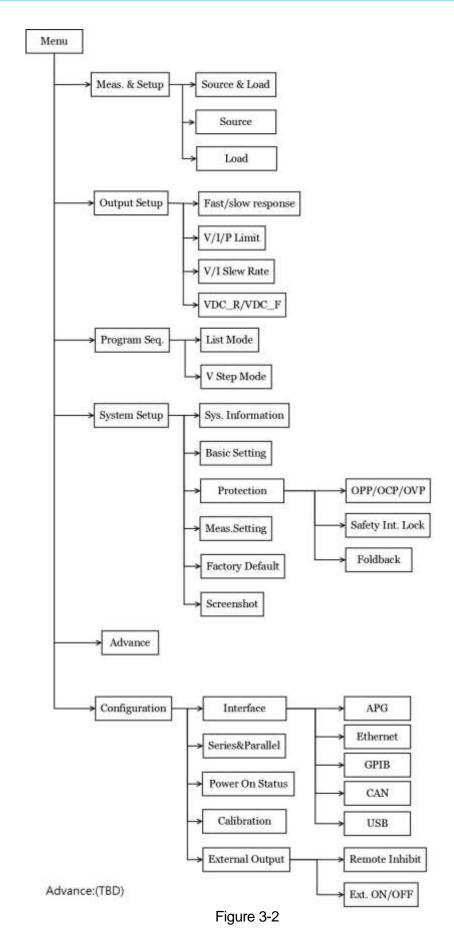


Figure 3-1



# 3.2.1 Meas. & Setup

#### 3.2.1.1 Source & Load Mode

There are two ways to set the output voltage (CV MODE).

#### Method 1:

- 1. Tap V next to the numbers of Vset, the touch panel will switch to a numeric keypad as Figure 3-3 shows.
- 2. Use the numeric buttons (  $\boxed{0} \sim \boxed{9}$  ) to set the value and tap " to complete the voltage setting.
- 3. Press " to output the set voltage. (Be noted that in order to remain the output in CV mode the current setting must be larger than the load current, otherwise the output voltage will not equal to the set voltage.)

#### Method 2:

- 1. Tap on the panel to use "Rotary" () knob and tap V next to the numbers of Vset, the cursor at the lower right of the number on the main screen will flicker.
- 2. When using "Rotary" ( ) knob for setting, pressing the knob can move the cursor to individual digit, and then turn the rotary knob to increase or decrease the set value.
- 3. Press " to output the set voltage. (Be noted that in order to remain the output in CV mode the current setting must be larger than the load current, otherwise the output voltage will not equal to the set voltage.)



Figure 3-3

Following is the way to set the current (CC MODE):

Tap A next to the numbers under Source, and the rest of the settings are same as shown in Figure 3-4.

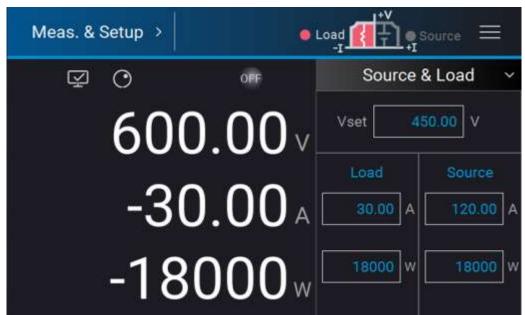
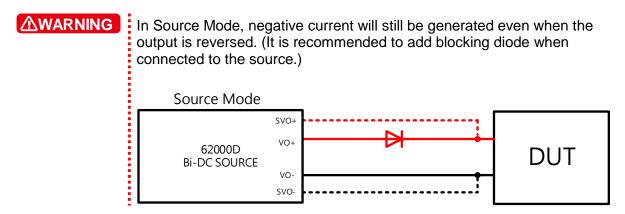


Figure 3-4

### 3.2.1.2 Source Mode

Following is the way to set Source Mode:

- 1. Tap the drop-down menu and select Source Mode; the panel will switch to the screen as Figure 3-5 shows.
- 2. The rest settings are same as Source & Load Mode.



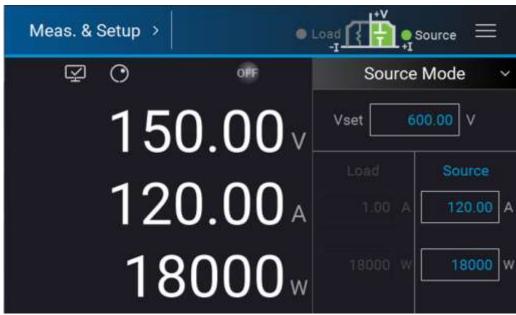
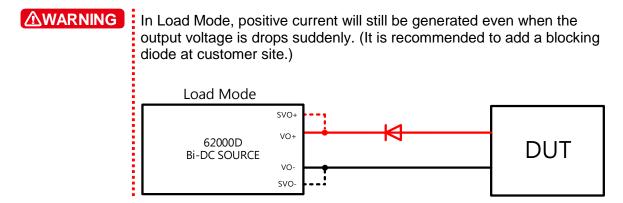


Figure 3-5

### 3.2.1.3 Load Mode

The following describes how to set Load Mode:

- 1. Tap the drop-down menu and select Load Mode; the panel will switch to the screen as Figure 3-6 shows.
- 2. The rest of the settings are same as Source & Load Mode.



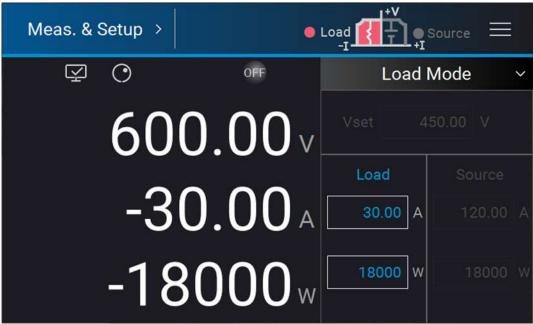


Figure 3-6

# 3.2.2 Output Setup

Tap "Output Setup" in Menu screen to enter the setup page as Figure 3-7 shows.

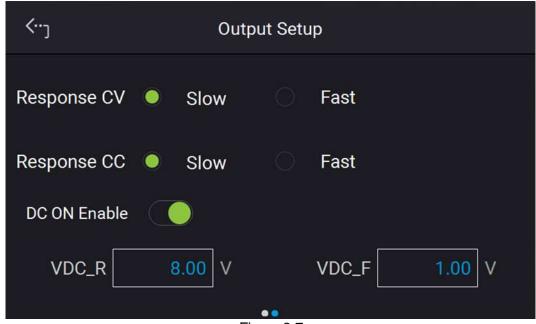


Figure 3-7



The values (for reference only) in Figure 3-7 are not the default settings of DC power supply.

### 3.2.2.1 Response CV

- Slow: This option reduces the voltage output response speed with higher priority on output stability.
- Fast: This option increases the voltage output response speed with higher priority on output response speed (default at power on).

### 3.2.2.2 Response CC

- Slow: This option reduces the current output response speed with higher priority on output stability.
- Fast: This option increases the current output response speed with higher priority on output response speed (default at power on).

### 3.2.2.3 V Limit

Select the V Limit Max/Min corresponding space to set the value.

Use this option to narrow down its range by setting the MIN and MAX. When setting the output voltage, the DC power supply allows setting the voltage within the range of [MIN value ≤ user-defined value ≤ MAX value] which is V LIMIT: MAX=100V, MIN=20V. If the setting exceeds the output voltage 110V set by the user, the BUZZER will beep one time (if BUZZER is set to ON) and the main screen will automatically prompt a warning message.

#### 3.2.2.4 | Limit

Select the I Limit Max/Min corresponding space to set the value.

Use this option can narrow down its range by setting the MIN and MAX. When setting the output current, the DC power supply allows setting the current within the range of [MIN value ≤ user-defined value ≤ MAX value] which is I LIMIT: MAX=20A, MIN=2A. If the setting exceeds the output current 21A set by the user, the BUZZER will beep one time (if BUZZER is set to ON) and the main screen will automatically prompt a warning message.

#### 3.2.2.5 P Limit

Select the P Limit Max/Min corresponding space to set the value.

Use this option can narrow down its range by setting the MIN and MAX. When setting the output power, the DC power supply allows setting the current within the range of [MIN value ≤ user-defined value ≤ MAX value] which is P LIMIT: MAX=20W, MIN=2W. If the setting exceeds the output current 21W set by the user, the BUZZER will beep one time (if BUZZER is set to ON) and the main screen will automatically prompt a warning message.

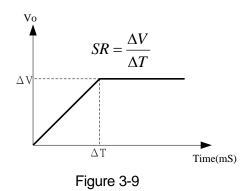
### 3.2.2.6 V SLEW RATE

 Swipe the "Output Setup" page on the touch screen left to next page as Figure 3-8 shows.



Figure 3-8

Select the V slew rate corresponding space to set the value.
 The output voltage slew rate of the DC power supply is set as follows. The maximum input Slew Rate is 60V/ms and the minimum is 0.001V/ms. The output of DC power supply will follow the slew rate to rise to the set output voltage while the fall slew rate is limited by load. (See Figure 3-9 for the calculation formula.)





The minimum transient time is ( $\Delta T$ ) = 0.5 ms.

### 3.2.2.7 I SLEW RATE

- 1. Select the I slew rate corresponding space as shown in Figure 3-8 to set the value.
- 2. The output current slew rate of the DC power supply is set as follows. The maximum input Slew Rate is 60A/ms and the minimum is 0.001A/ms. The output of DC power

supply will follow the slew rate to rise to the set output current. (See Figure 3-10 for the calculation formula.)

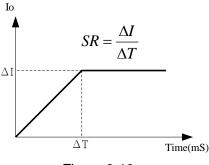


Figure 3-10

# 3.2.2.8 Setting DC\_ON

When the DC power supply is ON and the voltage is over VDC\_R, the pin10 DCOUT\_ON of the ANALOG INTERFACE on the rear panel will turn to HIGH; also when the DC power supply is OFF and the voltage is lower than VDC\_F, the pin1 DCOUT\_ON of the ANALOG INTERFACE on the rear panel will turn to LOW, allowing you to use them for other purpose as Figure 3-11 shows:

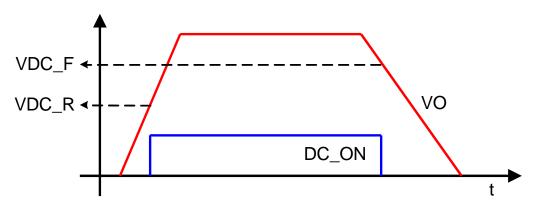


Figure 3-11

Set DC\_ON as described below:

- 1. The setting page is shown as Figure 3-7. Use the touch panel to enter the value. The low limit of DC\_ON RISE/FALL is 0V and high limit is 600V.
- 2. Tap the upper left corner on the touch panel and select the menu item.
- 3. Tap "MEAS. & Setup" to return to the main page.

# 3.2.3 System Setup

In Menu page, tap "System Setup" to enter into the screen as Figure 3-12 shows.

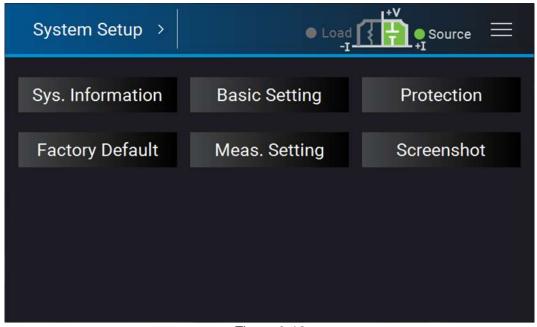


Figure 3-12

## 3.2.3.1 System Information

This function allows you to learn the firmware information of the DC power supply. Tap "Sys. Information" to access it.

The display of each item is explained as follows:

Device Model : Displays the power supply model no. as shown in Figure 3-13.

Serial No. : Displays the device serial no. as shown in Figure 3-13.

Host : Displays the version of CPLD, PCB and UI as shown in Figure 3-13 AD1~AD3 : Displays the firmware version no. of front stage module as shown in

Figure 3-14.

DD1~DD3 : Displays the firmware, CPLD, and PCB version no. of rear stage

module as shown in Figure 3-15.



Figure 3-13



Figure 3-14

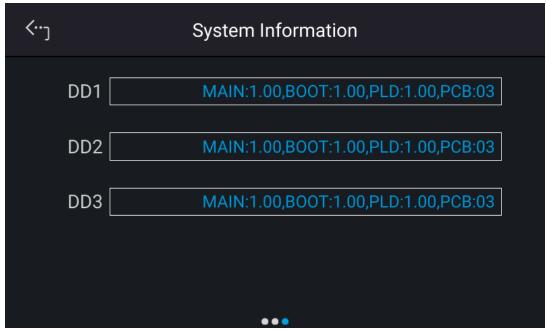


Figure 3-15

### 3.2.3.2 Factory Setup

This function lets you to reset the DC power supply to its factory default settings.

- 1. In Menu page, tap "System Setup" and select "Factory Default", the screen appears as Figure 3-16 shows.
- Tap Recall Factory Default. A warning message will prompt as Figure 3-17 shows. It will
  remain the last configuration settings saved by you if No is selected, and return all
  configurations to the factory default if Yes is selected.



Figure 3-16

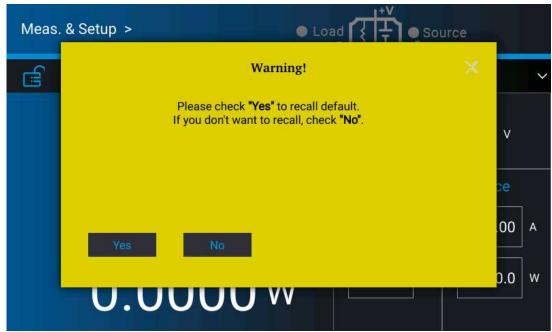


Figure 3-17

### 3.2.3.3 Basic Setting

This function allows you to set the brightness of backlight, language, buzzer, time and date. In Menu page, tap "System Setup" and select "Basic Setting", the screen will appear as Figure 3-18 or Figure 3-19 shows.

Tap Backlight to set its brightness.



- 1. There are 3 selections for BRIGHTNESS: **HIGH /NORMAL/ DIMMED**, the default is **HIGH**.
- 2. The lower backlight brightness, the longer the display panel life. Thus, it is suggested to turn the backlight brightness to **DIMMED** when the device is doing burn-in to prolong the product life of VFD display.
- 2. Tap Language to set the desired language.
- 3. The buzzer sounds when the touch panel or the rotary knob on the front panel is tapped or turned to remind user. It can be turned off if it is not necessary. (The default is ON.)



- 1. BUZZER has two options: ON / OFF.
- 2. When the BUZZER is set to ON, press any key or turn the rotary knob will beep once to remind user.
- 3. When the BUZZER is set to ON and the BUZZER will beep continuously if system protection occurs to remind user.
- 4. When BUZZER is set to OFF then it will not beep in any situation.
- 4. Swipe the "Basic Setup" page left to set "Time" and "Date" in the format of hh:mm:ss and yyyy-mm-dd as shown in Figure 3-19.

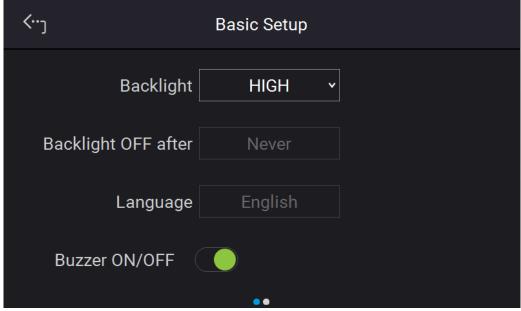


Figure 3-18

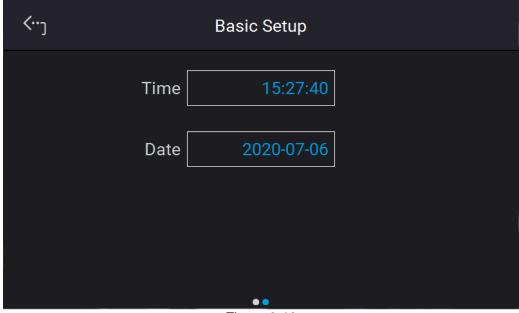


Figure 3-19

### 3.2.3.4 Protection

Chroma 62000D Series DC Power Supplies have complete protection functions divided in two classes. The first type protection includes over voltage, over current, over power and FOLDBACK; while the second type protection includes over temperature, fan failure and over/under input voltage. The first class protection trigger point is set by user as described below, while the second class protection is auto detected by the system hardware protection circuit.

In "System Setup" page, select "Protection" to set each protection as shown below. The first page sets the OVP, OCP, OPP and Foldback as Figure 3-20 shows.



Figure 3-20

#### 3.2.3.4.1 OVP

Use the touch panel to set OVP 660.00. This function sets the protection point for Over Voltage. Once the output voltage exceeds the range, it will turn off the output that is OUTPUT = OFF to protect the unit under test.



Table 3-1 shows the voltage range of OVP.

Model

62xxxD-xxxx

Table 3-1

Min. OVP (V) Max. OVP (V)

0 1.10 x Vo\_MAX

When OVP occurs the main page will prompt a protect message as Figure 3-21 shows. Tap "Confirm" to return to the setup page.



Figure 3-21

#### 3.2.3.4.2 OCP

Use the touch panel to set OCP 132.00. This function sets the protection point for Over Current. Once the output current exceeds the range, it will turn off the output that is OUTPUT = OFF to protect the unit under test.

There are A/D and D/D over current protections. The A/D OCP occurs when the device internal is having over current while the D/D OCP occurs when the output terminal is having over current.



Notice Table 3-2 shows the current range of OCP.

Table 3-2

Model	Min. OCP (A)	Max. OCP (A)
62xxxD-xxxx	0	1.10 x lo_MAX

When OCP occurs the main page will prompt a protect message as Figure 3-22 shows. Tap confirm " to return to the setup page.



Figure 3-22

#### 3.2.3.4.3 OPP

Use the touch panel to set OPP 18900. This function sets the protection point for Over Power. Once the output power exceeds the range, it will turn off the output that is OUTPUT = OFF to protect the unit under test.



Table 3-3 shows the power range of OPP.

Table 3-3

Model	Min. OPP (W)	Max. OPP (W)
62xxxD-xxxx	0	1.05 x Po_MAX

When OPP occurs the main page will prompt a protect message as Figure 3-23 shows. Tap " confirm " to return to the setup page.



Figure 3-23

### 3.2.3.4.4 Safety Int. Lock

This function allows you to control the DC power supply to be OFF temporary through the Pin 3 (INTERLOCK) of ANALOG INTERFACE.

 Use the touch button to set Safety Int. Lock mode to disable or enable as Figure 3-24 shows.

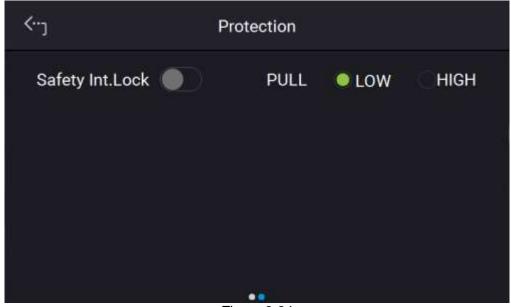


Figure 3-24

- (1) Set to disable: It closes this function.
- (2) Set to enable: It enables the Safety Int. Lock. The DC power supply's ON/OFF is still controlled by "...". When the PIN 3 of ANALOG INTERFACE is at low level, it indicates the power supply is outputting normally and when it is at high level, it closes the power supply output temporary (the "..." is still on) and issues

protection signal. Once the Pin 3 of ANALOG INTERFACE is returned to low level, the DC power supply will continue to output normally.

2. When protection occurs to Safety Interlock the main page will show this protection message as Figure 3-25 shows.

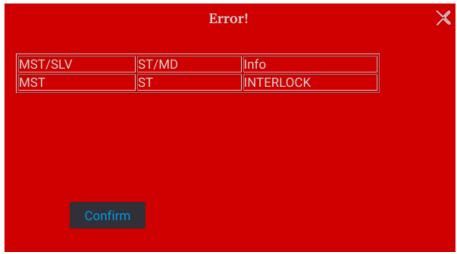


Figure 3-25

- 3. Pin 3 is the input pin of TTL Level and is able to set the initial state to PULL=HIGH or PULL=LOW.
- 4. When the DC power supply is set to OUTPUT = ON, the detail actions of Safety Interlock are as shown in Figure 3-26.

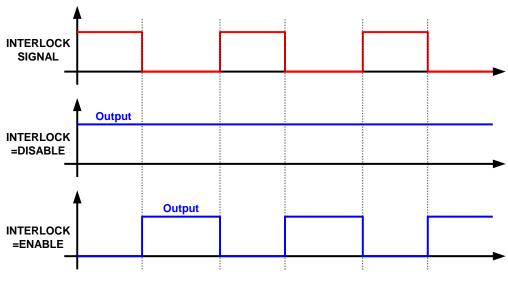


Figure 3-26

#### 3.2.3.4.5 FOLDBACK

This function allows users to turn off the output that is OUTPUT = OFF when changing output mode (CV to CC, or CC to CV) to protect the unit under test as Figure 3-27 shows.

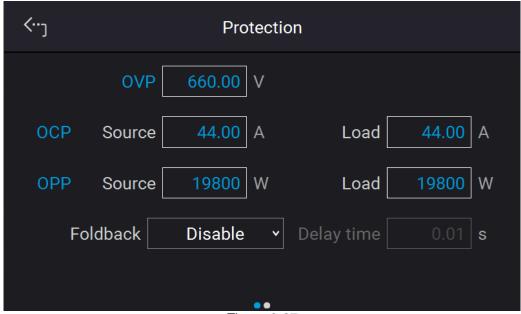


Figure 3-27

1. Use the touch button to set Foldback mode. There are three options available for selection: Disable, CV TO CC, and CC TO CV.

(1) Disable: Ignore the output off function.

(2) CV TO CC: Active in CV MODE only. Once the operating mode changes to CC

MODE the system will turn off the output to protect the UUT.

(3) CC TO CV: Active in CC MODE only. Once the operating mode changes to CV

MODE the system will turn off the output to protect the UUT.

When the FOLDBACK option set to CV TO CC or CC TO CV, a selection for DELAY TIME will prompt beneath for users to set the delay time for protection after changed the mode as Figure 3-28 shows.

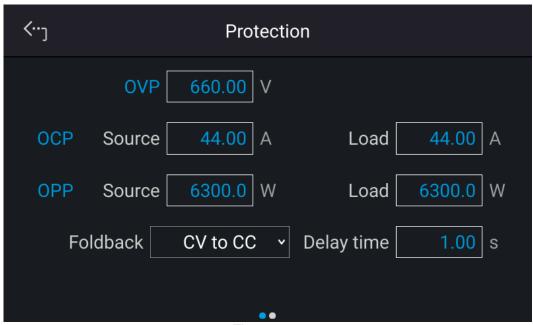


Figure 3-28

When Foldback protection occurs the main page will prompt a protect message as Figure 3-29 shows.

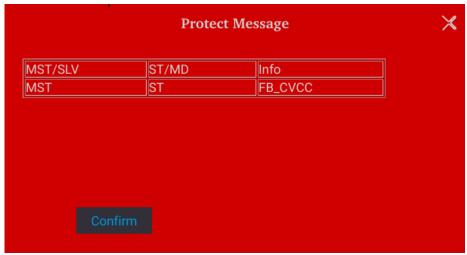


Figure 3-29

Be aware that if delay time sets to t seconds, it means the Foldback that set to CV TO CC or CC TO CV won't be activated unless it sustains t seconds when a mode change is detected. If the change time of mode is less than t seconds it will return to its original state and Foldback protection will not occur as Figure 3-30 shows.

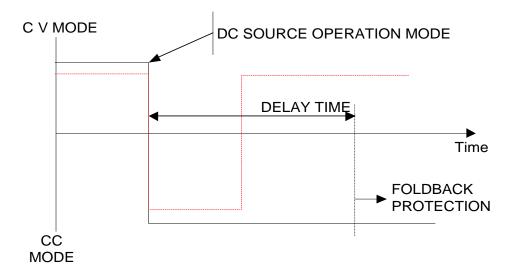


Figure 3-30

Assuming the Foldback is set to CV TO CC, the solid line in Figure 3-30 will create Foldback protection while the dot line will not.

# 3.2.3.5 Meas. Setting

- 1. Tap Meas. Setting to enter into Measurement Setup as Figure 3-31 shows.
- 2. There are Average Time and Average Method for setting.

