Chroma

High Power Electronic Load

63200A Series

Operation and Programming Manual

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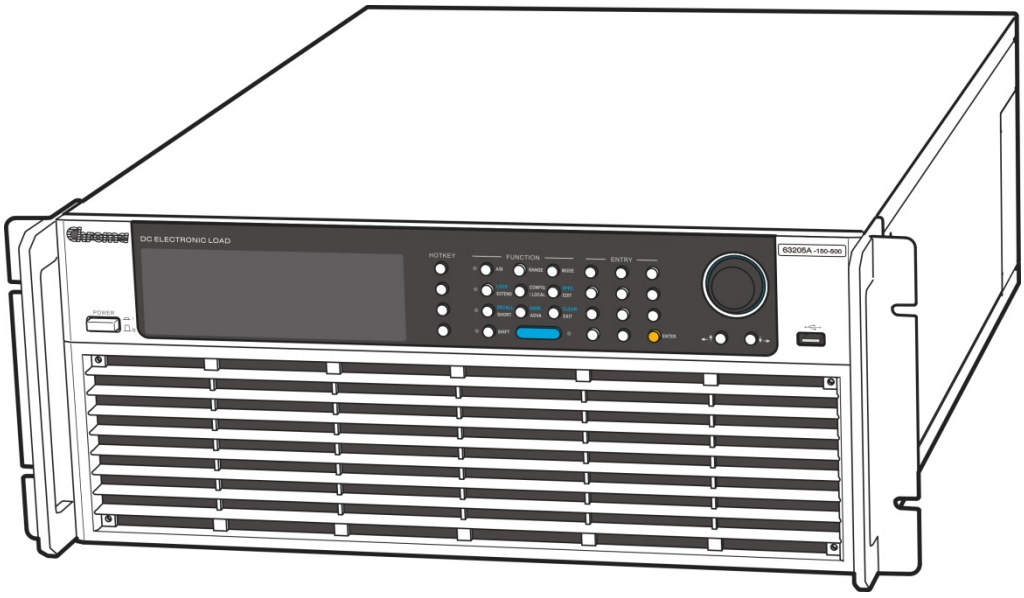

Version 1.9
March 2019

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CHROMA ATE INC.
66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

Warranty

All of Chroma's instruments are warranted against defects in material and workmanship for a period of one year from date of shipment. Chroma agrees to repair or replace any assembly or component found to be defective, under normal use during this period. Chroma's obligation under this warranty is limited solely to repairing any such instrument, which in Chroma's sole opinion proves to be defective within the scope of the warranty when returned to the factory or to an authorized service center. Purchaser is responsible for the shipping and cost of the service item to Chroma factory or service center. Shipment should not be made without prior authorization by Chroma.

This warranty does not apply to any products repaired or altered by persons not authorized by Chroma, or not in accordance with instructions furnished by Chroma. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

Chroma assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. High voltage used in some instruments may be dangerous if misused. Special disclaimers apply to these instruments. Chroma assumes no liability for secondary charges or consequential damages and in any event, Chroma's liability for breach of warranty under any contract or otherwise, shall not exceed the purchase price of the specific instrument shipped and against which a claim is made.

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66 Huaya 1st Road, Guishan,
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e-mail: info@chromaate.com
http://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 1>**.


: See **<Table 2>**.

<Table 1>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls/ Polybromodiphenyl Ethers	Selected Phthalates Group
	Pb	Hg	Cd	Cr^{6+}	PBB/PBDE	DEHP/BBP/DBP/DIBP
PCBA	O	O	O	O	O	O
CHASSIS	O	O	O	O	O	O
ACCESSORY	O	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

“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 and EU Directive 2011/65/EU.

“×” indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU Directive 2011/65/EU.

Remarks: The CE marking on product is a declaration of product compliance with EU Directive 2011/65/EU.

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 well-being. 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.

<Table 2>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls/ Polybromodiphenyl Ethers	Selected Phthalates Group
	Pb	Hg	Cd	Cr^{6+}	PBB/PBDE	DEHP/BBP/DBP/DIBP
PCBA	×	O	O	O	O	O
CHASSIS	×	O	O	O	O	O
ACCESSORY	×	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

"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 and EU Directive 2011/65/EU..

"×" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU Directive 2011/65/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.

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 well-being. 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.