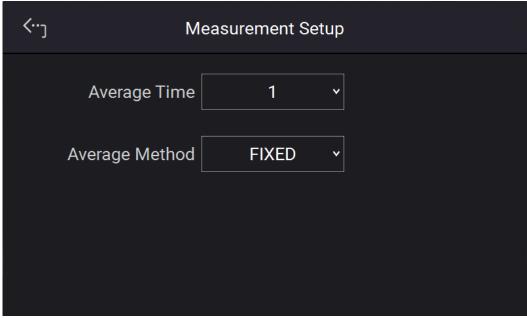


Figure 3-31

The way to change the Reading Average Times is shown in Figure 3-32.

3. Tap the touch screen to set the desired average times. Reading Average Time can be set to 1, 2, 3, and 4.



Figure 3-32



 Assuming the Reading Average Time is set to = 8, Average Method to FIXED, readings sampling is that the device clears all of the old samples (A1 ~ A8) in the buffer and saves the new samples (B1 ~ B8), then average them in repetition as Figure 3-33 shows.



Figure 3-33

2. Assuming the Reading Average Time is set to = 8, Average Method to MOVING, the readings sampling is that the device removes the oldest sample in the buffer and saves a new sample, then average them in repetition as Figure 3-34 shows.

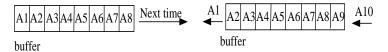


Figure 3-34

3. The panel reading is refreshed in the rate of 200ms.

Following is the way to change the Average Method:

4. Tap the touch screen to select the desired average method. Average Method can be set to FIXED and MOVING as shown in Figure 3-35.



Figure 3-35

#### 3.2.3.6 Screenshot

In Factory Default, tap Screenshot to turn on or off the screen capture gadget. It allows the users to capture the desired screens such as protection or error messages and save them to USB for technical service or RD engineer use. The screen shows as Figure 3-36 (with a small camera icon appears on the lower right corner.)



Figure 3-36

# 3.2.4 Configuration

### **3.2.4.1** Interface

Tap Configuration in Menu page and select Interface and APG as shown in Figure 3-37 and Figure 3-38.

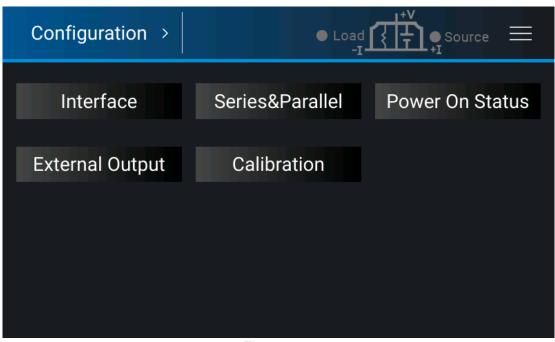


Figure 3-37

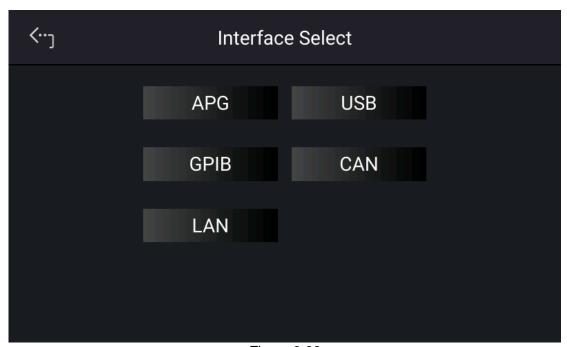


Figure 3-38

#### 3.2.4.1.1 APG

Analog Programming interface (APG) is able to perform the following two functions: 1. use the analog signal control panel to set the value and 2. Use the analog signal to indicate the panel measurement. Users can specify the value of set and measured values separately as described below.

1. Tap "Interface" and select APG to appear the screen as Figure 3-39 or Figure 3-40 shows.

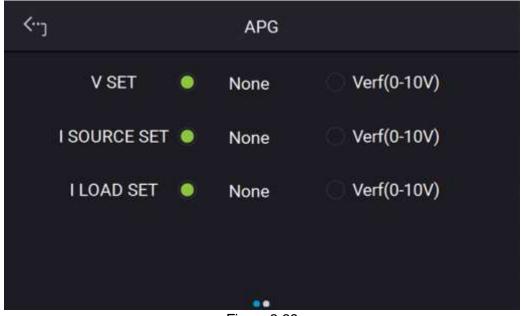


Figure 3-39

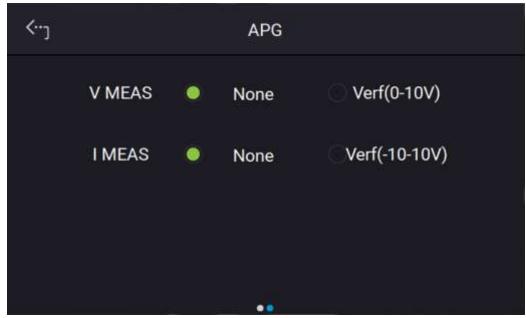


Figure 3-40

2. **V SET**: Use the touch panel to set the mode. There are 2 selections for V SET which are NONE /Vref (0-10V), where:

NONE: It means not using the programming function.

Vref (0-10V): It means using the external voltage source as the programming setting.

3. **I SOURCE SET**: Use the touch panel to set the mode. There are 2 selections for I SOURCE SET which are NONE /Vref (0-10V), where:

NONE: It means not using the programming function.

Vref (0-10V): It means using the external voltage source as the programming setting.

4. **I LOAD SET**: Use the touch panel to set the mode. There are 2 selections for I LOAD SET which are NONE /Vref (0-10V), where:

NONE: It means not using the programming function.

Vref (0-10V): It means using the external voltage source as the programming setting.

5. **V MEAS:** Use the touch panel to set the mode. There are 2 selections for APG VMEAS which are NONE /Vref (0-10V), where:

NONE: It means not using the programming function.

Vref (0-10V): It means using the external voltage source as the programming setting.

6. **I MEAS**: Use the touch panel to set the mode. There are 2 selections for APG IMEAS which are NONE /Vref (-10-10V), where:

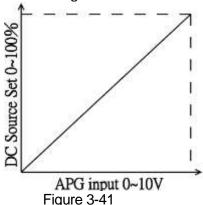
NONE: It means not using the programming function.

Vref (-10-10V): It means using the external voltage source as the programming setting.

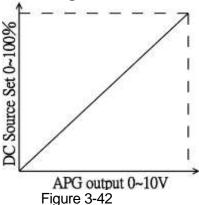
- 7. Tap the upper left corner on touch panel to go to Menu page.
- 8. Tap "MEAS. & Setup" to return to the main page.



 V SET/ I SOURCE SET has 2 selections which are NONE/Vref (0-10V). When selecting Vref=10V → it means the DC power supply's output 0~100% will map to 0~10V as Figure 3-41 shows.



V MEAS/ I MEAS has 2 selections which are NONE/Vref (0-10V).
 When selecting Vref=10V → it means the DC power supply's output 0~100% will map to 0~10V as Figure 3-42 shows.



- 3. When using APG, in case the error is too large be sure to calibrate the APG settings and measurements first.
- 4. For APG pin assignments, please refer to *Appendix A Analog Interface Pin Assignments*.

#### 3.2.4.1.2 LAN

This DC power supply uses LAN to provide remote operation. The LAN address is required for remote operation.



- 1. The user needs to connect the network cable to the DC power supply for auto detection.
- If the network cable is not connected properly, it may cause the DC power supply screen to show abnormally. Turn off the DC power supply to resolve the network cable problem and reboot it to clear the abnormal screen.

- 1. Tap "Menu", "Configuration" and "Interface:" to select LAN to as shown in Figure 3-37, Figure 3-38, and Figure 3-40.
- 2. Tap LAN to enter into the address setting screen.

#### Auto Detect:

The default of DHCP is ON. Swipe left to second page as Figure 3-44 shows, the DC Power Supply will automatically detect external network address.

#### Manual Detect:

- 1. Tap DHCP to set it to OFF.
- 2. Tap IP ADDR and set it.
- 3. Tap SUBNET MASK and set it.
- 4. Swipe left to the second page, tap GATEWAY ADDR and set it.
- 5. Tap "Apply" and wait for connection.
- 6. Touch the upper left corner to enter into Menu page.
- 7. Tap "MEAS. & Setup" to return to the main page.

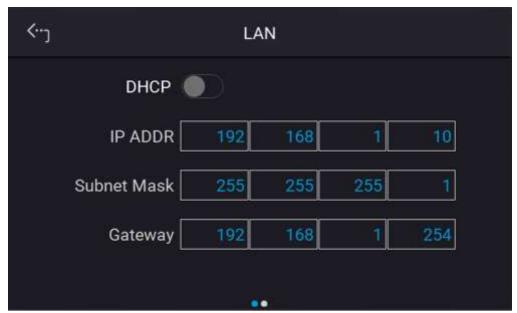


Figure 3-43

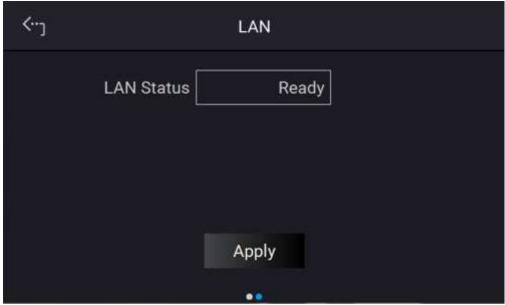


Figure 3-44



1. The LAN STATUS is displayed automatically in the following 5 types:

CONNECTED: It means the network is connected.

CONNECTING. . . .: It means the network is connecting.

NONE CONNECT: It means the network is not connected.

SETTING. . . .: It means the network is under setting.

ETHERNET MODULE FAIL: It means the network module is fail.

2. The ETHERNET IP address is 0~255. In ETHERNET setting, DHCP=ON will get the address automatically and DHCP=OFF will get the address manually. Once the IP address is set, it needs to set APPLY=YES for the address to be in effect.

#### 3.2.4.1.3 GPIB

This DC power supply supports remote operation via GPIB function. It is necessary to set the GPIB address before operating remotely.

 In "Interface" page, select GPIB to enter the power supplies GPIB Address as shown in Figure 3-45.



Figure 3-45

- 2. Tap to set the address.
- 3. Touch the upper left corner to enter into Menu page.
- 4. Tap "MEAS. & Setup" to return to the main page.

✓ Notice
V valid GPIB addresses are in the range of1~30.

#### 3.2.4.1.4 CAN

The D-series supplies supports remote operation via the CAN bus. It is necessary to set the baudrate before operating remotely.

- 1. In the "Interface" page, select CAN as the screen shows in Figure 3-46 or Figure 3-47 shows.
- 2. Tap Mode to set the bit number.
- 3. Tap Padding and set it.
- 4. Tap Baud and set it from the drop-down menu.
- 5. Tap Cyclic Time to set.
- 6. Swipe left to second page, then tap ID to set.
- 7. Tap Mask to set.
- 8. Tap Cyclic ID to set.
- 9. Tap SCPI ID to set.

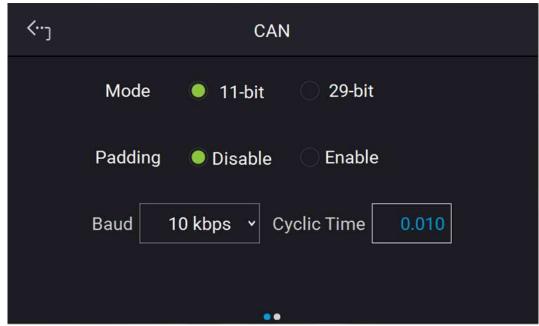


Figure 3-46

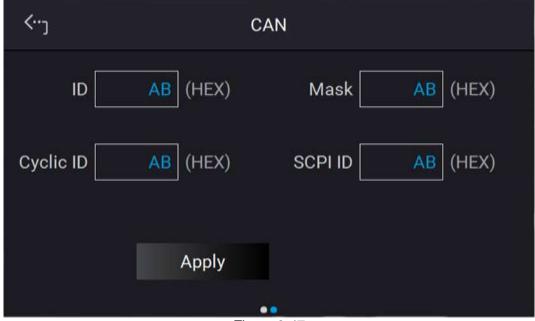


Figure 3-47

- 1. Tap Apply to execute the setting of each parameter.
- 2. Touch the upper left corner to enter into Menu page.
- 3. Tap "MEAS. & Setup" to return to the main page.

#### 3.2.4.1.5 USB

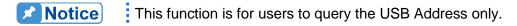
The D-series power supplies support remote operation via the USB bus. It is necessary to query the USB address before operating remotely.

1. In "Interface" page, select USB to enter into the USB Address screen as Figure 3-48 shows.



Figure 3-48

- Touch the upper left corner to enter into Menu page. 2.
- Tap "MEAS. & Setup" to return to the main page.



#### 3.2.4.2 **Series and Parallel Connection**

The 62000D Series Power Supplies are able to operate in series or parallel. The maximum voltage is 1200V when connected in series and if connecting in series and 5400A when instruments are connected in parallel.



**MARNING** For proper series mode operation, the power supplies must be equipped with a keypro fixture. Users must not use supplies in series without the keypro. Be sure to contact Chroma's Service Center or agent before purchasing. (\* It is highly dangerous to configure 62000D supplies in series without factory assistance. The factory warranty does not cover damage from unauthorized series operation.)



Figure 3-49

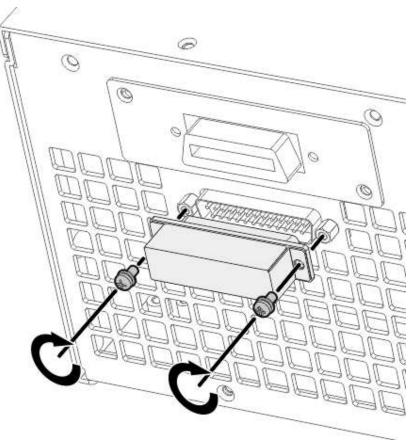


Figure 3-50



- Series/Parallel cannot be mixed in use.
- 2. The maximum output voltage or current is 1200V or 5400A when operating the 62000D power supplies in series or parallel as shown in Table 3-4.

Table 3-4

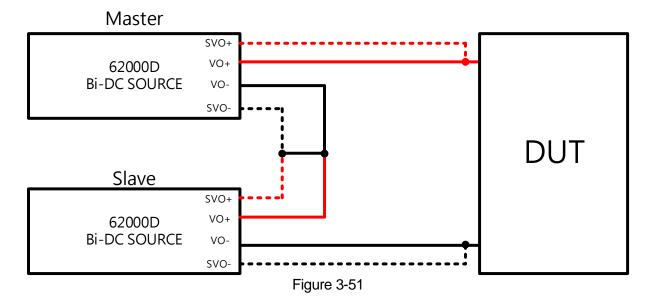
000000	Serial		Parallel	
62000D Series Model	Max. Devices	Max. Output Voltage (V)	Max. Devices	Max. Output Current (A)
62060D-100	2	200	10	1800
62120D-100	2	200	10	3600
62180D-100	2	200	10	5400
62060D-600	2	1200	10	400
62120D-600	2	1200	10	800
62180D-600	2	1200	10	1200
62120D-1200	0	1200	10	400
62180D-1200	0	1200	10	400
62180D-1800	0	1800	10	400

- 3. Some models maybe unable to be operated in parallel or serial.
- 4. Verify facility breaker capacity is large enough and the earth wire is grounded to earth ground when series/parallel is in use.
- 5. All models in 62000D Series can be paralleled with the same model no., and maximum 10 devices are planned. When the devices to be

- paralleled are over 3 sets, please contact the Service Center or agent of CHROMA.
- In 62000D Series, only the 100V & 600V type with the same model no.
  can be connected in series. The rest of the voltage model numbers do
  not support series connection. Please contact the Service Center or
  agent of CHROMA for the special keypro fixture required for series
  mode.

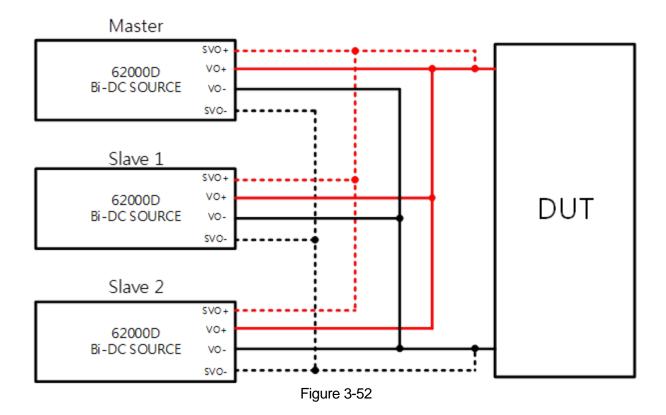
### 3.2.4.2.1 Output Connection in Series

Output connections for series operation are shown in Figure 3-51. Dotted lines show sense line connections and should be twisted pairs.



### 3.2.4.2.2 Output Connection in Parallel

The output connections for connecting three DC power supplies in parallel are shown in Figure 3-52. Dotted lines indicate sense line connections and should be twisted pairs.



## 3.2.4.2.3 Installing Series/Parallel Communication Interface

1. When two DC power supplies are connected in series or parallel, the DisplayPort connector on the rear panel must be connected as shown in Figure 3-53.

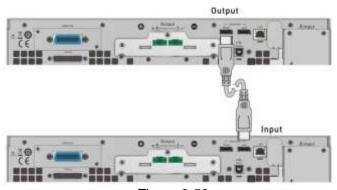


Figure 3-53

2. When three DC power supplies are connected in series or parallel for operation, the DisplayPort connector on the rear panel must be connected as shown in Figure 3-54.

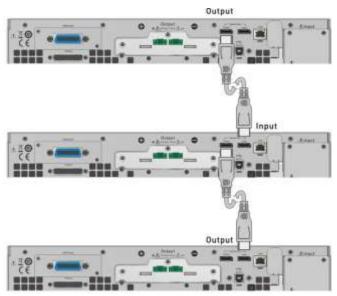


Figure 3-54



Each D-series supply has two DisplayPort female sockets. They need to be connected no matter if the connection is in series or parallel. There is no difference between left and right connection ports but connected in series as shown in Figure 3-53 or Figure 3-54. The communication cable has a limit of 5 meters for length, do not exceed this limit to avoid unstable signal. The DisplayPort communication cable connected to the last DC power supply does not connect back to the first DC power supply.

### **⚠WARNING**

If it is necessary to return to single unit mode from series or parallel mode of operation, the DisplayPort connection must be removed or the single unit will not work normally.

#### 3.2.4.2.4 Setting Series/Parallel Operation Mode



**CAUTION**: It is necessary to set SLAVE first and MASTER last when operating 62000D Series supplies in series or parallel mode, or a communication 62000D Series s error may result.

- In Menu page, tap "Configuration" → "Series & Parallel" and the screen will appear as 1. Figure 3-55.
- Select Series or Parallel connection mode (keypro is required for Series mode). 2.
- Select the Type to be Master or Slave. 3.
- Master+ 1 1 = this indicates that one Slave unit is connected to the master 4.
- If Master/Slave must be enable for Series or Parallel operation.

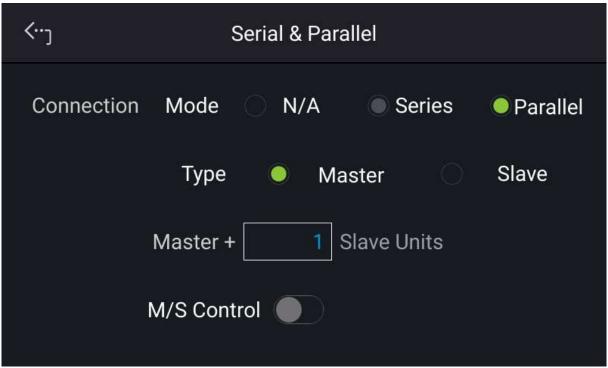


Figure 3-55



When multiple DC power supplies are connected in series or parallel, only one DC power supply can be the Master and the rest have to be set to Slave.



### For example:

- If there are 5 sets connected in parallel and 150V/600A is set, the setting of each set is 150V/120A and the total output will be 150V/600A.
- 2. If there are 2 sets connected in series and 1200V/60A is set, the setting of each set is 600V/60A and the total output will be 1200V/60A.
- 3. The total sets for connecting in series are 2; therefore, the maximum number of Master+ is 1.
- 4. The total sets for connecting in parallel are 10; therefore, the maximum number of Master+ 9 is 9.

#### 3.2.4.2.5 Parallel Mode Connection

- 1. When the parallel communication interface is installed, follow the steps described in previous section to enter into Serial & Parallel page as Figure 3-55 shows.
- 2. Set on one unit to Master, all others should be set to Slave mode.
- 3. When paralleling two units set Master+ 1 as shown in Figure 3-55.
- 4. After the above settings are made, M/S Control should be enabled to perform parallel connection control. When the connection is successful, the Master device display as Figure 3-56 (ex.62180D-600) shows while the Slave device displays as Figure 3-57 shows.



Figure 3-56

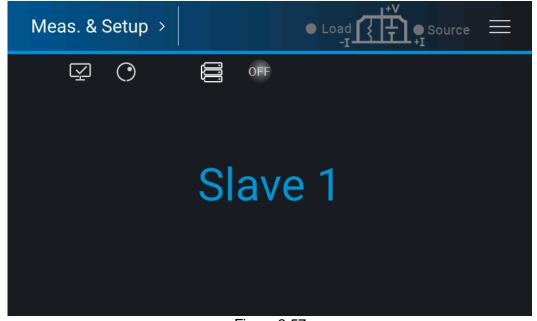


Figure 3-57

#### 3.2.4.2.6 Series Mode Connection

- When D-series power supplies are powered on after the keypro is installed the system will automatically enter into Serial & Parallel mode as Figure 3-58 shows. (Note: Standalone operation is invalid in this mode.)
- 2. Set one device to Master and the other to Slave.
- 3. Enable the M/S Control to perform series connection control. When the connection is successful, the Master device displays as Figure 3-59 (ex.62180D-600) shows while the Slave device displays as Figure 3-57 shows.

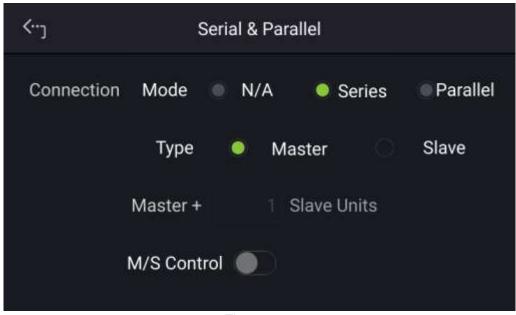


Figure 3-58



Figure 3-59

### 3.2.4.3 Power On Status

This function automatically loads the default output status after powered on, so that you don't have to set it again.

 In "Configuration" page, select "Power On Status" display will appear as Figure 3-60 shows.



Figure 3-60

#### Select the setting.

Power On Status has three options: Default / Last Turn Off / User Define.

- A. When set to Default, it means the output state is not defined specifically, which is V = 0.00V; I = 0.00A; OUTPUT = OFF.
- B. When set to Last Turn Off, the DC power supply will log the command voltage, command current and output state before powering off, so that the power supply will return to these settings when next powered-on.
- C. When set to User Define a setting line will prompt beneath the Power ON Status line as Figure 3-61 shows to set the default power-on state including voltage (V\_SET), current (I\_SET) and OUTPUT=ON/OFF.



Figure 3-61

- 3. Touch the upper left corner to enter into Menu page.
- 4. Tap "MEAS. & Setup" to return to the main page.

#### 3.2.4.4 Calibration

Chroma 62000D Series DC power supplies have 6 calibration functions:

- 1. HOST V: the actual voltage output (CV mode) and its measurement accuracy.
- 2. HOST I: the actual current output (CC mode) and its measurement accuracy.
- 3. APG V SET: the actual voltage output in analog voltage control mode.
- 4. APG I SET: the actual current output in analog current control mode.
- 5. APG V MEA: the accuracy of analog V Monitor.
- 6. APG I MEA: the accuracy of analog I Monitor.

In "Configuration" page, select "Calibration" and it will appear as Figure 3-62 shows.

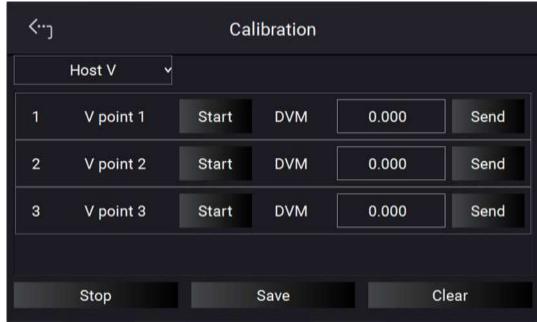


Figure 3-62



The DC power supply should be calibrated annually. For further requirements, please contact Chroma to arrange for calibration again. The voltage default calibration points of 62000D Series models are 3%, 50%, or 90% of Vmax.

The current default calibration points of 62000D Series models are  $\pm 3\%$ ,  $\pm 50\%$ , or  $\pm 90\%$  of Imax.

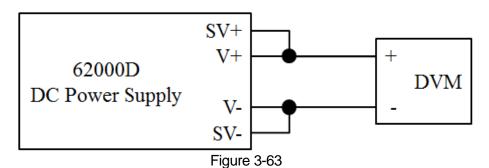
#### 3.2.4.4.1 Voltage Output and Measurement Calibration

The recommend DMM for calibrations are shown in Table 3-5. Ensure the DMM is within its calibration validity period before calling the power supply.

Table 3-5

Device	Suggested Model or Capacity
DVM	HP 34461A or equivalent DVM

The setup is shown in Figure 3-63.



Notice

- 1. The instrument that is used to perform calibration its accuracy has to be higher than the accuracy of spec.
- 2. It is suggested to set the Resolution parameter of HP34401 to SLOW 6 digit.
- 3. When conducting the voltage calibration, each calibration point has to key in at least 5 Arabic numerals to ensure the power supply accuracy after calibration.

Calibration Procedure (Model 62180D-600):

1. In Calibration page, tap "Host V" to list the voltage calibration items as shown in Figure 3-64.

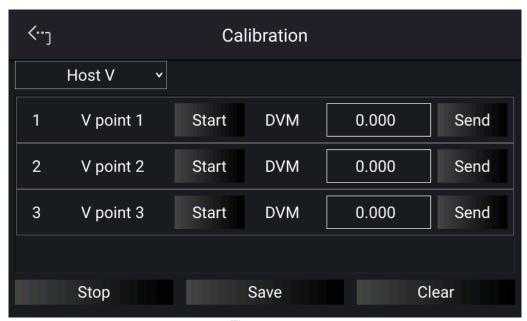


Figure 3-64

2. First complete the point 1 voltage calibration by tapping "START" next to "V point 1". The DC power supply will output a voltage of approximately 60.00V. Enter the actual voltage as measured by DVM in the position [1] entry box and tap "SEND" to confirm.

- 3. Next, tap "START" next to "V point 2" and complete the second point voltage calibration. The DC power supply will output a voltage of approximately 300.00V. Enter the voltage measured by DVM to position [2] and tap "SEND" to confirm.
- 4. Repeat the above for V point 3, the DC power supply will output a voltage of approximately 540.00V. Enter the voltage measured by DVM to position [3] and tap "SEND" to confirm.
- 5. When above voltage calibrations are done, tap "STOP" to exit the calibration procedure. To save the calibration data, tap "SAVE", and tap "CLEAR" to delete the calibration parameters if there is no need to save this data as shown in Figure 3-65.

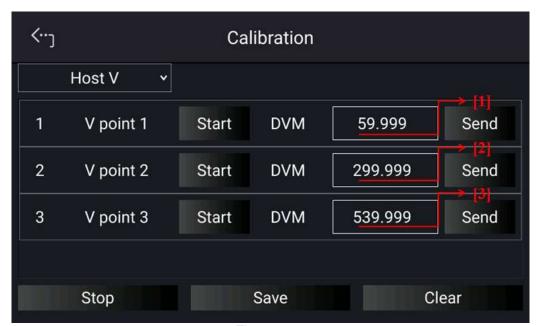


Figure 3-65



1. Calibration points will be different for other models (above example is for Model 62180D-600). It is necessary to remove the output load when performing voltage calibration. When performing this procedure, make sure there is no load connected to the output and sense line jumper are in place at the rear connectors, before tapping "START" to begin the calibration.

#### 3.2.4.4.2 Current Output and Measurement Calibration

The following instruments are recommended for calibration of the 62000D power supplies or equivalent, Table 3-6.

Table 3-6

Device		Suggest Model or Capacity	
DVM		HP 34401A or equivalent DVM	
DCCT (Current Shunt)		ULTRASTAB	
		current transducer 600/2000A	
		ITZ600-25PR or equivalent	
LOAD	DC Power Supply 2	CHROMA 62180D-600 or equivalent	

The setup is shown in Figure 3-66.

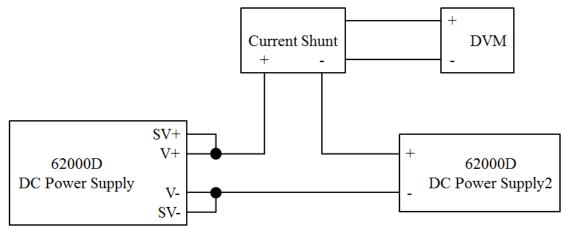


Figure 3-66



When conduct current calibration, each calibration point has to be entered with at least 5 significant digits to ensure the power supply accuracy after calibration (I.e. 50.004Amps).

Calibration Procedure (Model 62180D-600):

- 1. Set the DC Power Supply to CV mode at 100V.
- 2. In the Calibration page, tap "Host V" to set HOST I and list the current calibration items as shown in Figure 3-67

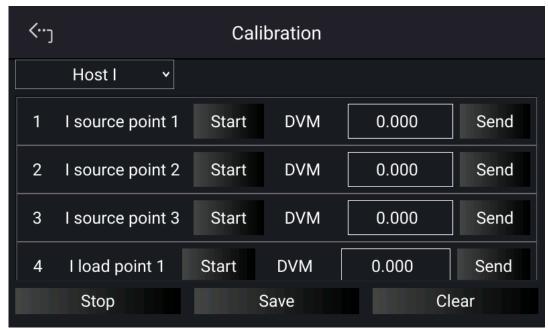


Figure 3-67

3. First perform the calibration of "I source point 1" by tapping "START" next to I source point 1. The DC power supply will output the current to approximately 12.00A. Enter the accrual current measured by across the current shunt and enter into entry box for point 1 and tap "SEND" to confirm.

- 4. Next, tap "START" next to "I source point 2" to perform the second point current calibration. The DC power supply will output a current of approximately 60.00A. Enter the accrual current measured by across the current shunt and enter into box for position [2] and tap "SEND" to confirm.
- 5. Repeat above for "I source point 3". The DC power supply will output a current of approximately 108.00A. Enter the current measured across the current shunt and enter into position [3] entry box and tap "SEND" to confirm.

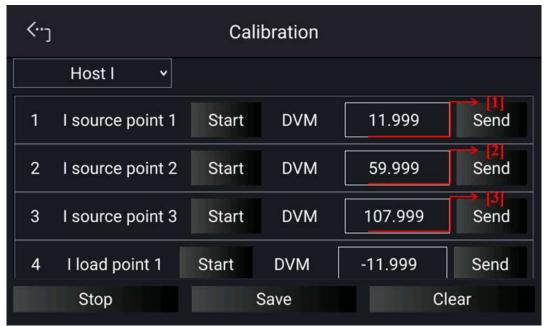


Figure 3-68

Next perform calibration of negative current points 1, 2 and 3 by following the above procedure and following display prompts. Calibration points will be -12A, -60A and -108A.

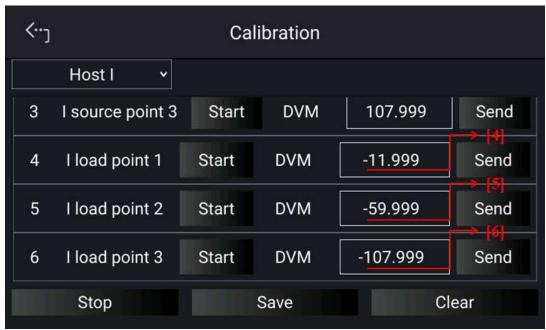
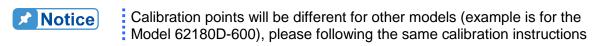


Figure 3-69

6. When above voltage calibrations are done, tap "STOP" to exit the calibration procedure. To save the calibration data, tap "SAVE", and tap "CLEAR" to delete the calibration parameters if there is no need to save them.





### 3.2.4.4.3 APG Voltage Output Calibration

Table 3-7 lists the hardware requirements for APG voltage output calibration.

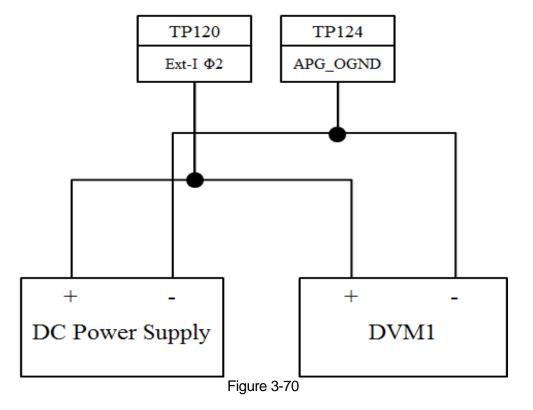
Table 3-7

Device Suggest Model or Capacity

DVM HP 34401A or equivalent DVM

DC Power Supply Any DC power supply or DC signal source that can output 10Vdc and drive more than 100mA.

Figure 3-70 shows the wire connection for APG voltage output calibration.





When conducting the APG voltage output calibration, each calibration point has to be entered to at least 4 significant digits (i.e. 5.007V) to ensure the power supply accuracy after calibration.

Calibration Procedure (Model 62180D-600):

1. In Calibration page, tap "Host V" to select APG V SET and list the APG voltage calibration items as shown in Figure 3-71.

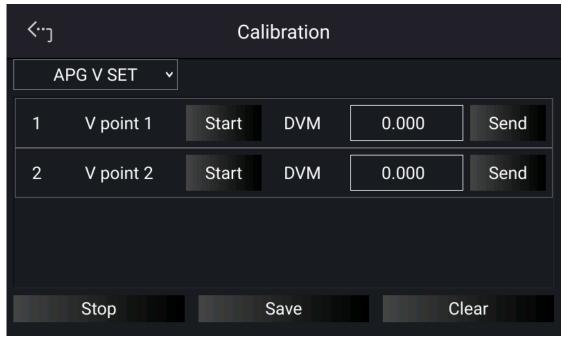


Figure 3-71



- When entering into the Calibration page, be sure to check the interface connection on the rear panel is correct.
- 2. If HP 34401 is used, the DVM1 and DVM2 can be connected to the front and rear measurement input terminal respectively.
- 2. When in APG V SET page and the wires are correctly connected, tap "START" next to V point 1 to calibrate the first point voltage.
- 3. User will be prompted to input about 1V voltage signal (TP120). Adjust the Power Supply to 1V±0.1V and use DVM1 to measure the Power Supply. Enter the actual measured voltage into position [1] and tap "SEND" to confirm.

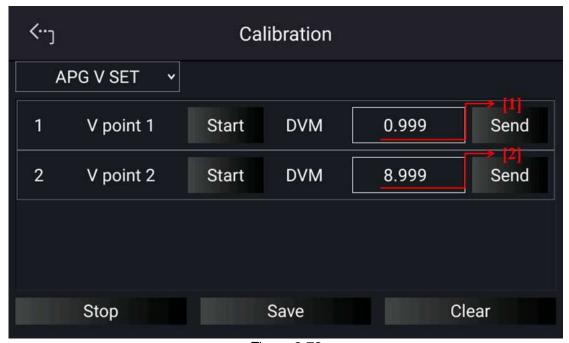


Figure 3-72

- 4. Next, tap "START" next to V point 2 to calibrate the second point voltage. User will be prompted to input about 9.0V voltage signal (TP120). Adjust the Power Supply to 9V±0.1V and use DVM1 to measure the Power Supply. Enter the measured voltage to position [2] and tap "SEND" to confirm.
- 5. When the APG voltage calibrations are done, tap "STOP" to exit the calibration procedure. To save the calibration data, tap "SAVE", and tap "CLEAR" to delete the calibration parameters if there is no need to save them.

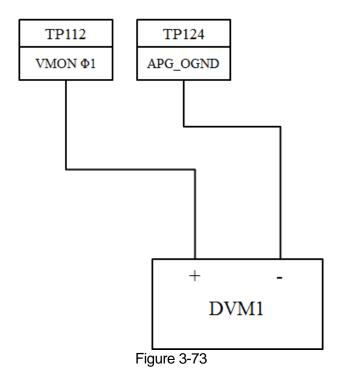
### 3.2.4.4.4 APG Voltage Measurement Calibration

Table 3-8 lists the hardware requirements for APG voltage measurement calibration.

Table 3-8

Device	Suggest Model or Capacity	
DVM	HP 34401A or equivalent DVM	
DC Power Supply	Any DC power supply or DC signal source that	
	can output 10Vdc and drive more than 100mA.	

Figure 3-73 shows the wire connection for APG voltage measurement calibration.



**Notice** 

When conducting the APG voltage measurement calibration, each calibration point has to enter at least four significant digits (4.005V) to ensure the power supply accuracy after calibration.

Calibration Procedure (Model 62180D-600):

 In Calibration page, tap "Host V" to select APG V MEAS and list the APG voltage calibration items as shown in Figure 3-71.

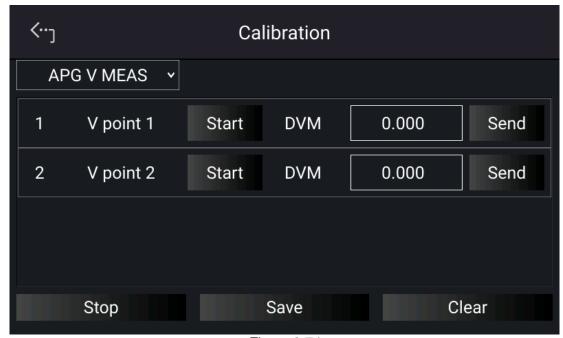


Figure 3-74



1. When entering into the Calibration page, be sure to check the interface connection on the rear panel is correct.

- 2. If HP 34401 is used, the DVM1 and DVM2 can be connected to the front and rear measurement input terminal respectively.
- 2. When in APG V MEAS page and the wires are correctly connected, tap "START" next to V point 1 to calibrate the first point voltage.
- 3. The system will set the output voltage on the rear panel to approx. 1.0V (TP112). Use DVM1 to measure the Power Supply. Enter the measured voltage to position [1] and tap "SEND" to confirm.



Figure 3-75

- 4. Next, tap "START" next to V point 2 to calibrate the second point voltage. The system will set the output voltage on the rear panel to 9.0V (TP112). Use DVM1 to measure the Power Supply. Enter the measured voltage to position [2] and tap "SEND" to confirm.
- 5. When the APG voltage calibrations are complete, tap "STOP" to exit the calibration procedure. To save the calibration data, tap "SAVE", and tap "CLEAR" to delete the calibration parameters if there is no need to save them.



Calibration point will be different for other models, please follow above instructions for all models.

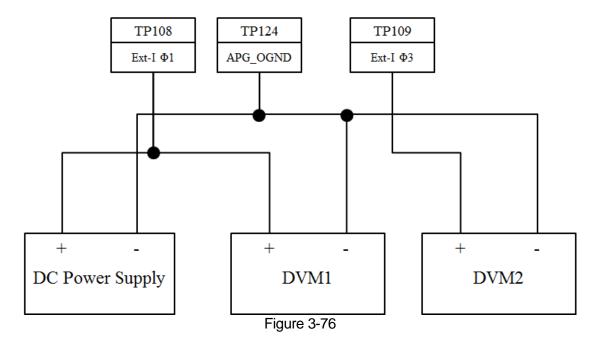
### 3.2.4.4.5 APG Current Output Calibration

Table 3-9 lists the hardware requirements for APG current output calibration.

Table 3-9

Device	Suggest Model or Capacity	
DVM	HP 34401A or equivalent DVM	
	Any DC power supply or DC signal source that can output 10Vdc and drive more than 100mA.	

Figure 3-73 shows the wire connection for APG voltage output calibration.





When conducting the APG current output calibration, each calibration point has to enter at least 4 significant digits to ensure the power supply accuracy after calibration.

Calibration Procedure (Model 62180D-600):

- 1. Tap "Menu", "Configuration" and "Interface" to select "APG" page, set the I SOURCE SET and I LOAD SET to Verf (0-10V).
- 2. In Calibration page, tap "Host V" to select APG I SET and list the APG current calibration items as shown in Figure 3-77.

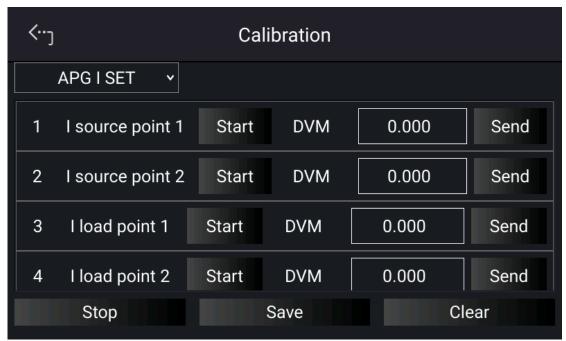


Figure 3-77



- 1. When entering into the Calibration page, be sure to check the interface connection on the rear panel is correct.
- 2. Calibration points will be different for other models, please operate it following the instructions displayed.
- 3. When in APG I SET page and the wires are correctly connected, tap "START" next to I source point 1 to calibrate the first point current.
- 4. It will request you to input about 1V voltage signal (TP108). Adjust the Power Supply to 1V±0.1V and use DVM1 to measure the Power Supply. Enter the measured voltage to position [1] and tap "SEND" to confirm as Figure 3-78 shows.
- 5. Next, tap "START" next to I source point 2 to calibrate the second point current. Adjust the Power Supply to 9V±0.1V and use DVM1 to measure the Power Supply. Enter the measured voltage to position [2] and tap "SEND" to confirm as Figure 3-78 shows.
- 6. Tap "START" next to I load point 1 to calibrate the first point positive current. It will request you to input about 1V voltage signal (TP109). Adjust the Power Supply to 1V±0.1V and use DVM2 to measure the Power Supply. Enter the measured voltage to position [3] and tap "SEND" to confirm as Figure 3-78 shows.
- 7. Next, tap "START" next to I load point 2 to calibrate the second point negative current. Adjust the Power Supply to 9V±0.1V and use DVM2 to measure the Power Supply. Enter the measured voltage to position [4] and tap "SEND" to confirm as Figure 3-78 shows.

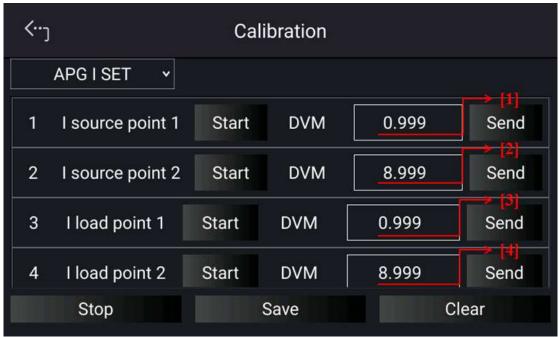


Figure 3-78

- 8. When the APG current calibrations are done, tap "STOP" to exit the calibration procedure. To save the calibration data, tap "SAVE", and tap "CLEAR" to delete the calibration parameters if there is no need to save them as Figure 3-78 shows.
- 9. When done, return to the "APG" of "Interface" to set the I SOURCE SET and I LOAD SET to None.

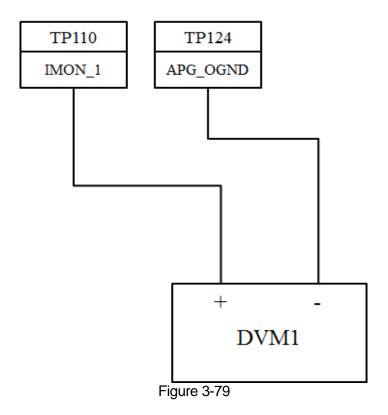
#### 3.2.4.4.6 APG Current Measurement Calibration

Table 3-10 lists the hardware requirements for APG current measurement calibration.

**Table 3-10** 

Device	Suggest Model or Capacity
DVM	HP 34401A or equivalent DVM
DC Power Supply	Any DC power supply or DC signal source that can output 10Vdc and drive more than 100mA.

Figure 3-79 shows the wire connection for APG current measurement calibration.





When conducting the APG current measurement calibration, each calibration point has to enter at least 4 Arabic numerals to ensure the power supply accuracy after calibration.

Calibration Procedure (Model 62180D-600):

1. In Calibration page, tap "Host V" to select APG I MEAS and list the APG current calibration items as shown in Figure 3-80.

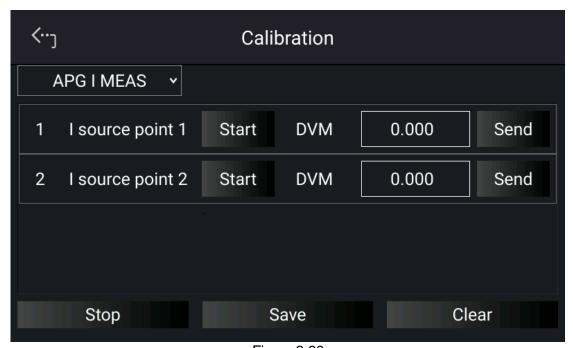


Figure 3-80



- When entering into the Calibration page, be sure to check the interface connection on the rear panel is correct.
- 2. Calibration points will be different for other models, please operate it following the instructions displayed.
- When in APG I MEAS page and the wires are correctly connected, tap "START" next to I source point 1 to calibrate the first point current. The system will set the output voltage on the rear panel to -9V (TP110). Use DVM1 to measure the Power Supply. Enter the measured current to position [1] and tap "SEND" to confirm.
- Next, tap "START" next to I source point 2 to calibrate the second point current. The
  system will set the output voltage on the rear panel to 9V (TP110). Use DVM1 to
  measure the Power Supply. Enter the measured current to position [2] and tap "SEND"
  to confirm.

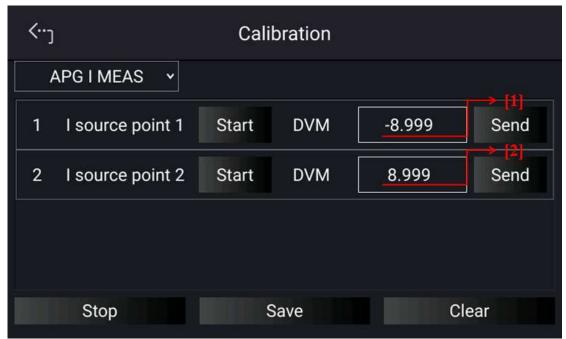


Figure 3-81

3. When the APG current calibrations are done, tap "STOP" to exit the calibration procedure. To save the calibration data, tap "SAVE", and tap "CLEAR" to delete the calibration parameters if there is no need to save them as Figure 3-81 shows.

### 3.2.4.5 External Output

The setting of DI1 and DI2 function needs to work with external Analog Interface as Figure 3-82 shows.



Figure 3-82

- 1. Remote INHIBIT function allows users to remotely turn-off power supply. Logic: Low
  - sets Remote INHIBIT to enable, the power supply's ON/OFF is still controlled by "When the Pin 6 and Pin18 (\_INHIBIT) of ANALOG INTERFACE are triggered in low
  - level that equals to tap " on the front panel and set OUTPUT = OFF. The DC
  - power supply will shut down and sends out a protection signal (in this case the "button will be off), and Pin6 and Pin18 (\_INHIBIT) of ANALOG INTERFACE cannot be used to release the protection.
- 2. When protection occurs to REMOTE INHIBIT the main page will appear the protection message as Figure 3-83 shows.
- 3. Tap "Confirm" to return to the main page.

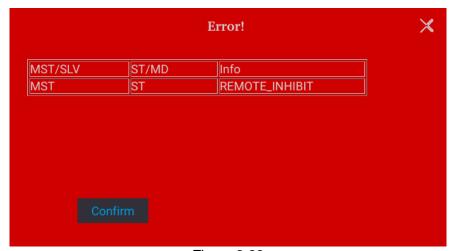


Figure 3-83

- 4. Pin6 and Pin18 are the input pins of TTL Level and are able to set the initial state to logic: ON=HIGH or OFF=LOW.
- 5. When the DC power supply is set to OUTPUT = ON, the detail actions of REMOTE INHIBIT are shown in Figure 3-84.

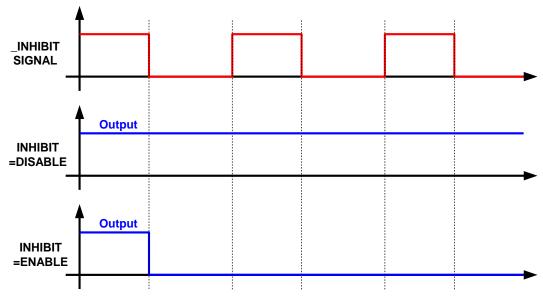


Figure 3-84

Ext. ON/OFF function allows users to control the DC power supply's output through the Pin 6 & 18 (\_EXT\_ON) of ANALOG INTERFACE.