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Declaration of Conformity

For the following equipment :

Programmable DC Electronic Load

(Product Name/ Trade Name)

63203A-150-300, 63203A-600-210, 63203A-1200-120, 63202A-150-200, 63202A-600-140, 63202A-1200-80, 63203E-150-300, 63203E-600-210, 63203E-1200-120, 63202E-150-200, 63202E-600-140, 63202E-1200-80

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

66 Huaya 1st Road, Guishan, Taoyuan 33383, 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 61000-3-2:2014, EN 61000-3-3:2013

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, EN 61000-4-6:2014, EN 61000-4-8:2010, EN 61000-4-11:2004

EN 61010-1:2010 and EN 61010-2-030:2010

The equipment describe above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 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)

66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

(Position/Title)

Taiwan	**2017.02.21**	Vincent Wu
(Place)	(Date)	(Legal Signature)

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Declaration of Conformity

For the following equipment :

DC Electronic Load

(Product Name/ Trade Name)

63204A-150-400, 63205A-150-500, 63206A-150-600, 63204E-150-400, 63205E-150-500, 63206E-150-600, 63206A-60-1000, 63204A-60-1000

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

66 Huaya 1st Road, Guishan, Taoyuan 33383, 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, EN 61326-2-1:2013, EN 61000-3-2:2014 Class A, EN 61000-3-3:2013

EN 55011:2009+A1:2010, Group 1,Class A, EN 61000-4-2:2009/ IEC 61000-4-2:2008 ED.2.0

EN 61000-4-3:2006+A1:2008+A2:2010/ IEC 61000-4-3:2010 ED.3.2

EN 61000-4-4:2012/ IEC 61000-4-4:2012 ED.3.0

EN 61000-4-5:2014+A1:2017/ IEC 61000-4-5:2014+A1:2017 ED.3.0

EN 61000-4-6:2014+AC:2015/ IEC 61000-4-6:2013 ED.4.0

EN 61000-4-8:2010/ IEC 61000-4-8:2009 ED.2.0

EN 61000-4-11:2004+A1:2017/ IEC 61000-4-11:2004+A1:2017 ED.2.0

EN 61010-1:2010 and EN 61010-2-030:2010

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66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

(Position/Title)

Taiwan	**2019.02.13**	Vincent Wu
(Place)	(Date)	(Legal Signature)

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Declaration of Conformity

For the following equipment :

High Power DC Electronic Load

(Product Name/ Trade Name)

63204A-600-280, 63205A-600-350, 63206A-600-420, 63204A-1200-160, 63205A-1200-200, 63206A-1200-240, 63204E-600-280, 63205E-600-350, 63206E-600-420, 63204E-1200-160, 63205E-1200-200, 63206E-1200-240

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

66 Huaya 1st Road, Guishan, Taoyuan 33383, 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, EN 61326-2-2:2013, EN 61000-3-2:2014 Class A, EN 61000-3-3:2013

EN 55011:2009+A1:2010,Group 1,Class A, EN 61000-4-2:2009/IEC 61000-4-2:2008 ED 2.0

EN 61000-4-3:2006+A1:2008+A2:2010/IEC 61000-4-3:2010 ED 3.2,

EN 61000-4-4:2012/IEC 61000-4-4:2012 ED 3.0, EN 61000-4-5:2006/IEC 61000-4-5:2005 ED 2.0

EN 61000-4-6:2014/IEC 61000-4-6:2013 ED 4.0, EN 61000-4-8:2010/IEC 61000-4-8:2009 ED 2.0

EN 61000-4-11:2004/IEC 61000-4-11:2004 ED 2.0

EN 61010-1:2010 and EN 61010-2-030:2010

The equipment describe above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 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)

66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

(Position/Title)

Taiwan	**2017.02.21**	Vincent Wu
(Place)	(Date)	(Legal Signature)

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CE

Declaration of Conformity

For the following equipment :

Programmable DC Electronic Load

(Product Name/Trade Name)

63208A-150-800, 63210A-150-1000, 63212A-150-1200, 63215A-150-1500, 63218A-150-1800, 63220A-150-2000, 63224A-150-2000, 63208A-600-560, 63210A-600-700, 63212A-600-840, 63215A-600-1050, 63218A-600-1260, 63220A-600-1400, 63224A-600-1680, 63208A-1200-320, 63210A-1200-400, 63212A-1200-480, 63215A-1200-600, 63218A-1200-720, 63220A-1200-800, 63224A-1200-960, A632009, A632010