- Tap EXT ON/OFF to set DISABLE and ENABLE;
  - (1) Selecting DISABLE: Turns output off.
  - invalid, also the Pin 6 & 18 (\_EXT\_ON) replaces the "o" to control the power supply's ON/OFF. When the Pin 6 & 18 (\_EXT\_ON) voltage level of ANALOG INTERFACE turns to HIGH, the power supply is unable to output, that is OUTPUT = OFF. When the Pin 6 & 18 (\_EXT\_ON) voltage level turns to LOW, the DC power supply outputs normally, that is OUTPUT = ON.
- 2. When the EXT. ON/OFF is enabled, the MAIN page will appear the EXT message. Moreover, Pin 6 & 18 are the input pins of TTL Level and are able to set the initial state to PULL=HIGH or PULL=LOW.
- 3. When the DC power supply is set to OUTPUT = ON, the detail actions of EXTERNAL ON/OFF are as shown in Figure 3-85.

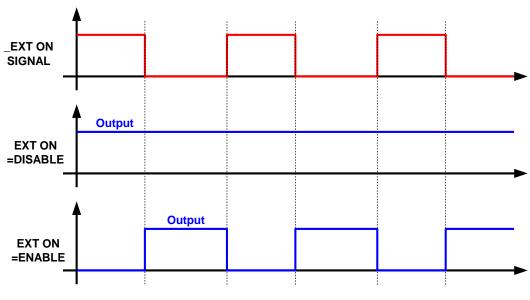


Figure 3-85

# 4. Program Sequence

The 62000D Series DC power supplies allow users to program the sequence for output in LIST MODE and V\_STEP MODE.

LIST MODE has 10 programs and each program can add new sequences liberally that total 100 sequences are available for editing. Each sequence in LIST MODE can be edited for voltage settings, voltage slew rates, current settings, current slew rates, run times and trigger types that can apply to almost any situation.

### Setting steps:

- 1. Select "Program Seq." from the Menu page.
- 2. In Program Seq. page, select LIST MODE and the screen appears as Figure 4-1.
- 3. To quit programming the sequence, tap "Program Seq. > " on the upper left to return to the Menu page.



Figure 4-1

V\_STEP MODE provides a run time voltage program with the maximum of 99 hours 59 minutes and 59.99 seconds.

### Setting steps:

- 1. Enter into Program Seq. and the screen appears as shown in Figure 4-1.
- 2. Tap "List Mode" to open the options as Figure 4-2 shows.
- 3. Select "v Step Mode" to enter into V\_STEP MODE as Figure 4-3 shows.
- 4. To quit programming the sequence, tap "Program Seq. > " on the upper left to return to the Menu page.

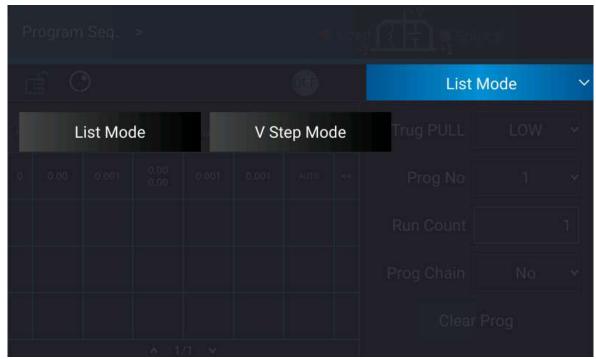


Figure 4-2

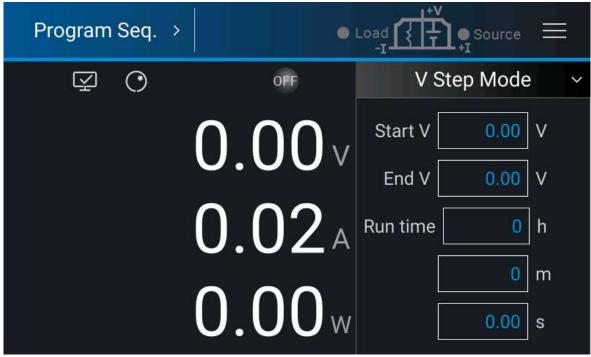


Figure 4-3

## 4.1 List Mode

In List Mode there are maximum 100 sequences that can be added to one program. The sequence setting is described in section 4.1.2 and the complete program structure is listed in Figure 4-4.

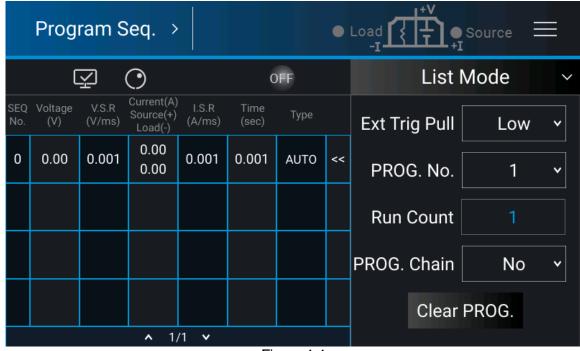


Figure 4-4

## 4.1.1 PROGRAM Settings

A program has 5 settings: (1) Ext Trig PULL, (2) Prog No, (3) Run Count, (4) Prog Chain, and (5) Clear Prog.

## 4.1.1.1 Setting Ext Trig Pull

Tap Ext Trig Pull on the right and select HIGH or LOW.



- 1. When the Ext Trig is set to HIGH, a negative edge trigger signal (TTL level) is needed from the Analog Interface PIN 15 on the rear panel to move to the next sequence step.
- 2. When the Ext Trig is set to LOW, a high level signal from the Analog Interface PIN15 on the rear panel and changes it to low level signal (negative edge trigger) to move to the next sequence step.

## 4.1.1.2 Setting Prog No.

Tap Prog No. on the right, the valid range is 1~10.

## 4.1.1.3 Setting Run Count

Tap Run Count on the right and input the value.

Each program has a Run Count that sets the execution number.

Table 4-1 lists the Run Count range:

Table 4-1

Table 4 T			
RUN COUNT	MIN	MAX	
TIMES	1	15000	

### Ex. 1: Set RUN COUNT for a program

Set Prog Chain =3, Run Count=2 for Prog No.1.

Set Prog Chain =No, Run Count=2 for Prog No.3.

The program execution flow of Run Count is listed in Figure 4-5.

#### A1: Execution steps:

- (1) When all Prog No.1 sequences are done, return to Prog No.1.
- (2) Repeat step (1) twice and skip Prog No.2 and jump to Prog No.3.
- (3) When all Prog No.3 sequences are done, return to Prog No.3.
- (4) Repeat step (3) twice.
- (5) End

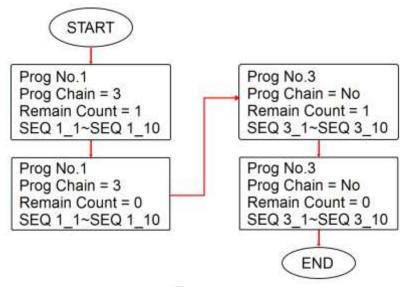


Figure 4-5

## 4.1.1.4 Setting Program Chain

Tap "Prog Chain" on the right and select "NO" or set the value from 1~10.

The Program Chain indicates the link among programs. To execute a different program, select the next Prog No. to be executed. The setting range is 0 ~ 10.

When the value is set to 1~10, it means to chain the programs as the example shown below.

### Ex. 2: Chain among programs

Set Prog Chain =3, Run Count=1 for Prog No.1.

Set Prog Chain =6, Run Count=1 for Prog No.3.

Set Prog Chain =No, Run Count=1 for Prog No.6.

The program execution flow is listed in Figure 4-6.

### A2: Execution steps:

- (1) When all Prog No.1 sequences are done, skip Prog No.2 and jump to Prog No.3.
- (2) When all Prog No.3 sequences are done, skip Prog No.4 and Prog No.5, jump to Prog No.6.
- (3) End

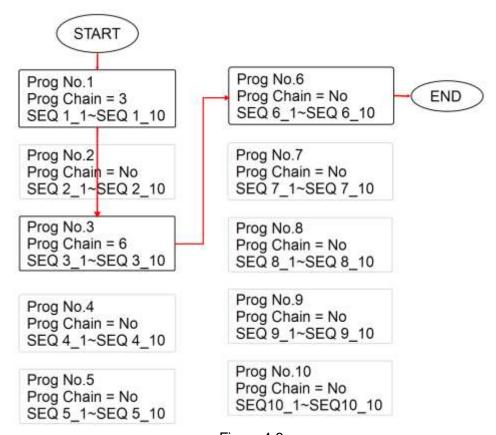


Figure 4-6

### Ex. 3: Use a Program to form an infinite loop. Set Prog Chain =1, Run Count =1 for Prog No.1. The program execution flow is listed in Figure 4-7.

### A3: Execution steps:

- (1) When all Prog No.1 sequences are done, jump to Prog No.1.
- (2) Rerun step (1).
- (3) Form an infinite loop.

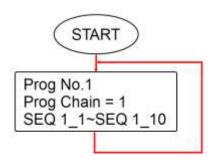


Figure 4-7



If program is commanded to skip to next Program and there is no sequence or all sequences are set to Skip (see 4.1.2.1), then program will stop execution.

## 4.1.1.5 Setting Clear Program

Tap Clear Prog on the right to clear all sequences in the program.

# 4.1.2 Setting Program Seq.

- The default sequence of all programs is 0 and maximum 100 sequences can be added freely to a program. In other words, the total sequences to be used by 10 programs are 100 maximum.
- 2. Adding a new sequence:
  - a. In the Program Seq. page (Figure 4-8), drag the "<<" boxed in red dot line to show a hidden function bar as shown in Figure 4-9.
  - b. Select the red dot line box in Figure 4-9 to add a new sequence. Check if the SEQ No. column turns to 1 from 0 as Figure 4-10 shows.
  - c. Repeat step a and b to a new sequence.

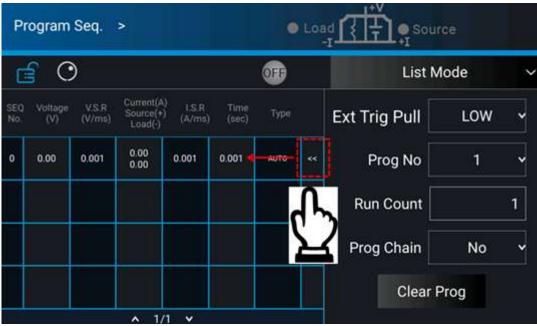


Figure 4-8

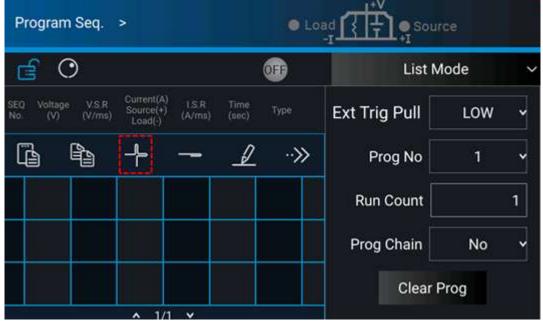


Figure 4-9

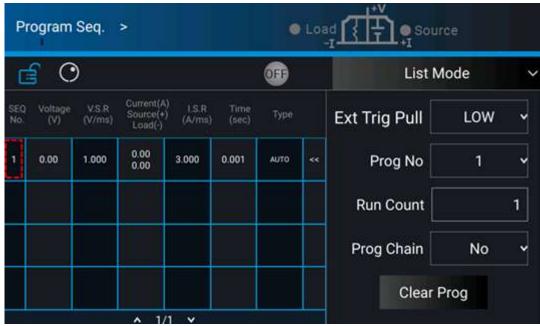


Figure 4-10

### 3. Setting a SEQUENCE:

- a. Repeat the steps to add a new sequence to show the hidden function bar. Tap the red dot line box in Figure 4-11 to perform the setting as Figure 4-12 shows.
- b. Each Sequence can included the following 7 items: (1) Voltage, (2) V slew rate, (3) Source current, (4) Load current, (5) I slew rate, (6) Type, and (7) Time as described below.

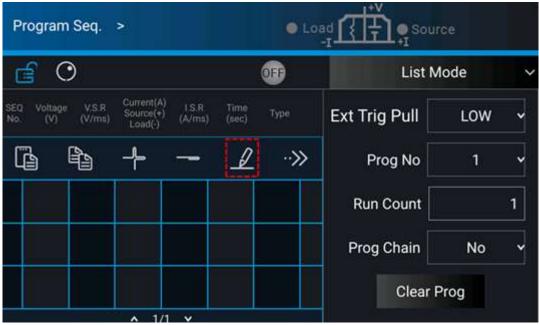


Figure 4-11



Figure 4-12

## 4.1.2.1 Setting Sequence Type

- 1. Tap Type as labeled (6) in Figure 4-12 to set the sequence type.
- 2. There are 4 sequence types, these are: (a) AUTO, (b) MANUAL, (c) TRIGGER, and (d) SKIP.
  - A. Setting sequence type to AUTO
    When SEQ TYPE = AUTO is selected, the page shown as Figure 4-13 indicates the sequence will complete the execution automatically and skip to next sequence.

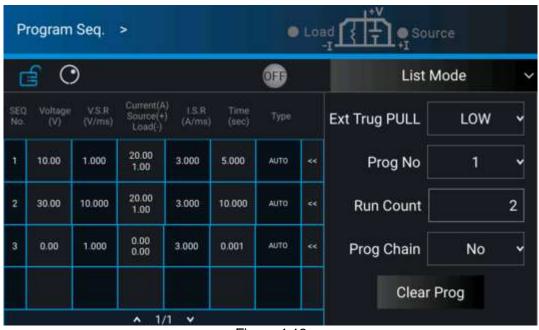
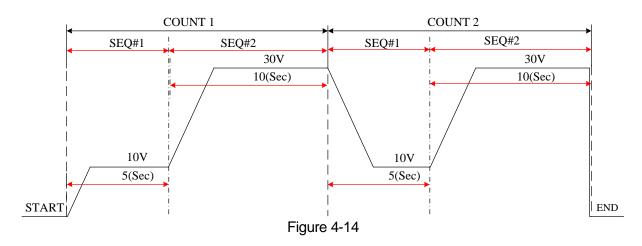


Figure 4-13

#### Execution steps:

- (1) SEQ#1:
  - (1) Since SEQ TYPE = AUTO is set for SEQ#1, it begins to execute the settings in SEQ#1.
  - (2) During SEQ#1 voltage rise, the maximum loading current is 1A and does not exceed the current setting 20A; therefore SEQ#1 is in CV Mode during voltage rise.
  - (3) Once the voltage reached the set 10V, the program lasts for 5 seconds from rising.
  - (4) Skip to SEQ#2.
- (2) SEQ#2:
  - (1) Since SEQ TYPE = AUTO is set for SEQ#2, it begins to execute the settings in SEQ#2
  - (2) During SEQ#2 voltage rise, the maximum loading current is 3A and does not exceed the current setting 20A; therefore, SEQ#2 is in CV Mode during voltage rise.
  - (3) Once the voltage reached the set 30V, the program lasts for 10 seconds from rising.
  - (4) Skip to SEQ#3.
- (3) SEQ#3:
  - (1) Since SEQ TYPE = AUTO and TIME=0 are set for SEQ#3, it indicates SEQ#3 is not executing and the Program is ended.
- (4) As RUN COUNT=2 is set, steps (1), (2) and (3) are executed again.
- (5) End.

Figure 4-14 shows the output waveform:



#### B. Setting sequence type to MANUAL

When SEQ TYPE = MANUAL is selected, the sequence will run automatically and stop at the setting of VOLTAGE or CURRENT without skipping to next sequence until any key on the front panel is presses. User will not be asked to enter the time the sequence to be remained when set to MANUAL.

### C. Setting sequence type to TRIGGER

When SEQ TYPE = TRIGGER is selected, the sequence will run automatically and stop at the setting of VOLTAGE or CURRENT without skipping to next sequence until inputting a signal from PIN15 of Analog Interface on the rear panel. See section 4.1.1.1 for the input signal definition of Analog Interface PIN 15.

D. Setting sequence type to SKIP When SEQ TYPE = SKIP is selected, the Sequence page as shown in Figure 4-12 indicates the Sequence will skip automatically and jump to next sequence.

## 4.1.2.2 Setting Time

- 1. Tap Figure 4-12 (7) to set the time parameter.
- 2. The time range for setting is listed in the table below.

Table 4-2

TIME	Min. (Sec)	Max. (Sec)
	0.002	15000

### 4.1.2.3 Setting Voltage

- 1. Tap Figure 4-12 (1) to set the voltage parameter.
- 2. See section 3.2 for detail description.

## 4.1.2.4 Setting Voltage Slew Rate

- 1. Tap Figure 4-12 (2) to set the voltage slew rate.
- 2. See section 3.2 for detail description.

## 4.1.2.5 Setting Current

- 1. Tap Figure 4-12 (3) (4) to set the current parameter.
- 2. See section 3.2 for detail description.

## 4.1.2.6 Setting Current Slew Rate

- 1. Tap Figure 4-12 (5) to set the current slew rate.
- 2. See section 3.2 for detail description.

### 4.1.3 Execution in List Mode

When the sequences are finished for editing, press " to start execution and press again to abort it.

# 4.2 V Step Mode

Allows user to set a run time program using V Step Mode. Figure 4-15 shows the screen when V Step Mode is selected.

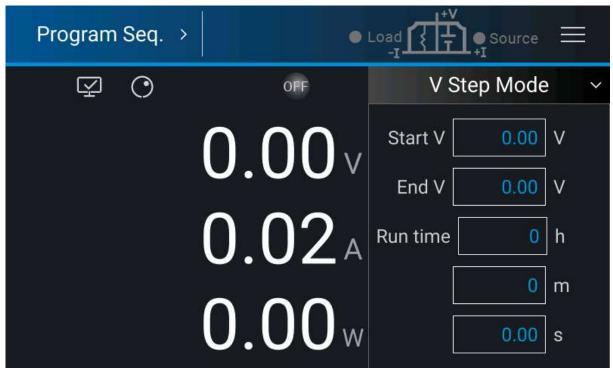


Figure 4-15

## 4.2.1 Setting V Step Mode

V Step Mode has three settings: (1) Start V, (2) End V, (3) Run time.

## 4.2.1.1 Setting Start V

There are two methods to set Start V:

Method 1 (via touch panel):

- Tap the value box after Start V and the touch panel will switch to a numeric pad as show in Figure 4-16.
- 2. Use numeric buttons (0 ~9) to set the value and tap " to complete the setting of Start V.



Figure 4-16

### Method 2 (via rotary knob):

- Tap O to use "Rotary" (O) knob. Tap the value box after Start V and the cursor at 1. lower right will flicker.
- When "Rotary" ( ) knob is used for setting, pressing it can move the cursor to a 2. different digit. Turning the rotary knob can increase or decrease the value of that digit.
- When the value is confirmed, tap "O" to complete the Start V setting. 3.



**CAUTION** When the initial voltage on the output of the supply does not equal the setting of Start V there are two circumstances that may occur in V Step Mode: (1) The output voltage will rise to the setting of start voltage and the V Slew Rate is 1V/ms by default (which can be changed if desired), or (2) output voltage will fall to the setting of Start V and the falling time is calculated by the default 1V/ms (which can be changed if desired) while the actual V Slew Rate is varied by load.

#### 4.2.1.2 **Setting End V**

There are two methods to set End V:

Method 1 (via touch panel):

- 1. Tap the value box after End V and the touch panel will switch to a numeric pad as show in Figure 4-16.
- 2. Use numeric buttons  $(0 \sim 9)$  to set the value and tap "to complete the setting of End" ٧.

Method 2 (via rotary knob):

1. Tap to use "Rotary" ( ) knob. Tap the value box after End V and the cursor at lower right will flicker.

- 2. When "Rotary" ( ) knob is used for setting, pressing it can move the cursor to a different digit. Turning the rotary knob can increase or decrease the value of that digit.
- 3. When the value is confirmed, tap "O" to complete the End V setting.

### 4.2.1.3 Setting RUN Time

Sets the run time of V Step Mode. The time format is HOUR:MIN:SEC and the maximum setting is 99 hours 59 minutes and 59.99 seconds.

There are two methods to set the Run time:

Method 1 (via touch panel):

- 1. Tap the value box after Run time and the touch panel will switch to a numeric pad.
- 2. Use numeric buttons (0 ~9) to set the value and tap " to complete the setting of Run time.

Method 2 (via rotary knob):

- 1. Tap to use "Rotary" ( ) knob. Tap the value box after Run time and the cursor at lower right will flicker.
- 2. When "Rotary" ( ) knob is used for setting, pressing it can move the cursor to a different digit. Turning the rotary knob can increase or decrease the value of that digit.
- 3. When the value is confirmed, tap "O" to complete the Run time setting.



It is suggested to set the initial V\_SET voltage and the current under SOURCE & LOAD (the current setting value cannot be lower than the load current, otherwise the output time will not be equal to the Run time setting) in MAIN PAGE as shown in Figure 3-4 before entering V Step

Mode and tapping " for output.

Ex. 1: Set the Start V to 10V, End V to 50V and Run time to 10 minutes.

- CASE1: The hardware initial voltage is 0V and the output waveform is as Figure 4-17 shows.
- CASE2: The hardware initial voltage is 10V and the output waveform is as Figure 4-18 shows.
- CASE3: The hardware initial voltage is 20V and the output waveform is as Figure 4-19 shows.

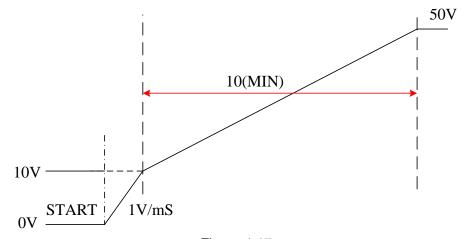


Figure 4-17

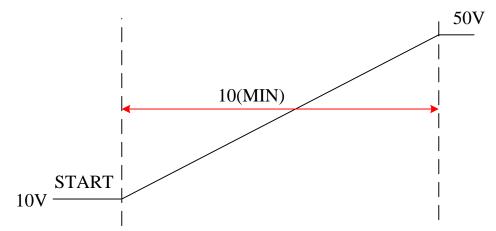


Figure 4-18

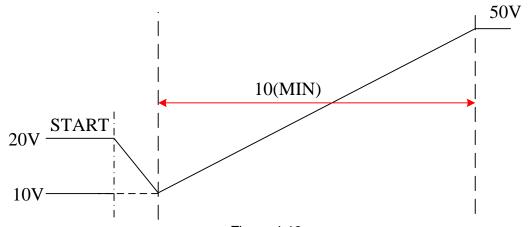


Figure 4-19

## 4.2.2 Execution in V Step Mode

After the settings of Start V, End V and Run time are done, tap " to confirm and start the execution. Tap " again to abort.

### 4.2.2.1 Running V Step Mode

Tap "Tap to execute it and the screen will appear as Figure 4-20 shows.



Figure 4-20

When V Step Mode is executed:

- 1. Start Volt: It is the start voltage setting of V Step Mode.
- 2. End\_Volt: It is the end voltage setting of V Step Mode.
- 3. Elapse Time: It is the executed time of V Step Mode. The time format is HOUR:MIN:SEC and the maximum display is 99 hours 59 minutes and 59.99 seconds.

# 5. Remote Operation

### 5.1 Overview

The 62000D Series DC power supply can be controlled remotely via USB, GPIB or Ethernet.

The USB interface supports USB 2.0/USB 1.1. GPIB interface is an 8-bit parallel data bus that synchronizes with the host bus commands. Ethernet interface is used in local area network for data transmission.

### 5.1.1 USB Interface

(1) Hardware Support: USB 2.0 and USB 1.1

(2) Software Support: USBTMC class and USB488 subclass

(3) OS Support: Windows 98/2000/XP/Vista/Windows 7/Windows 8

(4) Installing Driver: 62000D Series USB Interface supports USBTMC, so if the PC

OS supports USBTMC (installed NI-VISA runtime version 3.00 or above) it is no need to install other drivers. The OS will search for the standard USBTMC driver installation program

automatically.

If the PC's operating system does not support USBTMC, it is suggested to install the NI-VISA runtime version 3.00 or above first. When the installation of NI-VISA runtime is done, the USBTMC driver program is stored in the operating system. The PC can communicate with 62000D Series via NI-VISA after using the USB.

#### Related Documents:

- 1. USB Test and Measurement Class (USBTMC) specification, Revision 1.0, www.usb.org
- 2. USB Test and Measurement Class USB488 subclass specification, Revision 1.0, www.usb.org

## 5.1.2 Setting GPIB and Ethernet Parameters

See section 3.2.4.

### **5.1.3 Ethernet Remote Control**

To remote program a 62000D DC power supply via a PC with Ethernet interface, the 62000B needs to confirm the IP address, Gateway address and Subnet mask in advance. To ensure reliable data transmission, TCP is used for data transmission and the communication port is 5025.

## 5.2 GPIB Function of 62000D Series

Table 5-1

GPIB Function	Description
Talker/Listener	Commands and response messages can be sent and received over the GPIB bus. Status information can be read using a series poll.
Service Request	It sets the SRQ line to true if there is an enabled service request condition.
Remote/Local	Power-on in local mode, the front panel can be operated and the commands are responded through GPIB. When in remote mode, all front panel keys are invalid except . Tap " to return to local mode.

# 5.3 Introduction to Programming

All commands and response messages are transmitted in ASCII codes. The response messages must be read completely before a new command is sent, or the remaining response messages will be lost and cause a query interrupt error.

### 5.3.1 Conventions

The conventions used in this section are listed in Table 5-2.

Table 5-2

Angle brackets	<	>	Items in angle brackets are parameter abbreviations.
Vertical bar			Vertical bar separates alternative parameters.
Square	[	]	Items in square brackets are optional. For example,
brackets			OUTP[:STATe] means that :STATe may be omitted.
Braces	{	}	Braces indicate the parameters that may be repeated.  The notation <a> {&lt;, B&gt;} means that parameter "A" must be entered while parameter "B" may be omitted or entered once or</a>
			more times.

### 5.3.2 Numerical Data Formats

The numerical data format of 62000D DC power supply is listed in Table 5-3. Numerical data can be added to the suffix to distinguish data while the multiplier can be placed prior the suffix. Table 5-4 lists the suffix used by 62000D DC power supply and Table 5-5 lists the multiplier.

Table 5-3 Format of Numerical Data

Symbol	Description	Example
NR1	It is a digit without decimal point. The decimal is assumed	123, 0123
	to be at the right of the least significant digit.	
NR2	It is a digit with a decimal point.	12.3, .123
NR3	It is a digit with a decimal point and an exponent.	1.23E+2
NRf	Flexible decimal format including NR1or NR2 or NR3.	123, 12.3, .23E+3

Extended decimal format including NRf and MIN, MAX.	123,
MIN and MAX is the high and low limit of parameter.	12.3,1.23E+3,
	MIN, MAX

Table 5-4

Type	Suffix	Unit		
Current	Α	Ampere		
Voltage	V	Volt		
Time	S	Second		

Table 5-5

Multiplier	Symbol	Definition
1E6	MA	Mega
1E3	K	Kilo
1E-3	М	Milli
1E-6	U	Micro
1E-9	N	Nano

### 5.3.3 Boolean Data Format

The <Boolean> parameter uses the form ON|OFF only.

## 5.3.4 Character Data Format

The character strings returned by query command are shown in either of the following forms:

<CRD> Character Response Data: character string with maximum length of 12.

<SRD> String Response Data: character string.

### 5.3.5 Basic Definition

### 5.3.5.1 Command Tree Structure

The commands of the DC power supply are based on a hierarchical structure, also known as a tree system. In order to obtain a particular command, the full path to that command must be specified. This path is represented in the structure by placing the highest node in the farthest left position of the hierarchy. Lower nodes in the hierarchy are indented in the position to the right, below the parent node.

## 5.3.5.2 Program Headers

Program headers are key words that identify the command. They follow the syntax described in section 5.6 of IEEE 488.2. The DC power supply accepts characters in both upper and lower case without distinguishing the difference. Program headers consist of two distinctive types, common command headers and instrument-controlled headers.

### 5.3.5.3 Common Command and Query Headers

The syntax of common command and query headers is described in IEEE 488.2. It is used together with the IEEE 488.2-defined common commands and queries. The commands with a leading " \* " are common commands.

### 5.3.5.4 Instrument-Controlled Headers

Instrument-controlled headers are used for all other instrument commands. Each of them has a long form and a short form. 62000H Series only accepts the exact short and long forms. A special notation will be taken to differentiate the short form header from the long one of the same header in this subsection. The short form header is shown in characters of upper case, whereas the rest of the headers are shown in those of lower case.

### 5.3.5.5 Program Header Separator (:)

If a command has more than one header, the user must separate them with a colon (FETC:CURR FUNC:SHAP). Data must be separated from program header with one space at least.

## 5.3.5.6 Program Message

Program message consists of a sequence of zero or other elements of program message unit that are separated by separator elements of program message unit.

## 5.3.5.7 Program Message Unit

Program message unit represents a single command, programming data, or query.

Example: VOLT?, OUTPut ON.

### 5.3.5.7.1 Program Message Unit Separator (;)

The separator (semicolon;) separates the program message unit from one another element in a program message.

Example: VOLT 80; CURR 15<PMT>

### 5.3.5.7.2 Program Message Terminator (<PMT>)

A program message terminator represents the end of a program message. Three permitted terminators are:

(1) <END> : end or identify (EOI)

(2) <NL>: new line which is a single ASCII-encoded byte 0A (10 decimals).

(3) <NL> <END> : new line with EOI.



The response message is terminated by <NL> <END> for GPIB.

### 5.4 Traversal of Command Tree

Multiple program message unit elements can be sent in a program message. The first command is always referred to the root node. Subsequent commands are referred to the same tree level as the previous command in a program message. A colon preceding a program message unit changes the header path to root level.

Example:

SOURce:VOLTage:SLEW 1
SOURce:VOLTage:SLEW 1
SOURce:VOLTage:SLEW 1;:VOLT 100
All colons are header separators.
Only the first colon is a specific root.
Only the third colon is a specific root.

### 5.5 Execution Order

The 62000D DC power supply executes program messages by the order received. Program message units except coupled commands are executed in order of reception. The execution of coupled commands is deferred until program message terminator is received. A coupled command sets parameters, which are affected by the setting of other commands. Problems may arise, because the prior state of the 62000D DC power supply will affect the response of a coupled parameter to its programming.

## 5.6 DC Power Supply Commands

This section describes the syntax and parameters of all commands for DC power supply.

*CLS	Clear status command
*ESE	Standard event status enable
*ESR?	Standard event status register
*IDN?	Identification query
*OPC	Operation complete command
*OPC?	Operation complete query
*RCL	Recall instrument state command
*RST	Reset command
*SAV	Save command
*SRE	Service request enable command/query
*STB?	Read status byte query
ABORt	Sets all output state to "OFF".
CONFigure:BEEPer	Sets beeper to ON or OFF.
CONFigure:OUTPut	Sets the voltage/current output.
CONFigure:FOLDback	Sets the type of FOLDBACK PROTECT.
CONFigure:FOLDT	Sets the delay time of FOLDBACK
	PROTECT.
CONFigure: APGVSet	Sets the action type of APG VSET.

	Sata the action type of ADC \/MEAS
CONFigure:APGVMeas	Sets the action type of APG VMEAS.
CONFigure: APGISet	Sets the action type of APG SOURCE /
3	LOAD ISET.
CONFigure:APGIMeas	Sets the action type of APG IMEAS.
CONFigure:AVG:TIMES	Sets the average times for measuring
	voltage/current.
CONFigure:AVG:METHod	Sets the average method for measuring
	voltage/current.
CONFigure:BRIGhtness	Sets the display brightness of panel.
CONFigure:MSTSLV:ID	Sets the device to Master .
CONFigure:MSTSLV:PARSER	Sets to series or parallel mode.
CONFigure:MSTSLV:NUMSLV	Sets the number of SLAVE to be
	controlled.
CONFigure:MSTSLV:READY?	Queries the Master/Slave connection
	status.
CONFigure:MSTSLV	Executes the Master/Slave control.
CONFigure:INHibit	Executes the Remote Inhibit control.
CONFigure:INHibit:PULL	Executes the Remote Inhibit input signal to
	enhance the resistance control.
CONFigure:INTERLOCK	Executes the Safety Interlock control.
CONFigure:INTERLOCK:PULL	Executes the Safety Interlock input signal
CONE: EVTON	to enhance the resistance control.
CONFigure:EXTON	Executes the External ON/OFF control.
CONFigure: EXTON:PULL	Executes the External ON/OFF input signal
COURSe.VOLTers	to enhance the resistance control.
SOURce:VOLTage	Sets the output voltage.
SOURce:VOLTage:LIMit:{HIGH/LOW}	Sets the output voltage range.
SOURce:VOLTage:PROTect:HIGH	Sets the voltage range for over voltage protection.
SOURce:VOLTage:SLEW	Sets the rising or falling slew rate (volt/ms)
OOORGE. VOLTAGE. OLL VV	of output voltage.
SOURce: CURRent	Sets the output current (ampere).
SOURce:CURRent:LIMit:{HIGH/LOW}	Sets the output current range.
SOURce:CURRent:PROTect:HIGH	Sets the current range for over current
	protection.
SOURce:CURRent:SLEW	Sets the rising or falling slew rate (amp/ms)
	of output current.
SOURce:POWer	Sets the output power.
SOURce:POWer:LIMit:{HIGH/LOW}	Sets the output power range.
SOURce:POWer:PROTect:HIGH	Sets the power range for over power
	protection.
SOURce:DCON:{RISE/FALL}	Sets the DC_ON signal active point.
LOAD: CURRent	Sets the Load output current.
LOAD:CURRent:PROTect:HIGH	Sets the current range for Load over
	current protection.
LOAD:POWer	Sets the Load power output.
LOAD:POWer:PROTect:HIGH	Sets the power range for Load over power
	protection.
FETCh:VOLTage?	Measures the output of power supply and
	returns real time voltage.

EETOL: OUDD - :: (O	Management that a section of a financial section of
FETCh:CURRent?	Measures the output of power supply and
	returns real time current (with sign).
FETCh:POWer?	Measures the output of power supply and
	returns real time power (with sign).
FETCh:STATus?	Returns the status code of power supply's
	state.
MEASure:VOLTage?	Returns the voltage measured at the output
-	of power supply.
MEASure:CURRent?	Returns the current measured at the output
	of power supply (with sign).
MEASure:POWer?	Returns the power measured at the output
	of power supply(with sign).
PROGram:MODE	Sets the program output mode.
PROGram:RUN	Executes the program.
PROGram:SAVE	Saves the program.
PROGram: SELected	
i NOGIAIII. SELECIEU	Sets the executed program no. in List mode.
PROGram:LINK	
FROGIAIII.LINK	Links a program to another when ends in List mode.
PROGram:COUNT	
PROGram:COUNT	Sets the no. of times for the program file to
DDGG DIII I	execute in List mode.
PROGram:PULL	Executes the PROGRAM TRIGGER input
	signal to enhance the resistance control in
	List mode.
PROGram:SEQuence:SELected	Sets the execution sequence of a program
	in List mode
PROGram:SEQuence:TYPE	Sets the action type of sequence in List
	mode.
PROGram:SEQuence:VOLTage	Sets the sequence for voltage output in List
	mode.
PROGram:SEQuence:VOLTage:SLEW	Sets the sequence of voltage slew rate for
	output in List mode.
PROGram:SEQuence:CURRent	Sets the sequence for Source current
	output in List mode.
PROGram:SEQuence:CURRent:SLEW	Sets the sequence of current slew rate for
	output in List mode.
PROGram:SEQuence:CURRent:LOAD	Sets the sequence for Load current output
	in List mode.
PROGram:SEQuence:TIME	Sets the duration of the sequence in List
	mode.
PROGram:CLEAR	Clears all sequences from the program
	selected in List mode.
PROGram:ADD	Adds sequences to the program selected in
	List mode.
PROGram:MAX?	Queries the sequence amount of the
	program selected in List mode
PROGram:SEQuence	Sets the parameters of a single sequence
	in List mode.
PROGram:STEP:STARTV	Sets the Step Mode start voltage for output.
PROGram:STEP:ENDV	Sets the Step Mode end voltage for output.
PROGram:STEP:TIME	Sets the execution time for Step Mode.

SYSTem:ERRor?	Poturns the error message and code of
STSTEIII.ERROI?	Returns the error message and code of
OVOT	power supply.
SYSTem:MODE	Sets the Source/Load output mode of the
	system.
SYSTem:VERSion:INTernal?	Queries the Host version
SYSTem:MODule:VERSion?	Queries the module version.
SYSTem:DATE	Sets the system date.
SYSTem:TIME	Sets the system time.
SYSTem:COMMunicate:CAN:CYClic:TIME	Sets the CAN cycle time.
SYSTem:COMMunicate:CAN:CYClic:ID	Sets the CAN cycle command ID.
	Sets the CAN baudrate.
SYSTem:COMMunicate:CAN:BAUD	
SYSTem:COMMunicate:CAN:ID	Sets the CAN ID.
SYSTem:COMMunicate:CAN:MASK	Sets the CAN ID mask.
SYSTem:COMMunicate:CAN:MODE	Sets the CAN 11 bit / 29 bit mode.
SYSTem:COMMunicate:CAN:PADding	Sets the CAN padding function.
SYSTem:COMMunicate:CAN:SCPI:ID	Sets the CAN SCPI ID.
SYSTem:COMMunicate:CAN:APPLY	Updates the CAN setting.
SYSTem:COMMunicate:GPIB:ADDRess	Sets the GPIB address.
SYSTem:COMMunicate:SOCK:DHCP	Sets the Ethernet DHCP function.
SYSTem:COMMunicate:SOCK:GATEway	Sets the Ethernet Gateway.
SYSTem:COMMunicate:SOCK:IP	Sets the Ethernet IP.
SYSTem:COMMunicate:SOCK:MASK	Sets the Ethernet IP Mask.
SYSTem:COMMunicate:SOCK:APPLY	Updates the Ethernet setting.
INSTrument:STATus:AD?	Returns the AD module status.
INSTrument:STATus:DD?	Returns the DD module status.

# **5.6.1 Common Command Syntax**

Commands are defined by IEEE488.2 standard containing common and query commands. Common commands begin with a "\*" and consist of three letters and/or one "?" (query). Common commands and queries are listed alphabetically.

\*CLS Clear Status
Type: Device status

Description: \*CLS command acts the follows:

Clear Error Code Reset Error Message. If "\*CLS" is followed by <nl>, the

"output queue" and MAV bit will be clear as well.

Syntax: \*CLS Parameter: None

\*ESE Standard Event Status Enable

Type: Device status

Description: This command sets the condition of the Standard Event Status Enable

register, which determines which events of the Standard Event Status Event register (see \*ESR?) are allowed to set the ESB (Event Summary Bit) of the Status Byte register. A "1" in the bit position enables the corresponding event. All of enable events of the Standard Event Status Event register are logically ORed to cause the ESB (bit 5) of the Status

Byte register to be set.

Syntax: \*ESE <NRf>

Parameter: 0 to 255

Example: \*ESE 48 This command enables the CME and EXE events

of the Standard Event Status Event register.

Query Syntax: \*ESE? Return Parameter: <NR1>

Query Example: \*ESE? This query returns current setting of Standard

Event Status Enable.

\*ESR? Standard Event Status Register

Type: Device status

Description: This guery reads the Standard Event Status register and clears it.

Query Syntax: \*ESR? Return Parameter: <NR1>

Query Example: \*ESR? Return status readings of Standard Event Status register.

Return Example: 48

\*IDN? Identification Query
Type: System interface

Description: This query requests the power supply to identify itself.

Query Syntax: \*IDN? Query Example: \*IDN?

String Description
CHROMA ATE Manufacturer
62180D-600 Model name
123456 Serial No.

01.00 Firmware version

Return Example: Chroma,62180D-600, 96218030123456,1.00

\*OPC Operation Complete Command

Type: Device status

Description: This command causes the interface to set the OPC bit (bit 0) of the

Standard Event Status register when the DC power supply has

completed all pending operations.

Syntax: \*OPC Parameter: None

\*OPC? Operation Complete Query

Type: Device status

Description: This query returns an ASCII "1" when all pending operations are

completed.

Query Syntax: \*OPC? Return Parameter: <NR1>

Query Example: 1

\*RCL Recall Instrument State Command

Type: Device status

Description: This command restores the High Slew Rate Load to a state that was

previously stored in memory with the \*SAV command to the specified

location (see \*SAV).

Syntax: \*RCL <NR1>

Parameter: None Example: \*RCL 1

\*RST Reset Command

Type: Device status
Description: Reset System

Syntax: \*RST Parameter: None

\*SAV Save Command Type: Device status

Description: This command stores the present state of the DC power supply and the

states of current mode in a specified location in memory.

Syntax: \*SAV Example: \*SAV

\*SRE Service Request Enable Command/Query

Type: Device status

Description: This command sets the condition of the Service Request Enable

register, which determines which events of the Status Byte register (see \*STB) are allowed to set the MSS (Master Status Summary) bit. A "1" in the bit position enable bits are logically ORed to cause Bit 6 (the Master Summary Status Bit) of the Status Byte register to be set. See Status

Byte register for detail description.

Syntax: \*SRE <NRf>
Parameter: 0 to 255

Example: \*SRE 20 Enable the CSUM and MAV bit of the Service Request.

Query Syntax: \*SRE? Return Parameter: <NR1>

Query Example: \*SRE? Return the current setting of Service Request Enable.

\*STB? Read Status Byte Query

Type: Device status

Description: This query reads the Status Byte register. Note that the MSS (Master

Summary Status) bit instead of RQS bit is returned in Bit 6. This bit indicates if the High Slew Rate Load has at least one reason for

requesting service. \*STB? does not clear the Status Byte register, which is cleared only when subsequent action has cleared all its set bits.

Query Syntax: \*STB? Return Parameter: <NR1>

Query Example: \*STB? Return the contents of Status Byte.

Return Example: 20



Status Byte Register:

The Status Byte Register is composed of eight bits that summarize an overlaying status data structure. The Status Byte Register can be read using \*STB? to return a decimal expression of the register contents (which means the total byte weight of all the byte set to "1".)

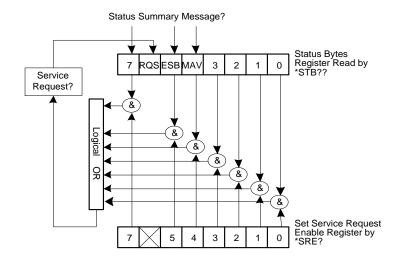


Figure 5-1

Table 5-6

Bit No.	Bit Weight	Description
7	128	Operation Status Register Summary Bit
6	64	Request Service Bit. This bit is set when any enabled bit of the Status Byte Register has been set, which indicates it has at least one reason for requesting service.
5	32	Standard Event Status Register Summary Bit.
4	16	Message Available Bit. This bit is set whenever there is data available in the output queue, and is reset when the available data is read.
3-0		Always 0.

### 2. Standard Event Status Register:

The Standard Event Status Register is frequently used. The common use commands \*ESE and \*ESR? can be utilized to program it.

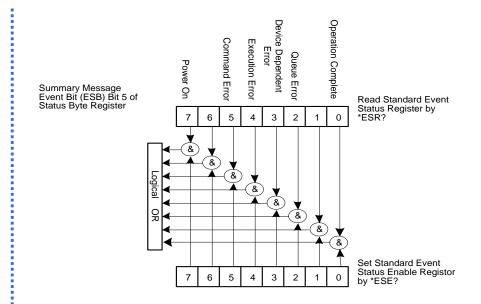


Figure 5-2

Table 5-7

Bit No.	Bit Weight	Description
7	128	Power on Bit. Reboot the power supply can set this bit to 1.
6		Always 0.
5	32	Command Error Bit. This bit is set to 1 if there is any IEEE 488.2 syntax error.
4		Execution Error Bit. This bit is set to 1 when the command parameter is out of valid range or inconsistent.
3	8	Device Dependent Error Bit. This bit is set to 1 when too many errors have occurred that the error queue is full.
2	4	Queue Error Bit. This bit is set to 1 when reading data from the output buffer and no data is present, or when the data is lost.
1		Always 0.
0	1	

# 5.6.2 Specific Commands for 62000D Series

## 5.6.2.1 Subsystem

**ABORt** 

Description: Sets all output state to "OFF".

Syntax: ABORt

### **5.6.2.2 CONFIGURE**

#### 1. CONFigure:BEEPer

Description: Sets the beeper to ON or OFF. Syntax: CONFigure:BEEPer <Arg>

Parameter: <Arg>: ON | OFF
Example: CONF:BEEPer ON
Query Syntax: CONFigure:BEEPer?

Return Parameter: ON | OFF

Query Example: CONFigure:BEEPer?

Return Example: ON

### 2. CONFigure:OUTPut

Description: Sets the output voltage/current. Syntax: CONFigure:OUTPut <Arg>

Parameter: <Arg>: ON | OFF
Example: CONFigure:OUTPut ON
Query Syntax: CONFigure:OUTPut?

Return Parameter: ON | OFF

Query Example: CONFigure:OUTPut?

Return Example: ON

### 3. CONFigure:FOLDback

Description: Sets the type of FOLDBACK PROTECT.

Syntax: CONFigure:FOLDback <Arg>

Parameter: <Arg>: DISABLE | CVTOCC | CCTOCV

Example: CONFigure:FOLD DISABLE

Query Syntax: CONFigure:FOLD?

Return Parameter: DISABLE | CVTOCC | CCTOCV

Query Example: CONFigure:FOLD?

Return Example: DISABLE

### 4. CONFigure:FOLDT

Description: Sets the delay time of FOLDBACK PROTECT.

Syntax: CONFigure:FOLDT <NRf+>
Parameter: 0.01~600.00 (Unit: Sec)
Example: CONF:FOLDT 10
Query Syntax: CONF:FOLDT?

Return Parameter: <NRf+>

Query Example: CONF:FOLDT? Return Example: 1.000000e+01

### 5. CONFigure: APGVSet

Description: Sets the action type of APG VSET.

Syntax: CONFigure:APGVSet <Arg>
Parameter: <Arg>: NONE | VREF10
Example: CONFigure:APGVSet VREF10

Query Syntax: CONFigure:APGVSet? Return Parameter: NONE | VREF10

Query Example: CONFigure:APGVSet?

Return Example: VREF10

### 6. CONFigure: APGVMeas

Description: Sets the action type of APG VMEAS.

Syntax: CONFigure:APGVMeas <Arg>
Parameter: <Arg>: NONE | VREF10

Example: CONFigure:APGVMeas VREF10

Query Syntax: CONFigure: APGVMeas?

Return Parameter: NONE | VREF10

Query Example: CONFigure:APGVMeas?

Return Example: VREF10

### 7. CONFigure: APGISet

Description: Sets the action type of APG ISET.

Syntax: CONFigure:APGISet <Arg>
Parameter: <Arg>: NONE | VREF10
Example: CONFigure:APGISet VREF10

Query Syntax: CONFigure:APGISet? Return Parameter: NONE | VREF10 CONFigure:APGISet?

Return Example: VREF10

Note: Before setting it, use SYST:MODE to switch to APG SOURCE ISET or APG LOAD

ISET.

### 8. CONFigure: APGIMeas

Description: Sets the action type of APG IMEAS.

Syntax: CONFigure:APGIMeas <Arg>
Parameter: <Arg>: NONE | VREF10

Example: CONFigure:APGIMeas VREF10

Query Syntax: CONFigure: APGIMeas?

Return Parameter: NONE | VREF10

Query Example: CONFigure: APGIMeas?

Return Example: VREF10

### 9. CONFigure: AVG: TIMES

Description: Sets the average times for measuring input voltage/current.

Syntax: CONFigure: AVG:TIMES < NR1>

Parameter: 0: 1 time

2 times
 4 times
 8 times

Example: CONFigure:AVG:TIMES 0
Query Syntax: CONFigure:AVG:TIMES?

Return Parameter: 1 | 2 | 4 | 8

Query Example: CONFigure: AVG:TIMES?

Return Example: 1

### 10. CONFigure:AVG:METHod

Description: Sets the average method for measuring input voltage/current.

Syntax: CONFigure:AVG:METHOD <Arg>

Parameter: <Arg>: FIX/MOV

Example: CONFigure:AVG:METHOD FIX Query Syntax: CONFigure:AVG:METHOD?

Return Parameter: FIX | MOV

Query Example: CONFigure:AVG:METHOD?

Return Example: FIX

### 11. CONFigure:BRIGhtness

Description: Sets the display brightness of panel.

Syntax: CONFigure:BRIGhtness <Arg>
Parameter: <Arg>: HIGH | NOR | DIM

Example: CONFigure:BRIGhtness HIGH

CONFigure:BRIGhtness Arg>

Query Syntax: CONFigure:BRIGhtness?