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

66 Huaya 1st Road, Guishan, Taoyuan 33383, 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 61000-3-2:2014, EN 61000-3-3:2013

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, EN 61000-4-6:2014, EN 61000-4-8:2010, EN 61000-4-11:2004

EN 61010-1:2010 and EN 61010-2-030:2010

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66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

(Position/Title)

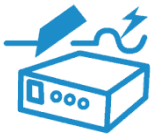
Taiwan	2018.04.09	Vincent Wu
(Place)	(Date)	(Legal Signature)

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.

Safety Symbols

	**DANGER –** High voltage.
	**Explanation:** To avoid injury, death of personnel, or damage to the instrument, the operator must refer to the explanation in the instruction manual.
	**High temperature:** This symbol indicates the temperature is hazardous to human beings. Do not touch it to avoid any personal injury.
	**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.
	**Functional grounding:** 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.
	**Frame or chassis:** To identify a frame or chassis terminal.
	**Alternating Current (AC)**
	**Direct Current (DC) / Alternating Current (AC)**
	**Direct Current (DC)**
	**Push-on/Push-off power switch**
	The **WARNING** sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury to, or death of, personnel or long term health hazards.
	The **CAUTION** sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of, equipment.
	The **Notice** 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
Mar. 2015	1.0	Complete this manual.
Oct. 2015	1.1	Add specifications and related descriptions for new model 63204A-150-400. Update the notices of model specifications and descriptions of Ethernet interface.
Apr. 2016	1.2	Add specifications and related descriptions for new models 63203A and 63224A series. Modify 63204A~63206A slew rate specifications Add dimension diagrams for models 63203A and 63224A series. Update accessories list. Add installation notices and load connection description for model 63224A. Add "*Effect of Wiring Electronic Load*" section in "*Installation*" chapter.
Sep. 2016	1.3	Add specifications, dimensions, load connections and standard accessories list for model 63212A and 63218A. Add specifications for EXT_WAVE BW and OTP. Add description for Voff. Update commands. Update *CE Declaration of Conformity* (63203A~63224A, total 33 models). Add parallel function. Add descriptions for warnings. Add new accessory icon and quantity (connector cover).
Mar. 2017	1.4	Update "*Material Contents Declaration*". Update CE "*Declaration of Conformity*". Modify the following sections: – "*Specifications*" in "*Overview*" chapter. – "*Inspection*" in "*Installation*" chapter. – "*Front Panel*", "*Setting Remote Communication Interface*" and "*Warnings*" in "*Operation Overview*" chapter. – "*PROGRAM Subsystem*" in "*Remote Operation*" chapter. – "*Performance Tests*" in "*Verification*" chapter. Modify the figures in *Appendix A* "*Precautions for Loading Battery*".
Jun. 2017	1.5	Modify the "*Program mode"* in the 63200A Series System Specifications. Delete the CR mode BW and CV mode BW in "Ext Wave" under the 63200A Series System Specifications. Modify the spec values of Current and Resistance subsystem. Add current accuracy spec to "*Dynamic mode*". Modify notice 3 in "*Specifications*" section. Modify caution in "*Precautions during Installation*" section. Add Ethernet connection speed to "*Setting Remote Communication Interface*" section. Modify the accessory icon and list in "*Inspection*" section.
Dec. 2017	1.6	Modify the following sections: – "*Features*" and "*Specifications*" in "Overview" chapter. – "*Inspection*" in "*Installation*" chapter.