Return Parameter: HIGH | NOR | DIM

Query Example: CONFigure:BRIGhtness?

Return Example: HIGH

#### 12. CONFigure:MSTSLV:ID

Description: Sets the device to Master. This command is not required for the

Slave device.

Syntax: CONFigure:MSTSLV:ID <Arg>

Parameter: <Arg>: MASTER

Example: CONFigure:MSTSLV:ID MASTER

Query Syntax: CONFigure:MSTSLV:ID?

Return Parameter: MASTER | SLAVE1 | SLAVE2 | ...... | SLAVE9

Query Example: CONFigure:MSTSLV:ID?

Return Example: MASTER

Note CONFigure: MSTSLV? must be OFF when setting it. (Not in series/parallel mode.)

### 13. CONFigure: MSTSLV: PARSER

Description: Sets to series or parallel mode. Both Master and Slave need to be

set by this command.

Syntax: CONFigure:MSTSLV:PARSER <Arg>

Parameter: <Arg>: PARALLEL | SERIES

Example: CONFigure:MSTSLV:PARSER PARALLEL

Query Syntax: CONFigure:MSTSLV:PARSER?

Return Parameter: PARALLEL | SERIES

Query Example: CONFigure:MSTSLV:PARSER?

Return Example: PARALLEL

Note CONFigure: MSTSLV? must be OFF when setting it. (Not in series/parallel mode.)

### 14. CONFigure:MSTSLV:NUMSLV

Description: Sets the number of SLAVE to be controlled. This command is not

required for the Slave device.

Syntax: CONFigure:MSTSLV:NUMSLV <NR1>

Parameter: <NR1>

Example: CONFigure:MSTSLV:NUMSLV 1 Query Syntax: CONFigure:MSTSLV:NUMSLV?

Return Parameter: <NR1>

Query Example: CONFigure:MSTSLV:NUMSLV?

Return Example: 1

Note 1. CONFigure:MSTSLV? must be OFF when setting it. (Not in series/parallel mode.)

- 2. Only 1 slave can be set when in series mode and maximum 3 slaves can be set when in parallel mode.
- 3. Keypro is required for series connection, so be sure to connect it first in series mode. Release and remove the keypro when operating standalone or in parallel mode.

#### 15. CONFigure: MSTSLV: READY?

Description: Queries the Master/Slave connection status.

Syntax: CONFigure:MSTSLV:READY?

Return Parameter: ON | OFF | WAIT

Query Example: CONFigure:MSTSLV:READY?

Return Example: ON | OFF | WAIT

### 16. CONFigure: MSTSLV

Description: Executes the Master/Slave control.

Syntax: CONFigure:MSTSLV <Arg>

Parameter: <Arg>: ON | OFF

Example: CONFigure:MSTSLV ON

Query Syntax: CONF:MSTSLV?

Return Parameter: ON | OFF

Query Example: CONF:MSTSLV?

Return Example: ON

### **Note** 1. Set the following 3 command before controlling this function:

CONFigure:MSTSLV:ID

> ONFigure:MSTSLV:PARSER

➤ CONFigure:MSTSLV:NUMSLV

Use CONFigure:MSTSLV:READY? to query the connection status at present. If the status is WAIT, query again until the status is ON | OFF to perform this function.

2. When Program RUN is executed, series/parallel control is not available.

#### 17. CONFigure:INHibit

Description: Executes the Remote Inhibit control.

Syntax: CONFigure:INHibit <Arg>
Parameter: <Arg>: DISABLE | ENABLE
Example: CONFigure:INHibit DISABLE

Query Syntax: CONFigure:INHibit?
Return Parameter: DISABLE | ENABLE
Query Example: CONFigure:INHibit?

Return Example: DISABLE

### 18. CONFigure:INHibit:PULL

Description: Executes the Remote Inhibit input signal to enhance the

resistance control.

Syntax: CONFigure:INHibit:PULL <Arg>

Parameter: <Arg>: LOW | HIGH

Example: CONFigure:INHibit:PULL LOW Query Syntax: CONFigure:INHibit:PULL?

Return Parameter: LOW | HIGH

Query Example: CONFigure:INHibit:PULL?

Return Example: LOW

### 19. CONFigure:INTERLOCK

Description: Executes the Safety Interlock control.
Syntax: CONFigure:INTERLOCK <Arg>
Parameter: <Arg>: DISABLE | ENABLE

Example: CONFigure:INTERLOCK DISABLE

Query Syntax: CONFigure:INTERLOCK? Return Parameter: DISABLE | ENABLE

Query Example: CONFigure:INTERLOCK?

Return Example: DISABLE

### 20. CONFigure:INTERLOCK:PULL

Description: Executes the Safety Interlock input signal to enhance the

resistance control.

Syntax: CONFigure:INTERLOCK:PULL <Arg>

Parameter: <Arg>: LOW | HIGH

Example: CONFigure:INTERLOCK:PULL LOW Query Syntax: CONFigure:INTERLOCK:PULL?

Return Parameter: LOW | HIGH

Query Example: CONFigure:INTERLOCK:PULL?

Return Example: LOW

#### 21. CONFigure: EXTON

Description: Executes the External ON/OFF control.

Syntax: CONFigure:EXTON <Arg>
Parameter: <Arg>: DISABLE | ENABLE
Example: CONFigure:EXTON DISABLE

Query Syntax: CONFigure:EXTON? Return Parameter: DISABLE | ENABLE | CONFigure:EXTON?

Return Example: DISABLE

#### 22. CONFigure: EXTON:PULL

Description: Executes the External ON/OFF input signal to enhance the

resistance control

Syntax: CONFigure: EXTON:PULL <Arg>

Parameter: <Arg>: LOW | HIGH

Example: CONFigure: EXTON:PULL LOW Query Syntax: CONFigure: EXTON:PULL?

Return Parameter: LOW | HIGH

Query Example: CONFigure: EXTON:PULL?

Return Example: LOW

### 5.6.2.3 SOURCE Subsystem

### 1. SOURce:VOLTage

Description: Sets the output voltage.

Syntax: SOURce:VOLTage <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:VOLT 0.01 It sets the output voltage to 0.01 volt.

SOUR: VOLT 80.00 It sets the output voltage to 80.00 volt.

Query Syntax: SOUR:VOLT? [{MAX | MIN}]

Return Parameter: <NRf+> [Unit=Volt]

Query Example: SOUR:VOLT? It returns the voltage.

SOUR: VOLT? MAX It returns the max. voltage can be set.

Return Example: 8.000000e+01

### 2. SOURce:VOLTage:LIMit:{HIGH/LOW}

Description: Sets the output voltage range.

Syntax: SOURce:VOLTage:LIMIT:HIGH <NRf+>[suffix]

SOURce:VOLTage:LIMIT:LOW <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:VOLT:LIMIT:HIGH 60.0 It sets the output voltage range

to 60V maximum.

SOUR: VOLT: LIMIT: LOW 20.0 It sets the output voltage range

to 20V minimum.

Query Syntax: SOUR:VOLT:LIMIT:HIGH? [{MAX/MIN}]

SOUR: VOLT: LIMIT: LOW? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Volt]

Query Example: SOUR:VOLT:LIMIT:HIGH? It returns the voltage high limit.

SOUR: VOLT: LIMIT: HIGH? MAX It returns the max. voltage can

be set.

Return Example: 8.000000e+01

3. SOURce: VOLTage: PROTect: HIGH

Description: Sets the voltage range for over voltage protection.

Syntax: SOURce:VOLTage:PROTect:HIGH <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR: VOLT: PROT: HIGH 60.0 It sets the high limit to 60V for

voltage output protection.

Query Syntax: SOUR:VOLT:PROT:HIGH? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Volt]

Query Example: SOUR:VOLT:PROT:HIGH? It returns the high limit of

voltage protection.

SOUR: VOLT: PROT: HIGH? MAX It returns the max. over

voltage protection.

Return Example: 8.800000e+01

4. SOURce: VOLTage: SLEW

Description: Sets the rising or falling slew rate (volt/ms) of output voltage.

Syntax: SOURce:VOLTage:SLEW <NRf+>[suffix]
Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:VOLT:SLEW 0.01 It sets the output voltage slew rate

to 0.01 volt/ms.

SOUR: VOLT: SLEW 10 It sets the output voltage slew rate

to 10 volt/ms.

Query Syntax: SOUR:VOLT:SLEW? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Volt/ms]

Query Example: SOUR:VOLT:SLEW? It returns the voltage slew rate.

SOUR: VOLT: SLEW? MAX It return the max. voltage slew rate.

Return Example: 1.000000e+01

5. SOURce: CURRent

Description: Sets the output current (ampere).
Syntax: SOURce:CURRent <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:CURR 1 It sets the output current to 1 amps.

SOUR:CURR 60.00 It sets the output current to 60.00 amps.

Query Syntax: SOUR:CURR? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Amp]

Query Example: SOUR:CURR? It returns the current.

SOUR:CURR? MAX It returns the max. current can be set.

Return Example: 1.000000e+00

#### 6. SOURce:CURRent:LIMit:{HIGH/LOW}

Description: Sets the output current range.

Syntax: SOURce:CURRent:LIMIT:HIGH <NRf+>[suffix]

SOURce:CURRent:LIMIT:LOW <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:CURR:LIMIT:HIGH 60.0 It sets the output current

range to 60A maximum.

SOUR:CURR:LIMIT:LOW 20.0 It sets the output current

range to 20A minimum.

Query Syntax: SOUR:CURR:LIMIT:HIGH? [{MAX/MIN}]

SOUR:CURR:LIMIT:LOW? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Amp]

Query Example: SOUR:CURR:LIMIT:HIGH? It returns the current high

limit.

SOUR:CURR:LIMIT:HIGH? MAX It returns the max, current

can be set.

Return Example: 6.000000e+01

Note Source and Load current share this setting.

#### 7. SOURce:CURRent:PROTect:HIGH

Description: Sets the current range for over current protection.

Syntax: SOURce:CURRent:PROTect:HIGH <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:CURR:PROT:HIGH 60.0 It sets the high limit to 60A

for current output protection.

Query Syntax: SOUR:CURR:PROT:HIGH? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Amp]

Query Example: SOUR:CURR:PROT:HIGH? It returns the high limit of

current protection.

SOUR:CURR:PROT:HIGH? MAX It returns the max. over

current protection.

Return Example: 6.000000e+01

#### 8. SOURce:CURRent:SLEW

Description: Sets the rising or falling slew rate (amp/ms) of output current.

Syntax: SOURce:CURRent:SLEW <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:CURR:SLEW 0.01 It sets the output current slew

rate to 0.01 Amp/ms.

SOUR:CURR:SLEW 1.00 It sets the output current slew

rate to 1.00 Amp/ms.

Query Syntax: SOUR:CURR:LIMIT:HIGH? [{MAX/MIN}]

SOUR:CURR:LIMIT:LOW? [{MAX/MIN}]

Return Parameter: < NRf+> [Unit=Amp/ms]

Query Example: SOUR:CURR:SLEW? It returns the current slew rate.

SOUR:CURR:SLEW? MAX It returns the max. current slew

rate.

Return Example: 1.000000e+00

**Note** Source and Load current share this setting.

#### 9. SOURce:POWer

Sets the output power (watt). Description: SOURce:POWer <NRf+>[suffix] Syntax:

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:POW 1 It sets the output power to 1 watt.

SOUR:POW 60.00 It sets the output power to 60 watt.

Query Syntax: SOUR:POW? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Watt]

Query Example: SOUR:POW? It returns the power.

> SOUR:POW? MAX It returns the max. power can be set.

Return Example: 1.000000e+00

10. SOURce:POWer:LIMit:{HIGH/LOW}

Description: Sets the output power range.

Syntax: SOURce:POWer:LIMIT:HIGH <NRf+>[suffix]

SOURce:POWer:LIMIT:LOW <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

SOUR: POW:LIMIT:HIGH 60.0 Example: It sets the output power range

to 600V maximum

SOUR: POW:LIMIT:LOW 20.0 It sets the output power range to

200V minimum.

SOUR:POW:LIMIT:HIGH? [{MAX/MIN}] Query Syntax:

SOUR:POW:LIMIT:LOW? [{MAX/MIN}]

<NRf+> [Unit=Watt] Return Parameter:

SOUR: POW:LIMIT:HIGH? Query Example: It returns the power high limit.

> SOUR: POW:LIMIT:HIGH? MAX It returns the max. power can

> > be set.

Return Example: 8.000000e+01

**Note** Source and Load functions share this setting.

#### 11. SOURce:POWer:PROTect:HIGH

Description: Sets the power range for over power protection. SOURce:POWer:PROTect:HIGH <NRf+>[suffix] Syntax: Parameter: Refer to individual spec for valid numeric range.

SOUR:POW:PROT:HIGH 1260 It sets the high limit to Example:

1260W for power output

protection.

Query Syntax: SOUR:POW:PROT:HIGH? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Watt]

Query Example: SOUR:POW:PROT:HIGH? It returns the high limit of

power protection.

SOUR:POW:PROT:HIGH? MAX It returns the max. power

protect can be set.

Return Example: 1.260000e+03

#### 12. SOURce:DCON:{RISE/FALL}

Sets the DC\_ON signal active point. Description: Syntax: SOURce:DCON:RISE <NRf+>[suffix] SOURce:DCON:FALL <NRf+>[suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: SOUR:DCON:RISE 79.5 It sets the DC ON rise to

79.5V.

SOUR:DCON:FALL 0.5 It sets the DC\_ON fall to 0.5V.

Query Syntax: SOUR:DCON:RISE? [{MAX/MIN}] SOUR:DCON:FALL? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Watt]

Query Example: SOUR:DCON:RISE? It returns the setting.

Return Example: 7.950000e+01

**Note** The output must be OFF for setting.

## 5.6.2.4 LOAD Subsystem

1. LOAD: CURRent

Description: Sets the Load output current (ampere).

Syntax: LOAD:CURRent <NRf+>[ suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: LOAD:CURR 1 It sets the output current to 1 amps.

LOAD:CURR 60.00 It sets the output current to 60.00 amps.

Query Syntax: LOAD:CURR? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Amp]

Query Example: LOAD:CURR? It returns the current.

LOAD:CURR? MAX It returns the max. current can be set.

Return Example: 1.000000e+00

2. LOAD:CURRent:PROTect:HIGH

Description: Sets the current range for Load over current protection.

Syntax: LOAD:CURRent:PROTect:HIGH <NRf+>[ suffix] Parameter: Refer to individual spec for valid numeric range.

Example: LOAD:CURR:PROT:HIGH 60.0 It sets the high limit to 60A

for current output protection.

Query Syntax: LOAD:CURR:PROT:HIGH? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Amp]

Query Example: LOAD:CURR:PROT:HIGH? It returns the high limit of

current protection.

current protection..

Return Example: 6.000000e+01

3. LOAD:POWer

Description: Sets the Load power output (watt). Syntax: LOAD:POWer <NRf+>[ suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: LOAD:POW 1 It sets the output power to 1 watt.

LOAD:POW 60.00 It sets the output power to 60 watt.

Query Syntax: LOAD:POW? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Watt]

Query Example: LOAD:POW? It returns the power

LOAD:POW? MAX It returns the max. power can be

set.

Return Example: 1.000000e+00

4. LOAD:POWer:PROTect:HIGH

Description: Sets the power range for Load over power protection.

Syntax: LOAD:POWer:PROTect:HIGH < NRf+>[ suffix]

Parameter: Refer to individual spec for valid numeric range.

Example: LOAD:POW:PROT:HIGH 1260 It sets the high limit to

1260W for power output

protection.

Query Syntax: LOAD:POW:PROT:HIGH? [{MAX/MIN}]

Return Parameter: <NRf+> [Unit=Watt]

Query Example: LOAD:POW:PROT:HIGH? It returns the high limit of

power protection.

protect can be set.

Return Example: 1.260000e+03

## 5.6.2.5 FETCH Subsystem

1. FETCh:VOLTage?

Description: Measures the output of power supply and returns real time

voltage.

Query Syntax: FETCh:VOLTage? Return Parameter: <NRf+> [Unit=Volt]

Query Example: FETC:VOLT?
Return Example: 9.983100e+00

2. FETCh:CURRent?

Description: Measures the output of power supply and returns real time current

(with sign)...

Query Syntax: FETCh:CURRent?
Return Parameter: <NRf+> [Unit=Amp]

Query Example: FETC:CURR? Return Example: 2.000000e-04

3. FETCh:POWer?

Description: Measures the output of power supply and returns real time power

(with sign).

Query Syntax: FETCh:POWer?

Return Parameter: <NRf+> [Unit=Power]

Query Example: FETC:CURR? Return Example: 5.000000e+03

4. FETCh:STATus?

Description: Returns the status code of power supply's state.

Query Syntax: FETCh:STATus?

Return Parameter: <Arg1><,><Arg2><,><Arg3>

<Arg1>: return warning message 0~4294967295, 0: no warning,

use binary for the rest and identify the cause of error.

BIT 0	OVP	BIT 16	DD_PROTECT
BIT 1	SOCP	BIT 17	Inter Lock
BIT 2	SOPP	BIT 18	FPGA Fail
BIT 3	Remote Inhibit	BIT 19	Reserve
BIT 4	OTP	BIT 20	Security IC Error
BIT 5	FAN Lock	BIT 21	Machine ID Error

BIT 6	Calibration Error	BIT 22	System parameter Error
BIT 7	Reserve	BIT 23	Boot Up Initial Error
BIT 8	Reserve	BIT 24	FAN Start Up Error
BIT 9	Reserve	BIT 25	AD Number Error
BIT 10	Fold Back CV to CC	BIT 26	DD Number Error
BIT 11	Fold Back CC to CV	BIT 27	CD FPGA Number Error
BIT 12	LOCP	BIT 28	Keypro In/Out
BIT 13	LOPP	BIT 29	Reserve
BIT 14	UTP	BIT 30	Cascade Conn Error
BIT 15	AD_PROTECT	BIT 31	Slave Protect Alarm

<Arg2>: ON|OFF output status at present

<Arg3>: CV or CC status at present

Query Example: FETCh:STATus?

Return Example: 0,OFF,CV

## 5.6.2.6 MEASURE Subsystem

#### 1. MEASure:VOLTage?

Description: Returns the voltage measured at the output of power supply.

Query Syntax: MEASure:VOLTage?
Return Parameter: <NRf+> [Unit=Volt]
Query Example: MEAS:VOLT?
Return Example: 8.120000e+01

#### 2. MEASure:CURRent?

Description: Returns the current measured at the output of power supply (with

sign)..

Query Syntax: MEASure:CURRent?
Return Parameter: <NRf+> [Unit=Amp]
Query Example: MEAS: CURR?
3.150000e+01

#### 3. MEASure:POWer?

Description: Returns the power measured at the output of power supply (with

sign).

Query Syntax: MEASure: POWer?
Return Parameter: <NRf+> [Unit=Watt]
Query Example: MEAS: POWer?
Return Example: 5.000000e+03

## 5.6.2.7 PROGRAM Subsystem

#### 1. PROGram: MODE

Description: Sets the program output mode.

Syntax: PROGram:Mode <Arg>
Parameter: <Arg>: LIST | STEP
Example: PROGram:Mode STEP
Query Syntax: PROGram:Mode?

Return Parameter: LIST | STEP Query Example: PROG:MODE?

Return Example: STEP

2. PROGram:RUN

Description: Executes the program.
Syntax: PROGram:RUN <Arg>
Parameter: <Arg>: ON | OFF
Example: P PROG:RUN ON
Query Syntax: PROGram:RUN?

Return Parameter: ON | OFF

Query Example: PROGram:RUN?

Return Example: ON

3. PROGram:SAVE

Description: Saves the program. Syntax: PROGram:SAVE

Parameter: None

Example: PROG:SAVE

4. PROGram: SELected

Description: Sets the executed program no. in List mode.

Syntax: PROGram:SELected <NR1>

Parameter: 1到10

Example: PROG:SEL 10 Query Syntax: PROG:SEL?

Return Parameter: <NR1>

Query Example: PROG:SEL? It returns the program no. in use.

Return Example: 10

5. PROGram:LINK

Description: Links a program to another at the end of a List.

Syntax: PROGram:LINK <NR1>
Parameter: 0 to 10 (0 is not linked)

Example: PROG:LINK 7
Query Syntax: PROG:LINK?

Return Parameter: <NR1>

Query Example: PROG:LINK?

Return Example: 7

6. PROGram:COUNT

Description: Sets the number of times for the program file is to be executed in

List mode.

Syntax: PROGram:COUNT <NR1>

Parameter: 1 to 15000
Example: PROG:COUNT 7
Query Syntax: PROG:COUNT?

Return Parameter: <NR1>

Query Example: PROG:COUNT?

Return Example: 7

7. PROGram:PULL

Description: Executes the PROGRAM TRIGGER input signal to enhance the

resistance control in List.

Syntax: PROGram:PULL <ARG>
Parameter: <ARG>: LOW | HIGH
Example: PROGram:PULL LOW
Query Syntax: PROGram:PULL?
Return Parameter: LOW | HIGH
Query Example: PROGram:PULL?

Return Example: LOW

#### 8. PROGram:SEQuence:SELected

Description: Sets the execution sequence of a program in List mode.

Syntax: PROGram:SEQuence:SELected <NR1>
Parameter: 1 to the sequence no. of present program.

Example: PROG:SEQ:SEL 3

Query Syntax: PROGram:SEQuence:SELected? [{MAX/MIN}]

Return Parameter: <NR1>

Query Example: PROG:SEQ:SEL?

Return Example: 3

#### 9. PROGram:SEQuence:TYPE

Description: Sets the action type of a sequence in List mode.

Syntax: PROGram:SEQuence:TYPE <Arg>
Parameter: <Arg> AUTO | MANUAL | TRI | SKIP

Example: PROG:SEQ:TYPE AUTO Query Syntax: PROG:SEQ:TYPE?

Return Parameter: AUTO | MANUAL | EXT.TRIGGER | SKIP

Query Example: PROG:SEQ:TYPE?

Return Example: AUTO

#### 10. PROGram:SEQuence:VOLTage

Description: Sets the sequence for voltage output in List mode.

Syntax: PROGram:SEQuence:VOLTage <NRf+>

Parameter: <NRf+>

Example: PROG:SEQ:VOLT 40.5

Query Syntax: PROG:SEQ:VOLT? [{MAX/MIN}]

Return Parameter: <NRf+>

Query Example: PROG:SEQ:VOLT? Return Example: 4.050000e+01

#### 11. PROGram:SEQuence:VOLTage:SLEW

Description: Sets the sequence of voltage slew rate for output in List mode.

Syntax: PROGram:SEQuence:VOLTage:SLEW <NRf+>

Parameter: <NRf+>

Example: PROG:SEQ:VOLT:SLEW 1

Query Syntax: PROG:SEQ:VOLT:SLEW? [{MAX/MIN}]

Return Parameter: <NRf+>

Query Example: PROG:SEQ:VOLT:SLEW?

Return Example: 1.000000e+01

#### 12. PROGram:SEQuence:CURRent

Description: Sets the sequence for Source current output in List mode.

Syntax: PROGram:SEQuence:CURRent <NRf+>

Parameter: <NRf+>

Example: PROG:SEQ:CURR 45

Query Syntax: PROG:SEQ:CURR? [{MAX/MIN}]

Return Parameter: <NRf+>

Query Example: Return Example: PROG:SEQ:CURR? 4.500000e+01

#### 13. PROGram:SEQuence:CURRent:SLEW

Sets the sequence of current slew rate for the output in List mode. Description:

Syntax: PROGram:SEQuence:CURRent:SLEW < NRf+>

Parameter: <NRf+>

Example: PROG:SEQ:CURR:SLEW 1

Query Syntax: PROG:SEQ:CURR:SLEW? [{MAX/MIN}]

Return Parameter: <NRf+>

Query Example: PROG:SEQ:CURR:SLEW?

Return Example: 1.000000e+00

**Note** Source and Load current share this setting.

#### 14. PROGram: SEQuence: CURRent: LOAD

Description: Sets the sequence for Load current output in List mode.

PROGram:SEQuence:CURRent:LOAD <NRf+> Syntax:

Parameter: <NRf+>

Example: PROG:SEQ:CURR:LOAD 45

Query Syntax: PROG:SEQ:CURR:LOAD? [{MAX/MIN}]

Return Parameter: <NRf+>

PROG:SEQ:CURR:LOAD?

Query Example: Return Example: 4.500000e+01

#### 15. PROGram:SEQuence:TIME

Sets the duration of the sequence in List mode. Description:

Syntax: PROGram:SEQuence:TIME <NRf+>

Parameter: 0.001~15000 seconds Example: PROG:SEQ:TIME 10

Query Syntax: PROG:SEQ:TIME? [{MAX/MIN}]

Return Parameter: <NRf+>

Query Example: PROG:SEQ:TIME? Return Example: 1.000000e+01

#### 16. PROGram:CLEAR

Description: Clears all sequences from the program selected in List mode.

Syntax: PROGram:CLEAR

Parameter: None

Example: PROG:CLEAR

#### 17. PROGram: ADD

Description: Adds sequences to the program selected in List mode.

Syntax: PROGram: ADD < NR1>

Parameter: 1~100 (based on the remaining sequence no. for configuration)

PROG:ADD 15 Example:

Query Syntax: PROGram: ADD? (It returns the configurable sequence no.)

Return Parameter: <NR1>

Query Example: PROGram: ADD?

Return Example: 85 –it indicates the remaining no. is 85.

#### 18. PROGram: MAX?

Description: Queries the sequence amount of the program selected in List

mode.

Query Syntax: PROGram:MAX?

Return Parameter: None

Query Example: PROG:MAX?

Return Example: 2 –means there are two sequences under the present program.

#### 19. PROGram: SEQuence

Description: Sets the parameters of a single sequence in List mode.

Syntax: PROGram:SEQuence

<Arg1><,><Arg2><,><Arg3><,><Arg4><,><Arg5><,><Arg6><,><

Arg7>

Parameter: <Arg1>: Sequence TYPE (0:Auto, 1:Manual, 2:EXT.Trig, 3:Skip)

<Arg2>: Sequence Voltage (NRf+ unit: voltage)

<Arg3>: Sequence Voltage Slewrate (NRf+ unit: voltage) <Arg4>: Sequence Source Current (NRf+ unit: current)

<Arg5>: Sequence Current Slewrate (NRf+ unit: current), Source

and Load share this setting.)

<Arg6>: Sequence Load Current (NRf+ unit: current) <Arg7>: Sequence TIME (NRf+ unit: SEC, only valid when

Sequence Type is AUTO) (

Example: PROGram:SEQuence 0,80,10,15,1, 15,10

Query Syntax: PROG:SEQ?

Return Parameter: <arg1><,><arg2><,><arg3><,><arg4><,><arg5><,><arg6><,><ar

g7>

Same as the set sequence.

Query Example: PROG:SEQ?

Return Example: 0,8.000000e+01,1.000000e+01,1.500000e+01,1.000000e+00,0,

1.000000e+010,80,10,15,1,15,1

#### 20. PROGram:STEP:STARTV

Description: Sets the Step Mode start voltage for output.

Syntax: PROGram:STEP:STARTV <NRf+>

Parameter: <NRf+>

Example: PROGram:STEP:STARTV 20 Query Syntax: PROGram:STEP:STARTV?

Return Parameter: <NRf+>

Query Example: PROGram:STEP:STARTV?

Return Example: 2.000000e+01

#### 21. PROGram:STEP:ENDV

Description: Sets the Step Mode end voltage for output.

Syntax: PROGram:STEP:ENDV <NRf+>

Parameter: <NRf+>

Example: PROGram:STEP:ENDV 50 Query Syntax: PROGram:STEP:ENDV?

Return Parameter: <NRf+>

Query Example: PROGram:STEP:ENDV?

Return Example: 5.000000e+01

#### 22. PROGram:STEP:TIME

Description: Sets the execution time for Step Mode.

Syntax: PROGram:STEP:TIME <Arg1><,><Arg2><,><Arg3>

Parameter: <Arg1>: Hour (NR1) 0 ~ 99

<Arg2>: Minute (NR1) 0 ~ 59 <Arg3>: Second (NR1) 0 ~ 59.99

Example: PROG:SEQ:TIME 10

Query Syntax: PROG:SEQ:TIME? [{MAX/MIN}]

Return Parameter: <Arg1><,><Arg2><,><Arg3> same as the parameter.

Query Example: PROG:SEQ:TIME? Return Example: 1.000000e+01

### 5.6.2.8 SYSTEM Subsystem

#### 1. SYSTem:ERRor?

Description: Returns error message and code of power supply.

Query Syntax: SYSTem:ERRor?

Return Parameter: aard

Query Example: SYST:ERR?

Return Example: -203, "Data out of range"

#### Table 5-8

Code	Error Message	Code	Error Message
0	"No error"	-101	"Invalid character"
-102	"Syntax error"	-103	"Invalid separator"
-104	"Data type error"	-105	"GET not allowed"
-106	"Illegal parameter value"	-108	"Parameter not allowed"
-109	"Missing parameter"	-112	"Program mnemonic too long"
-113	"Undefined header"	-121	"Invalid character in number"
-123	"Numeric overflow"	-124	"Too many digits"
-131	"Invalid suffix"	-141	"Invalid character data"
-148	"Character data not allowed"	-151	"Invalid string data"
-158	"String data not allowed"	-202	"Setting conflict"
-203	"Data out of range"	-204	"Too much data"
-211	"Data stale"	-224	"Self-test failed"
-225	"Too many errors"	-226	"INTERRUPTED"
-227	"UNTERMINATED"	-228	"DEADLOCKED"
-229	"MEASURE ERROR"	-230	"Sequence overflow"
-231	"Sequence selected error"		_

#### 2. SYSTem:MODE

Description: Sets the Source/Load output mode of the system.

Syntax: SYSTem:MODE SOURCE-LOAD

SYSTem:MODE SOUR SYSTem:MODE LOAD

Parameter: SOURCE-LOAD | SOUR | LOAD Example: SYSTem:MODE SOURCE-LOAD

Query Syntax: SYSTem:MODE?

Return Parameter: Source&Load | Source | Load

Query Example: SYSTem:MODE? Return Example: Source&Load

#### SYSTem:VERSion:INTernal?

Description: Queries the Host version.

Query Syntax: SYSTem:VERSion:INTernal? [<Arg>]

Query Parameter: Arg: Select subsystem: 1~2, 1: DSP-CPU1, 2: DSP-CPU2

Query Example: SYSTem: VERSion: INTernal?

Return Example: MAIN:0.70,PLD:0.27,PCB:01,UI:0.57

#### 4. SYSTem:MODule:VERSion?

Description: Queries the module version.

Query Syntax: SYSTem:MODule:VERSion? <Arg1>[<,><Arg2>]

Query Parameter: Arg1: Module No.: 1~3

Arg2: Module No.: 1~2, 1: AD, 2: DD

Query Example: SYSTem:MODule:VERSion? 1,2

Return Example: MAIN:0.90,BOOT:0\_06,PLD:0.31,PCB:03

#### 5. SYSTem:DATE

Description: Sets the system date.

Syntax: SYSTem:DATE <Arg1>,<Arg2>,<Arg3>

Parameter: Arg1: Year (NR1)

Arg2: Month (NR1) Arg3: Day (NR1)

Example: SYSTem:DATE 2020,01,01

Query Syntax: SYSTem:DATE?

Return Parameter: <Arg1>,<Arg2>,<Arg3> same as the parameter.

Query Example: SYSTem:DATE? Return Example: 2020,01,01

#### 6. SYSTem:TIME

Example:

Description: Sets the system time.

Syntax: SYSTem:TIME <Arg1><,><Arg2><,><Arg3>

Parameter: <Arg1>: Hour (NR1)

<Arg2>: Minute (NR1) <Arg3>: Second (NR1) SYSTem:TIME 20,30,01

Query Syntax: SYSTem:TIME?

Return Parameter: <Arg1>,<Arg2>,<Arg3> same as the parameter.

Query Example: SYSTem:TIME?

Return Example: 20,30,01

#### 7. SYSTem:COMMunicate:CAN:CYClic:TIME

Description: Sets the CAN cycle time.

Syntax: SYSTem:COMMunicate:CAN:CYClic:TIME <NRf+>

Parameter: 0.001 to 3600

Example: SYSTem:COMMunicate:CAN:CYClic:TIME 1.001 Query Syntax: SYSTem:COMMunicate:CAN:CYClic:TIME?

Return Parameter: <NRf+>

Query Example: SYSTem:COMMunicate:CAN:CYClic:TIME?

Return Example: 1.001000e+00

#### 8. SYSTem:COMMunicate:CAN:CYClic:ID

Description: Sets the CAN cycle command ID.

Syntax: SYSTem:COMMunicate:CAN:CYClic:ID <NRf+>

Parameter: 11bit: 0 to 2047, 29bit: 0 to 536870911
Example: SYSTem:COMMunicate:CAN:CYClic:ID 10
Query Syntax: SYSTem:COMMunicate:CAN:CYClic:ID?

Return Parameter: <NR1>

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Query Example: Return Example: SYSTem:COMMunicate:CAN:CYClic:ID?

#### 9. SYSTem:COMMunicate:CAN:BAUD

Description: Sets the CAN baudrate

Syntax: SYSTem:COMMunicate:CAN:BAUD <NRf+>

Parameter:

Parameter	Baudrate	Parameter	Baudrate
0	10k	7	200k
1	20k	8	250k
2	40k	9	400k
3	50k	10	500k
4	80k	11	800k
5	100k	12	1000k
6	125k		

Example: SYSTem:COMMunicate:CAN:BAUD 12 Query Syntax: SYSTem:COMMunicate:CAN:BAUD?

Return Parameter: <NR1>

Query Example: SYSTem:COMMunicate:CAN:BAUD?

Return Example: 12

#### 10. SYSTem:COMMunicate:CAN:ID

Description: Sets the CAN ID.

Syntax: SYSTem:COMMunicate:CAN:ID <NR1>
Parameter: 11bit: 0 to 2047, 29bit: 0 to 536870911
Example: SYSTem:COMMunicate:CAN:ID 1024
Query Syntax: SYSTem:COMMunicate:CAN:ID?

Return Parameter: <NR1>

Query Example: SYSTem:COMMunicate:CAN:ID?

Return Example: 1024

#### 11. SYSTem:COMMunicate:CAN:MASK

Description: Sets the CAN ID mask.

Syntax: SYSTem:COMMunicate:CAN:MASK <NR1>
Parameter: 11bit: 0 to 2047, 29bit: 0 to 536870911
Example: SYSTem:COMMunicate:CAN:MASK 256
Query Syntax: SYSTem:COMMunicate:CAN:MASK?

Return Parameter: <NR1>

Query Example: SYSTem:COMMunicate:CAN:MASK?

Return Example: 256

#### 12. SYSTem:COMMunicate:CAN:MODE

Description: Sets the CAN 11 bit / 29 bit mode.

Syntax: SYSTem:COMMunicate:CAN:MODE <NR1>

Parameter: 0: 11bit, 1: 29bit

Example: SYSTem:COMMunicate:CAN:MODE 1
Query Syntax: SYSTem:COMMunicate:CAN:MODE?

Return Parameter: <NR1>

Query Example: SYSTem:COMMunicate:CAN:MODE?

Return Example: 1

#### 13. SYSTem:COMMunicate:CAN:PADding

Description: Sets the CAN padding function.

Syntax: SYSTem:COMMunicate:CAN:PADding <Arg>

Parameter: <Arg>: ENABLE | DISABLE

Example: SYSTem:COMMunicate:CAN:PADding ENABLE

Query Syntax: SYSTem:COMMunicate:CAN:PADding?

Return Parameter: ENABLE | DISABLE

Query Example: SYSTem:COMMunicate:CAN:MODE?

Return Example: ENABLE | DISABLE

#### 14. SYSTem:COMMunicate:CAN:SCPI:ID

Description: Sets the CAN SCPI ID.

Syntax: SYSTem:COMMunicate:CAN:SCPI:ID <NRf+>

Parameter: 11bit: 0 to 2047, 29bit: 0 to 536870911
Example: SYSTem:COMMunicate:CAN:SCPI:ID 1024
Query Syntax: SYSTem:COMMunicate:CAN:SCPI:ID?

Return Parameter: <NR1>

Query Example: SYSTem:COMMunicate:CAN:SCPI:ID?

Return Example: 1024

#### 15. SYSTem:COMMunicate:CAN:APPLY

Description: Updates the CAN setting.

Syntax: SYSTem:COMMunicate:CAN:APPLY

Parameter: None

Example: SYSTem:COMMunicate:CAN:APPLY Query Syntax: SYSTem:COMMunicate:CAN:APPLY?

Return Parameter: DONE | UNDONE

Query Example: SYSTem:COMMunicate:CAN:APPLY?

Return Example: DONE | UNDONE

#### 16. SYSTem:COMMunicate:GPIB:ADDRess

Description: Sets the GPIB address.

Syntax: SYSTem:COMMunicate:GPIB:ADDRess <NR1>

Parameter: 0~30

Example: SYSTem:COMMunicate:GPIB:ADDRess 5
Query Syntax: SYSTem:COMMunicate:GPIB:ADDRess?

Return Parameter: <NR1>

Query Example: SYSTem:COMMunicate:GPIB:ADDRess?

Return Example: 5

#### 17. SYSTem:COMMunicate:SOCK:DHCP

Description: Sets the Ethernet DHCP function.

Syntax: SYSTem:COMMunicate:SOCK:DHCP <Arg>

Parameter: <Arg>: ENABLE | DISABLE

Example: SYSTem:COMMunicate:SOCK:DHCP ENABLE

Query Syntax: SYSTem:COMMunicate:SOCK:DHCP?

Return Parameter: ENABLE | DISABLE

Query Example: SYSTem:COMMunicate:SOCK:DHCP?

Return Example: ENABLE | DISABLE

#### 18. SYSTem:COMMunicate:SOCK:GATEway

Description: Sets the Ethernet Gateway.

Syntax: SYSTem:COMMunicate:SOCK:GATEway <Arg>

Parameter: <Arg>: "255.255.255.0"

Example: SYSTem:COMMunicate:SOCK:GATEway "255.255.255.0"

Query Syntax: SYSTem:COMMunicate:SOCK:GATEway?

Return Parameter: "255.255.255.0"

Query Example: SYSTem:COMMunicate:SOCK:GATEway?

Return Example: "255.255.255.0"

#### 19. SYSTem:COMMunicate:SOCK:IP

Description: Sets the Ethernet IP.

Syntax: SYSTem:COMMunicate:SOCK:IP <Arg>

Parameter: <Arg>: "192.168.1.1"

Example: SYSTem:COMMunicate:SOCK:IP "192.168.1.1"

Query Syntax: SYSTem:COMMunicate:SOCK:IP?

Return Parameter: "192.168.1.1"

Query Example: SYSTem:COMMunicate:SOCK:IP?

Return Example: "192.168.1.1"

#### 20. SYSTem:COMMunicate:SOCK:MASK

Description: Sets the Ethernet IP Mask.

Syntax: SYSTem:COMMunicate:SOCK:MASK <Arg>

Parameter: <Arg>: "192.168.1.1"

Example: SYSTem:COMMunicate:SOCK:MASK "192.168.1.1"

Query Syntax: SYSTem:COMMunicate:SOCK:MASK?

Return Parameter: "192.168.1.1"

Query Example: SYSTem:COMMunicate:SOCK:MASK?

Return Example: "192.168.1.1"

#### 21. SYSTem:COMMunicate:SOCK:APPLY

Description: Updates the Ethernet setting.

Syntax: SYSTem:COMMunicate:SOCK:APPLY

Parameter: None

Example: SYSTem:COMMunicate:SOCK:APPLY Query Syntax: SYSTem:COMMunicate:SOCK:APPLY?

Return Parameter: DONE | UNDONE

Query Example: SYSTem:COMMunicate:SOCK:APPLY?

Return Example: DONE | UNDONE

# 5.6.2.9 INSTRUMENT Subsystem

#### 1. INSTrument:STATus:AD?

Description: Returns the AD module status.

Syntax: INSTrument:STATus:AD? <NR1>

Query Syntax: 1 | 2 | 3

Return Parameter:  $0 \sim 4294967295 (2^{32}-1)$ 

	•		
BIT 0	AD_VDC_OVP	BIT 16	DD_IO_REG_OCP
BIT 1	AD_VDC_UVP	BIT 17	AD_RLY_STARTFAIL
BIT 2	AD_VRS_OVP	BIT 18	AD_PWM_TOP_FAULT
BIT 3	AD_VTR_OVP	BIT 19	AD_PWM_BOT_FAULT
BIT 4	AD_VST_OVP	BIT 20	AD_AC_STARTFAIL
BIT 5	AD_VRS_UVP	BIT 21	AD_PFC_STARTFAIL
BIT 6	AD_VTR_UVP	BIT 22	AD_HARD_ERR
BIT 7	AD_VST_UVP	BIT 23	DD_VO_UVP_S
BIT 8	DD_VO_OVP_F	BIT 24	AD_MODEL_RES_ERR
BIT 9	DD_VO_UVP_F	BIT 25	DD_SHORT
BIT 10	AD_IR_OCP	BIT 26	AD_MEM_ERR
BIT 11	AD_IT_OCP	BIT 27	DD_LLC_STARTFAIL
BIT 12	AD_IS_OCP	BIT 28	AD_VAC_UBL
BIT 13	AD_Vd_OVP	BIT 29	DD_IP_OCP

BIT 14	DD_IO_SRC_OCP	BIT 30	AD_Vd_UVP
BIT 15	AD_OTP	BIT 31	AD_FRE_ERR

Query Example: INSTrument:STATus:AD? 1

Return Example: 4194304

#### **INSTrument:STATus:DD?**

Description: Returns the DD module status. Syntax: INSTrument:STATus:DD? <NR1>

Query Syntax:  $1 \mid 2 \mid 3$ Return Parameter:  $0 \sim 4294967295 (2^{32}-1)$ 

0 12010	5 · +25+307233 (Z · 1)				
BIT 0	OVP	BIT 16	Reserve		
BIT 1	SOCP	BIT 17	Reserve		
BIT 2	LOCP	BIT 18	Reserve		
BIT 3	IL_SHARE	BIT 19	Reserve		
BIT 4	SENSE_FAULT	BIT 20	Reserve		
BIT 5	MODULE_ERR	BIT 21	Reserve		
BIT 6	AD_ERR	BIT 22	Reserve		
BIT 7	OTP	BIT 23	Reserve		
BIT 8	HOST_SHUTDOWN	BIT 24	Reserve		
BIT 9	UTP	BIT 25	Reserve		
BIT 10	Reserve	BIT 26	Reserve		
BIT 11	MOS_SHORT	BIT 27	PWM_CH1_WARN		
BIT 12	HOST_SYNC	BIT 28	PWM_CH2_WARN		
BIT 13	DB_FAULT	BIT 29	PWM_CH3_WARN		
BIT 14	AUX_FAULT	BIT 30	CAN_ID_WARN		
BIT 15	Reserve	BIT 31	PCB_VER_WARN		

INSTrument:STATus:DD? 1

Query Example:

Return Example: 256

# 6. **Operation Theory**

# 6.1 Overview

The 62000D DC power supplies have AL, B, BD, CB, CD, CP, D, E, EA, EB, EC, EI, EL, F, G, H, IR, L, LC, LM, LQ, OC, OP, P, RP, SE, and the communication interface GPIB/CAN board (option). The instruments have a total of 27 internal circuit boards as follows:

No.	Board	Function	Model 62000D-100	Model 62000D-600
1	AL	3-phase AC input power	0	0
2	В	DC to DC voltage power	0	0
		board for output stage		
3	BD	DC to DC driver for output		©
4	СВ	Output measurement	0	©
		circuit board		
5	CD	DC to DC output digit	©	©
6	СР	board Input stage measurement	©	©
O	CF	circuit, module auxiliary		9
		power, and digital control		
		board		
7	D	System digital board	0	<b>O</b>
8	E	Input EMI filter	0	0
9	EA	Input EMI X capacitor	0	0
		board	_	_
10	EB	Surge absorber	©	0
11	EC	Input EMI Y capacitor	0	0
		board		
12	El	3-phase AC input	©	©
40	FI	connector		
13	EL_	EMI capacitor board	©	©
14	F	Input stage boost	©	©
15	G	capacitor board Screen display		©
16	H		<u> </u>	
16	П	Input stage boost inductor and rectifier output	©	©
		capacitor		
17	IR	Inrush inhibit circuit board	©	©
18	L	Output DC to DC inductor	©	©
		and rectifier capacitor		
19	LC	DC to DC output filter	0	0
		circuit board		
20	LM	Output inductor current	0	
		measurement circuit board		
21	LQ	Output capacitor board	©	
22	OC	Output EMI Y capacitor	©	
22	OD	board Output parallal baard		
23	OP	Output parallel board		0

24	Р	Input stage boost and high voltage DC to DC power component board	©	©
25	RP	Remote sense board	©	©
26	SE	Software security protection lock	©	©
27	GPIB/CAN (Option)	Communication interface GPIB or CAN board per customer's requirement	©	©

Figure 6-1 shows the system diagram of model 62180D-600 for example:

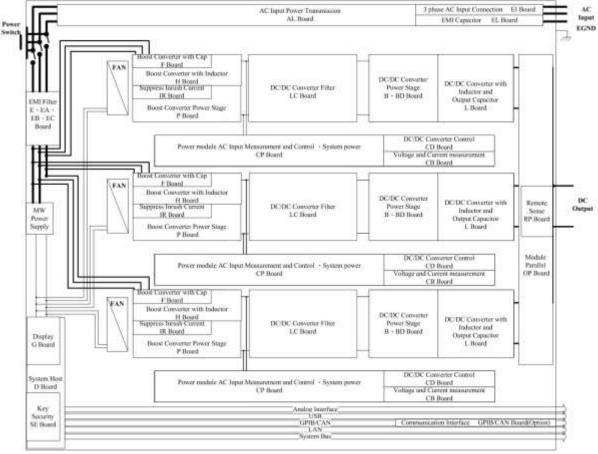


Figure 6-1

# 7. Self Test and Troubleshooting

# 7.1 Overview

Follow the actions described in this chapter to inspect the instrument and troubleshoot problems if the power supply is unable to operate normally. Please consult the Chroma or its sales agent if the information provided in this manual is unable to resolve the problem.

# 7.2 Troubleshooting

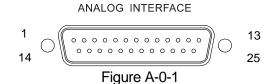
Operation problems and suggestions for resolution:

Problem	Cause	Resolution
Bad measurement for V, I	Feature swings due to aged	It needs calibration periodically.
	components.	See section 3.2.4.4 Calibration.
Output is not within	Feature swings due to aged	It needs calibration periodically.
Accuracy SPEC.	components.	See section 3.2.4.4 Calibration.
Over Temperature	1. The ambient temperature is	1. Operate the instrument within
Protection (OTP)	too high.	the temperature of 0 ~ 40°C.
	2. The vent is blocked.	2. Clear the vent.
Over Power Protection	1	Remove the over load or enlarge
(OPP)	spec.	the OPP settings.
Over Current Protection	The output current exceeds the	
(OCP)	spec. or OCP settings.	enlarge the OCP settings.
Fan Fail Protection (FAN	1. The fan is out of order.	Consult with your local sales
LOCK)	<ol><li>The feedback circuit is abnormal.</li></ol>	agent if it is unable to reset the protection state.
Input Error Protection 1	The voltage of AC input line is	Adjust the voltage if it exceeds
AC FAULT	either too low or too high.	the spec. when measuring the
ACTAGET	entiler too low or too riigii.	input voltage.
No output voltage	1. The output voltage feedback	
The surpur voltage	is abnormal.	agent if it is unable to reset the
	2. The D/D power stage is	protection state.
	damaged.	1
Over Voltage Protection	The output voltage exceeds	1. Check the OVP settings.
(OVP)	the spec. or OVP settings.	2. Consult with your local
		sales agent if it is unable to
		reset the protection state.
Unable to control DC	The address of DC power	<ol> <li>Update the address.</li> </ol>
power supply via GPIB	supply is incorrect.	Check the cable connection
	2. The GPIB cable is loose	and secure it with screws.
	and fallen at rear.	
D/D power stage error	1. The transient current is too	When D/D FAULT protection
protection (D/D FAULT)	big.	occurs, first turn off the
	2. The D/D power stage is	power supply and remove the
	damaged.	load. Also make sure cables
		are connected correctly and
		then power it on again.

Problem	Cause	Resolution
		Consult with your local sales agent for further assistance.
MATCH warning for incompatible models when connecting in series or parallel (ERROR!!! MASTER OR SLAVE NO MATCH)	The model numbers do not match.	1. The power supplies of different models are unable to be connected in series or parallel for use.  2. Consult with your local sales agent for further assistance.
FPGA UPDATE! version incompatible protection (FPGA IS TOO OLD,PLS UPDATE!)	The power supply's FPGA does not match with the F/W.	Consult with your local sales agent for further assistance.