		– "*Parallel & Sync.*", "*Setting Remote Communication Interface*", "*CCD Mode*", "*OCP and OPP*", "*CZ Mode*" and "*UDW (User Defined Waveform)*" in "*Operation Overview*" chapter. – "*Common Commands*", "*MODE Subsystem*" and "*CONFIGURE Subsystem*" in "*Remote Operation*" chapter. Add the following sections: – "*MPPT (Maximum Power Point Tracking)*" to "*Operation Overview*" chapter. – "*TIMING Subsystem*" to "*Remote Operation*" chapter. – "*Appendix B Parallel Procedure and Example*"
Apr. 2018	1.7	Modify the following sections in "*Operation Overview*" chapter: – "*DIGITIAL IO*" – "*Measurement*" – "*Parallel & Sync.*" – "Constant Voltage Mode" – "*BATT (Battery Discharge Timer)*" – "*SWD (Sine Wave Dynamic)*" – "*OCP and OPP*" – "*SWP (CC Dynamic Sweep)*" – "*CVCC*" – "*CVCR*" – "*Auto Mode*" Add the following: – *CE Declaration of Conformity* for models A632009 and A632010 – Specifications, dimensions, load connection and standard package list of model A632009 and A632010 – "*Using UDW Mode*" and "*Using Program Mode*" two appendixes
Sep. 2018	1.8	Update "*Specifications*" section in "*Overview*" chapter.
Mar. 2019	1.9	Add specifications for new model 63206A-60-1000. Add CAN BUS related description.

Table of Contents

1. Overview

1.1 Introduction

This manual describes the specifications, installation, and programming of 63200A Series High Power Electronic Loads.

1.2 Description

The functions of 63200A Series Electronic Loads are the same except the input voltage, load current and operable power. All models can be operated under basic and advanced loading modes.

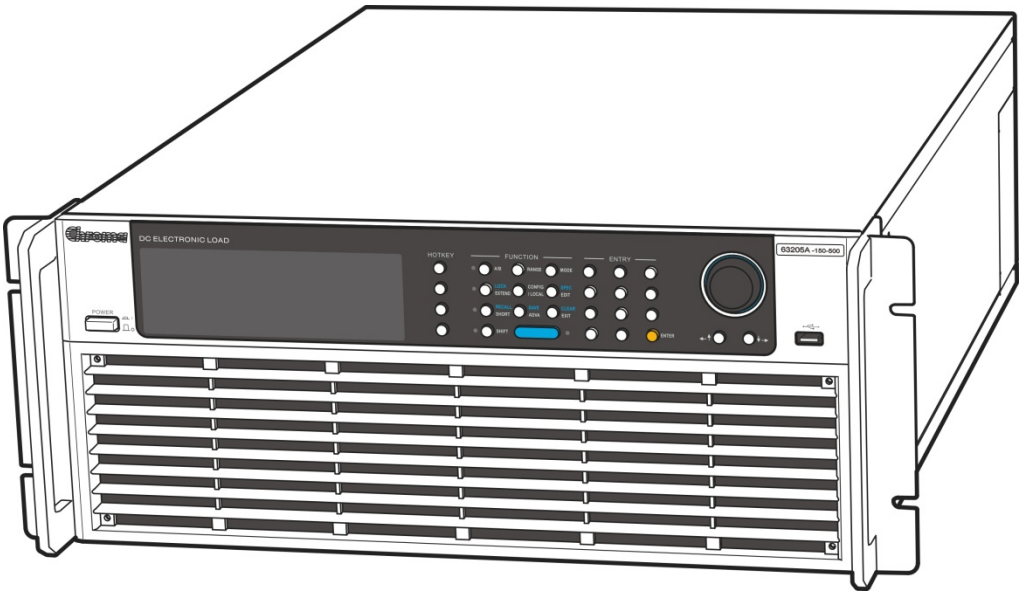


Figure 1-1 63205A-150-500 DC Electronic Load

1.3 Features

- CC (Constant Current), CR (Constant Resistance), CV (Constant Voltage), CP (Constant Power), CCD (Constant Current Dynamic) and CRD (Constant Resistance Dynamic) operating modes.
- Programmable slew rate, load levels, load periods and conduct voltage (Von).
- Programmable dynamic loading with speed up to 50kHz (limited by Minimum Rise Time.)
- Minimum input resistance, allows load to sink high current even with low input voltage (see SPEC.)
- Selective voltage and current ranges.
- Remote sensing capability.
- 255 sets of memories to save/recall user-definable setups.
- 10 sets of programs to link files for automatic test.
- A/D converter with precision measurement.
- Short circuit simulation.

- Master/Slave parallel control mode, allow synchronous load control under static and dynamic loading mode.
- Automatic GO/NG inspection to examine if the UUT is within spec.
- Protection for over voltage, over current, overpower and over temperature along with reverse polarity warning.
- Front panel keys for local operation.
- Smart fan with temperature control to reduce the noise.
- Remote PC control via GPIB, USB, LAN or CAN BUS.
- Isolated voltage and current to monitor the waveform output.
- Isolated external Vdc reference input to control the Load current.