# Appendix A Analog Interface Pin Assignments

The 25-pin connector is located at rear panel as Figure A-0-1 shows:



Pin No.	Pin Definition	Pin No.	Pin Definition
1	DCOUT_ON	14	FAULT
2	DC_ON_ST	15	PROG_TRIG
3	INTERLOCK	16	DPG_GND
4	DO1	17	DO2
5	N.C.	18	DI1
6	DI2	19	DPG_GND
7	KEYPRO	20	N.C.
8	AIO_S_SET_V	21	AVO_SET_V
9	AIO_L_SET_V	22	APG_GND
10	AIO_MEAS_V	23	N.C.
11	N.C.	24	APG_GND
12	AVO_MEAS_V	25	N.C.
13	N.C.		

- (1) PIN 1: DCOUT\_ON, when the output voltage exceeds VDC\_R, the DCOUT\_ON will turn to HIGH. When the DC power supply output voltage is lower than the VDC\_F setting, the DCOUT\_ON will turn to LOW.
- (2) PIN 2: DC\_ON\_ST, when DC ON, it outputs signal to trigger TTL Level to Active High.
- (3) PIN 3: INTERLOCK, this function allows users to control the power supply for temporary OFF, see section 3.2.3.4.4 for detail description.
- (4) PIN 4: DO1, this pin is HIGH when in CV mode and LOW when in CC mode.
- (5) PIN 5: N.C.
- (6) PIN 6: DI2, it provides External Load ON/OFF function for you to control it. If DI1 and DI2 are set to External Load ON/OFF, both signals need to be HIGH to set the Load OFF and on the contrary, both signals need to be LOW to set the Load ON.
- (7) PIN 7: KEYPRO, it is the foolproof mechanism for series/parallel hardware connection (KEYPRO), 0: Series, 1: Standalone and parallel.
- (8) PIN 8: AIO\_S\_SET\_V, Source current setting only that allows you to set in "voltage form" with input voltage range from 0 to 10V, see section 3.2.4.1.1 APG for detail information
- (9) PIN 9: AIO\_L\_SET\_V, Load current setting only that allows you to set in "voltage form" with input voltage range from 0 to 10V, see section 3.2.4.1.1 APG for detail information.
- (10) PIN 10: AIO\_MEAS\_V, current measurement only that allows you to set in "voltage form" with input voltage range from -10V to 10V, see section 3.2.4.1.1 APG for detail information.
- (11) PIN 11: N.C.

- (12) PIN 12: AVO\_MEAS\_V, voltage measurement only that allows you to set in "voltage form" with input voltage range from 0V to 10V, see section 3.2.4.1.1 APG for detail information.
- (13) PIN 13: N.C.
- (14) PIN 14: FAULT, the signals include output over voltage, output over current, output over power and FOLDBACK, over temperature, fan failure, and input over voltage or input under voltage protection; TTL: Active Low.
- (15) PIN 15: PROG\_TRIG, the external trigger signal (negative edge trigger) in program editing mode.
- (16) PIN 16: DPG GND, digital signal for grounding.
- (17) PIN 17: DO2, over temperature protection signal. TTL: Active Low.
- (18) PIN 18: DI1, it provides External Load ON/OFF function for you to control it. If DI1 and DI2 are set to External Load ON/OFF, both signals need to be HIGH to set the Load OFF and on the contrary, both signals need to be LOW to set the Load ON. When DI1 (or DI2) is set to Remote Inhibit and Low, all channels in FRAME are Load OFF and a REMOTE INHIBIT protection message will appear. This protection is not cleared even if the DI1 (or DI2) is High, thus Load ON is unable to be executed. DI1 and DI2 are communication control and the action time must less than 5ms.
- (19) PIN 19: DPG \_GND, digital signal for grounding.
- (20) PIN 20: N.C.
- (21) PIN 21: AVO\_SET\_V, voltage setting only that allows you to set in "voltage form" with input voltage range from 0 to 10V, see section 3.2.4.1.1 APG for detail information.
- (22) PIN 22: APG \_GND, analog signal for grounding.
- (23) PIN 23: N.C.
- (24) PIN 24: APG \_GND, analog signal for grounding.
- (25) PIN 25: N.C.

# **Appendix B** List of Protection

Follow the protections described in this appendix to inspect the instrument and troubleshoot any problems if the 62000D DC power supply is unable to operate normally. Please consult Chroma or the sales agent if the information provided in this manual is unable to resolve the problem.

The table below lists the system protection:

Message on Panel	Protection	Possible Cause	Troubleshooting
OVP(*)	Means the output voltage exceeds the voltage set on the user protection interface.	The voltage set on protection interface is lower than the output voltage. (The maximum voltage can be set is Vmaxx1.1.)	Check the protection interface voltage setting.
SOCP(*)	Means the output current in Source Mode exceeds the current set on the user protection interface.	1	Check the protection interface current setting.
SOPP(*)	Means the output power in Source Mode exceeds the power set on the user protection interface.	The power set on protection interface is lower than the output power. (The maximum power can be set is Pmax×1.05.)	Check the protection interface power setting.
OTP(*)	Means the internal temperature of the whole device is too high.	<ol> <li>The operating environment temperature is over the limit.</li> <li>The module component is abnormal.</li> <li>The circuit detection is malfunction.</li> </ol>	<ol> <li>Eliminate the ambient overheating problem.</li> <li>Check the abnormal phase power component and replace it.</li> <li>Check the abnormal fan circuit board and sensing wire, and replace them.</li> </ol>
FAN Lock(*)	Means the detected fan speed is abnormal.(Latch)	<ol> <li>The fan is not connected.</li> <li>The fan power is abnormal or damaged.</li> <li>The fan is blocked by foreign object.</li> </ol>	<ol> <li>Make sure the fan is correctly connected.</li> <li>Make sure the fan is normal and not damaged.</li> <li>Make sure there is no foreign</li> </ol>

			object blocking the fan.
Fold Back CV to CC(*)	Means the CV to CC transition time exceeds the protection time set by the user.	The protection time setting is lower than the CV to CC transition time (setting time range: 0.01~600.00 sec.)	Check the CV to CC transition time setting.
Fold Back CC to CV (*)	Means the CC to CV transition time exceeds the protection time set by the user.	The protection time setting is lower than the CV to CC transition time (setting time range: 0.01~600.00 sec.)	Check the CV to CC transition time setting.
LOCP(*)	Means the input current in Regen Mode exceeds the current set on the user protection interface.	protection interface	Check the protection interface current setting.
LOPP(*)	Means the input power in Regen Mode exceeds the power set on the user protection interface.	The power set on protection interface is lower than the output power. (The maximum power can be set is Pmax×1.05.)	Check the protection interface power setting.
UTP(*)	Means the internal temperature of the whole device is too low.	<ol> <li>The operating environment temperature is under the limit.</li> <li>The module component is abnormal.</li> <li>The circuit detection is malfunction.</li> </ol>	<ol> <li>Eliminate the ambient temperature too low problem.</li> <li>Check the abnormal phase power component and replace it.</li> <li>Check the abnormal fan circuit board and sensing wire, and replace them.</li> </ol>
AD PROTECT(*)	Means the AC/DC and DC/DC (front) modules are abnormal and notify the system.	The AC/DC and DC/DC (front) module will notify the system for the alarm.	Check and replace the AC/DC and DC/DC (front) module boards where the protection occurred.
DD PROTECT(*)	Means the DC/DC (rear) module is abnormal and notifies the system.	The DC/DC (rear) module will notify the system for the alarm.	Check and replace the DC/DC (rear) module board where the protection occurred.

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Inter Lock(*)	39	ANALOG INPUT Interlock triggers the device	Check if the external ANALOG INPUT Interlock triggers the
FPGA_Fail(*)	protection.  Means the device power-on initialization of communication is abnormal.	The control board component of the system device is abnormal.	device protection.  Check and replace the device system control board.
Security IC Error(*)	Means that an error is occurred during security IC identification.	The Security IC version is not correct.	Check if the correct Security IC version is correct.
Machine ID Error(*)	Means the identification of model name (number of modules) is wrong.		<ol> <li>Check the firmware in Security IC version.</li> <li>Check if the Security IC is fallen off.</li> <li>Check if the Security IC is broken.</li> </ol>
System parameter Error(*)	Means the device power-on initialization is abnormal when reading the data.	<ol> <li>The firmware in Security IC version is wrong.</li> <li>The system control board is abnormal.</li> </ol>	<ol> <li>Check the firmware in Security IC version.</li> <li>Check and replace the system control board.</li> </ol>
Boot Up Initial Error(*)	Means the device initialization process is abnormal.	<ol> <li>The burned in Security IC version is wrong.</li> <li>The system control board is abnormal.</li> </ol>	<ol> <li>Check the firmware in Security IC version.</li> <li>Check and replace the system control board.</li> </ol>
AD Number Error(*)	Means the AC/DC and DC/DC (front) modules cannot be identified.	<ol> <li>The comm.         cable of AC/DC         and DC/DC         (front) module         control board is         fallen off.</li> <li>The control         board of AC/DC         and DC/DC         (front) module is         abnormal.</li> </ol>	1. Check if the comm. cable of AC/DC and DC/DC (front) module control board is fallen off.  2. Check and replace the control board of AC/DC and DC/DC (front) module.
DD Number Error (*)	Means the DC/DC (rear) module cannot be recognized.	The comm.     cable of DC/DC     (rear) module     control board is	Check if the comm. cable of DC/DC (rear) module control

		fallen off.  2. The control board DC/DC (rear) module is abnormal.	board is fallen off.  2. Check and replace the control board of DC/DC (rear) module.
CD FPGA Number Error(*)	Means the DC/DC (rear) module cannot be recognized.	(rear) module control board is fallen off.	<ol> <li>Check if the comm. cable of DC/DC (rear) module control board is fallen off.</li> <li>Check if the control board of DC/DC (rear) module is damaged.</li> </ol>
Cascade Conn Error(*)	Means the connection of multiple devices failed due to unable to recognize.	The comm. cable used for connecting multiple devices is wrong or fallen off.	Check if the connecting comm. Cable is wrong or fallen off.
Slave Protect Alarm(*)	Means the connected multiple Slave devices are warning the Master.	A Slave warning status is applied to multiple devices.	Check the Slave warning status.
Keypro In/Out(*)	Means the keypro for series connection has been re-plugged after rebooted.	This fixture is fallen off or unplugged during power on causing the protection.	Power off and remove the keypro, or re-plug the keypro and reboot the device.

The table below lists the protections of front stage module:

Message	Protection	Possible Cause	Troubleshooting
AD_OTP(*)	It occurs when the internal temperature of AC/DC or DC/DC (front) power module is too high.(Latch)	<ol> <li>The operating environment temperature is over.</li> <li>The module power switch is abnormal.</li> <li>The circuit detection is malfunction.</li> </ol>	<ol> <li>Eliminate the ambient overheating problem.</li> <li>Check the abnormal phase power module and replace it.</li> <li>Check the abnormal fan circuit board and sensing wire, and replace them.</li> </ol>
AD_VRS_OVP(*) AD_VTR_OVP(*) AD_VST_OVP(*)	Means the line transient input voltage of AD/DC module is over the specification. (Latch)	<ol> <li>The input power is abnormal.</li> <li>The AC/DC module measurement circuit is abnormal.</li> </ol>	<ol> <li>Check if the input power meets the rated value.</li> <li>Check and replace the AC/DC module board that has protection</li> </ol>

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	Moone the line	1 The inner name:	occurred.
AD_VRS_UVP(*) AD_VTR_UVP(*) AD_VST_UVP(*)	Means the line transient input voltage of AD/DC module is under the specification. (Latch)	<ol> <li>The input power is abnormal.</li> <li>The AC/DC module input fuse is broken.</li> <li>The AC/DC module measurement circuit is abnormal.</li> </ol>	<ol> <li>Check if the input power meets the rated value.</li> <li>Measure the AC/DC module input fuse and replace it.</li> <li>Check and replace the AC/DC module board that has protection occurred.</li> </ol>
AD_VAC_UBL(*)	Means the line input of the AD/DC module is unbalanced or phase loss. (Latch)	is connected wrong (the line voltage difference is 10%).  2. The input power is disconnected (phase loss).  3. The AC/DC module fuse is damaged.  4. The measurement circuit of AC/DC module is abnormal.	protection occurred.
AD_FRE_ERR(*)	Means the line input frequency of the AD/DC module is out of specification. (Latch)		frequency exceeds the range. (47Hz- 63Hz)
AD_AC_STARTFAIL(*)	conditions and the DC BUS rectified voltage is out of specification. (Latch)	<ol> <li>The input power is connected wrong.</li> <li>The input power is disconnected.</li> <li>The AC/DC module fuse is damaged.</li> <li>The measurement circuit of AC/DC module is abnormal.</li> <li>The drive signal of AC/DC module relay is abnormal or the relay is damaged.</li> <li>The PWM drive signal of AC/DC module is damaged.</li> </ol>	power meets the rated value.  2. Measure the AC/DC module fuse and replace it.  3. Check and replace the AC/DC module board that has

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AD_PFC_STARTFAIL(*)	Means the start of AD/DC module is failed and the DC BUS voltage is out of specification.(Latch)	1.	abnormal. The AC/DC power component is abnormal or damaged. The measurement circuit of AC/DC module is abnormal. The drive signal of AC/DC module relay is abnormal or the relay is damaged. The PWM drive signal of AC/DC module is abnormal. The AC/DC power component is	2.	Check if the input power meets the rated value. Measure the AC/DC module fuse and replace it. Check and replace the AC/DC module board that has protection occurred.
			abnormal or damaged.		
AD_MODEL_RES_ERR(*)	Means the output terminal of the AD/DC module cannot be identified as a Buck or Inverter module. (Latch)		The GPIO pins are abnormal. The hardware resistor is dropped or printed wrong.		Check and replace the AC/DC module board that has protection occurred.
AD_IR_OCP(*) AD_IT_OCP(*) AD_IS_OCP(*)	Means the transient input current of the AD/DC line is over the limit. (Latch)		The output transient power is too high (input line current is higher than 14Arms, 18kW; 12Arms, 12kW) The measurement circuit of AC/DC module is abnormal.	2.	Remove the UUT and check if the operation is correct. Check and replace the AC/DC module board that has protection occurred.
AD_VDC_OVP(*)	Means the DC BUS transient voltage of the AD/DC module is over the specification. (Latch)		The output transient power is too high (the VDC is over 850V that has protection occurred.) (Regen Mode) The measurement circuit of AC/DC module is abnormal.	2.	Remove the UUT and check if the operation is correct. Check and replace the AC/DC module board that has protection occurred.
AD_VDC_UVP(*)	Means the internal DC BUS transient voltage of the AD/DC		The output transient power is too high (the VDC	1.	Remove the UUT and check if the operation is

	module is under the specification. (Latch)	is under 720V that has protection occurred.) (Source Mode) 2. The measurement circuit of AC/DC module is abnormal. 3. The drive signal of AC/DC module relay is abnormal or the relay is damaged. 4. The PWM drive signal of AC/DC module is abnormal. 5. The AC/DC power
	Means the input	component is abnormal or damaged.
AD_Vd_UVP(*)	Means the input voltage amplitude of the AD/DC module is under the specification. (Latch)	module fuse is 2. Measure the
AD_Vd_OVP(*)	over the specification. (Latch)	2. The measurement circuit of AC/DC module is abnormal.  2. Measure the AC/DC module fuse and replace it.  3. Check and replace the AC/DC module board that has protection occurred.
AD_PWM_TOP_FAULT(*)	Means the internal power components of AD/DC module are shorted. (Latch)	The top power component on the AC/DC module is abnormal or damaged.  1. Remove the UUT and check if the operation is correct.  2. Check and

	Means the internal	The bottom power	replace the
	power components	component on the	AC/DC module
AD_PWM_BOT_FAULT(*)	of AD/DC module	AC/DC module is	board that has
	are shorted. (Latch)	abnormal or	protection
		damaged.	occurred.
	The front stage	1. One of the AC/DC	1. Check and
	module in the device	modules in the	replace the
	has triggered a	device has	AC/DC module
	protection. This	protection	board that has
	message is used to	occurred.	protection
AD_HARD_ERR(*)	stop the normal	2. A certain AC/DC	occurred.
	module from output.	module message	
	(Latch)	or measured	
		value cannot be	
		found in the	
		device.	
	Means the DSP	The AC/DC module	Check and replace
AD_MEM_ERR(*)	memory on AC/DC	digital board DSP	the digital board.
)	module digital board	memory is abnormal.	
	is abnormal. (Latch)	4	4 5 4 1115
	Means the start of	1. The measurement	
	DC/DC (front)	circuit of the	and check if the
	module is failed, and	DC/DC (front) module is	operation is
	the DC BUS voltage		correct. 2. Check and
	is out of		
	specification. (Latch)	signal of DC/DC	replace the AC/DC module
DD_LLC_STARTFAIL(*)		(front) module is	board that has
DD_LLC_STARTT AIL( )		abnormal.	protection
		3. The power	occurred.
		components of	occurred.
		DC/DC (front)	
		module are	
		abnormal or	
		damaged.	
	Means the primary	1. The LC board is	Check if the LC
	side transient of	unlocked or not	board is fully
	DC/DC module has	secured.	locked.
	over current. (Latch)	2. The output	<ol><li>Check if the AD</li></ol>
	, ,	terminal of the	module output or
		DC/DC module is	the back-end
DD_SHORT(*)		shorted.	UUT is shorted.
		3. The top and	3. Measure if the
		bottom leg of	MOS switch of
		secondary side	the DC/DC
		switch on DC/DC	module is
		module are	broken.
ļ	Manage district	shorted.	4. Damasis (k. 1997)
	Means the internal	1. The output	1. Remove the UUT
DD ID 000(*)	transient of DC/DC	transient power is	and check if the
DD_IP_OCP(*)	(front) module has	too high (the IO	operation is
	over current.(Latch)	module is over	correct.
		51A peak that has	z. Check and

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		protection occurred.) (Source/Regen Mode) 2. The measurement circuit of the DC/DC (front) module is abnormal. 3. The PWM drive signal of DC/DC (front) module is abnormal. 4. The power components of DC/DC (front) module are abnormal or damaged.	replace the DC/DC (front) module board that has protection occurred.
DD_IO_SRC_OCP(*)	Means the internal transient of DC/DC (front) module has over current.(Latch)	1. The output transient power is too high (the IO module is over 12Arms, 18kW; 7.5A, 12kW that has protection occurred.) (Source Mode)  2. The measurement circuit of the DC/DC (front) module is abnormal.  3. The power components of DC/DC (front) module are abnormal or damaged.	1. Remove the UUT and check if the operation is correct. 2. Check and replace the DC/DC (front) module board that has protection occurred.
DD_IO_REG_OCP(*)	Means the internal transient of DC/DC (front) module has over current.(Latch)	1. The output transient power is too high (the IO module is over 10Arms, 18kW; 7A, 12kW that has protection occurred.) (Regen Mode) 2. The measurement circuit of the DC/DC (front) module is abnormal.	<ol> <li>Remove the UUT and check if the operation is correct.</li> <li>Check and replace the DC/DC (front) module board that has protection occurred.</li> </ol>

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		3. The power components of DC/DC (front) module are abnormal or damaged.	
DD_VO_OVP_F(*)	Means the DC BUS transient voltage of DC/DC (front) module is over the specification. (Latch)	<ol> <li>The output transient power is too high (the DC BUS is over 900V that has protection occurred.) (Regen Mode)</li> <li>The measurement circuit of the AC/DC module is abnormal.</li> </ol>	replace the DC/DC (front) module board that has protection occurred.
DD_VO_UVP_S(*)	Means the DC BUS transient voltage of DC/DC (front) module is under the specification. (Latch)	1. The transient power of DC/DC module is too high (the DC BUS is under 651V that	<ol> <li>Remove the UUT and check if the operation is correct.</li> <li>Check and</li> </ol>
DD_VO_UVP_F(*)	Means the DC BUS transient voltage of DC/DC (front) module is under the specification. (Latch)	has protection occurred.) (Source mode) 2. The measurement circuit of the DC/DC module is abnormal. 3. The drive signal of DC/DC module relay is abnormal or the relay is damaged. 4. The PWM drive signal of DC/DC module is abnormal. 5. The power components of DC/DC (front) module are abnormal or damaged.	replace the DC/DC module board that has protection occurred.

The table below lists the protections of rear stage module:

Message	Protection	Possible Cause	Troubleshooting
OVP(*)	Means the output voltage of the DD/DC (rear) module circuit is over the specification.	The power components of the DC/DC (rear)	Check if the output active load meets the rated value.     Check and

	Means the Source		damaged. The measurement circuit of the DC/DC (rear) module is abnormal. The output	1.	replace the DC/DC (rear) module board that has protection occurred.  Remove the UUT
SOCP(*)	Mode output current of the DC/DC (rear) module is over the limit.		current is too high (protection occurs when the module current is over 44A.) (Source Mode) The measurement circuit of the DC/DC (rear) module is abnormal.		and check if the operation is correct. Check and replace the DC/DC (rear) module board that has protection occurred.
LOCP(*)	Means the Regen Mode input current of the DC/DC (rear) module is over the limit.		The input current is too high (protection occurs when the module current is over 44A.). (Regen Mode) The measurement circuit of the DC/DC (rear) module is abnormal.		Remove the UUT and check if the operation is correct. Check and replace the DC/DC (rear) module board that has protection occurred.
IL_SHARE(*)	Means the current flow in the DC/DC (rear) module is uneven.		The difference between the measured current the DC/DC (rear) module is 5A The measurement circuit of the DC/DC (rear) module is abnormal.	2.	Remove the UUT and check if the operation is correct. Check and replace the DC/DC (rear) module board that has protection occurred.
SENSE_FAULT(*)	Means the output voltage of the DC/DC (rear) module is detected abnormally.	2.	The DC/DC (rear) module output voltage sense is reversed. It occurs when the load line loss is over 30V. The measurement circuit of the DC/DC (rear) module is abnormal.	2.	Remove the UUT and confirm if the voltage sense wiring of output terminal is correct. Check if the load line loss is over the limit. Check and replace the DC/DC (rear)

			module board that has protection
MODULE_ERR(*)	Means the model identification of DC/DC module is abnormal.	<ol> <li>The GPIO pin is abnormal.</li> <li>The hardware resistor is dropped or printed wrong.</li> </ol>	occurred. Check and replace the DC/DC (rear) module board that has protection occurred.
AD_ERR(*)	Means the AC/DC and DC/DC (front) modules are abnormal, and notify the DC/DC (rear) module	The AC/DC and DC/DC (front) module will notify the DC/DC (rear) module if there is any alarm.	Check and replace the AC/DC and DC/DC (front) module board that has protection occurred.
OTP(*)	Means the internal temperature of the power component in DC/DC (rear) module is too high.	The operating environment temperature is over the	<ol> <li>Eliminate the ambient temperature too high problem.</li> <li>Check and replace the abnormal power components.</li> <li>Check the abnormal fan circuit board and sensing wire, and replace them.</li> </ol>
UTP(*)	Means the internal temperature of the power component in DC/DC (rear) module is too low.	<ol> <li>The operating environment temperature is under the temperature limit.</li> <li>The module component is abnormal.</li> <li>It detects circuit malfunction.</li> </ol>	<ol> <li>Eliminate the ambient temperature too low problem.</li> <li>Check and replace the abnormal power components.</li> <li>Check the abnormal fan circuit board and sensing wire, and replace them.</li> </ol>
MOS_SHORT(*)	Means the PWM output signal of the DC/DC (rear) module is abnormal.	The DSP components output abnormal PWM signals.     FPGA detects circuit malfunction	Check and replace the DC/DC (rear) module board that has protection occurred.
HOST_SYNC(*)	Means one of the modules connected to multiple devices alarmed.	The power component of a certain module phase is abnormal or damaged.      The module	Check and replace the module that has protection occurred.

		detects abnormal circuit.	
DB_FAULT(*) PWM_CH1_WARN PWM_CH2_WARN PWM_CH3_WARN	The internal power components of the DC/DC (rear) module are short-circuited.	1. The power component of a certain phase in the DC/DC module is abnormal or damaged.  2. The power component of a certain phase in the DC/DC module detects over current analog.	1. Remove the UUT and check if the operation is correct. 2. Check and replace the DC/DC (rear) module board that has protection occurred.
AUX_FAULT(*)	Means the auxiliary power of the DC/DC (rear) module is abnormally low.	<ol> <li>The circuit detection function is abnormal.</li> <li>The auxiliary power of the DC/DC (rear) module is abnormally low.</li> </ol>	Check and replace the DC/DC (rear) module board that has protection occurred.



The protection message is marked \_F(FAST) and \_S(SLOW) by transient and steady state.

The protection point varies by the measurement error, thus protection circuits may act before reaching the protection point set. DC/DC module is divided into DC/DC(front) module and DC/DC (rear) module.



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