1.4 Specifications

Electronic Load

Model	**63206A-60-1000**
Voltage*[2]	0-60V
Current	0-1,000A
Power*[3]	6kW
Min. operating Voltage*[4]	0.6V @ 1,000A
Constant Current	
Range	100 / 500 / 1,000 A
Resolution	1 / 5 / 10 mA
Accuracy	0.05%+0.05%F.S.
Constant Voltage	
Range	6 / 30 / 60 V
Resolution	0.1 / 0.1 / 0.5 mV
Accuracy	0.025%+0.025%F.S.
Constant Resistance	
Range	1.2mΩ-12Ω (6V/6kW) 4.8mΩ-48Ω (30V/6kW) 0.12Ω-240Ω (60V/6kW)
Accuracy*[5]	Vin/Rset*(0.2%)+0.5% IF.S.
Constant Power	
Range	600 / 3,000 / 6,000W
Resolution	20 / 100 / 200 mW
Accuracy	0.2%+0.2%F.S.
Dynamic mode	
Timing	
T1 & T2	0.020-99.999ms/100ms-99999ms
Resolution	1μs/1ms
Accuracy	1μs+100ppm
Slew Rate	1mA/μs-2A/μs
	5mA/μs-10A/μs
	10mA/μs-20A/μs
Resolution	1 / 5 / 10 mA/μs
Accuracy	5% ± 10μs
Min. Rise Time*[7]	20μs (Typical)
Current	

Accuracy	0.2%F.S.
Other	
Input Capacity	8μF+0.417Ω(15W)

Model	**63202A-150-200**	**63203A-150-300**	**63204A-150-400**
Voltage*[2]	0-150V		
Current	0-200A	0-300A	0-400A
Power*[3]	2kW	3kW	4kW
Min. operating Voltage*[4]	1.8V @200A	1.8V @ 300A	1.8V @ 400A
Constant Current			
Range	20 / 100 / 200 A	30 / 150 / 300 A	40 / 200 / 400 A
Resolution	0.2 / 1 / 2 mA	0.2 / 1 / 2 mA	0.4 / 2 / 4 mA
Accuracy	0.05%+0.05%F.S.		
Constant Voltage			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	15mΩ-150Ω (16V) 60mΩ-600Ω (80V) 1.5Ω-3000Ω (150V)	10mΩ-100Ω (16V) 40mΩ-400Ω (80V) 1Ω-2000Ω (150V)	7.5mΩ-75Ω (16V) 30mΩ-300Ω (80V) 0.75Ω-1.5kΩ (150V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	200 / 1000 / 2000W	300 / 1500 / 3000W	400 / 2000 / 4000 W
Resolution	5 / 20 / 50 mW	5 / 20 / 50 mW	10 / 50 / 100 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.2mA/μs-2A/μs	0.2mA/μs-3A/μs	0.5mA/μs-4A/μs
	1mA/μs-7A/μs	1mA/μs-10.5A/μs	2mA/μs-14A/μs
	2mA/μs-14A/μs	2mA/μs-21A/μs	5mA/μs-28A/μs
Resolution	0.2/ 1/ 2 mA/μs	0.2/ 1/ 2 mA/μs	0.4/ 2/ 4 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[7]	10μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	4μF+0.42Ω(7W)	6μF+0.28Ω(7W)	8μF+0.21Ω(15W)

Model	**63205A-150-500**	**63206A-150-600**	**63208A-150-800**
Voltage*[2]	0-150V		
Current	0-500A	0-600A	0-800A
Power*[3]	5kW	6kW	8kW
Min. operating Voltage*[4]	1.8V @ 500A	1.8V @ 600A	1.8V @ 800A
Constant Current			
Range	50 / 250 / 500 A	60 / 300 / 600 A	80 / 400 / 800 A

Resolution	0.5 / 2 / 5 mA	0.5 / 2 / 5 mA	1 / 5 / 10 mA
Accuracy	0.05%+0.05%F.S.		
Constant Voltage			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	5mΩ-50Ω (16V) 20mΩ-200Ω (80V) 0.5Ω-1kΩ (150V)	5mΩ-50Ω (16V) 20mΩ-200Ω (80V) 0.5Ω-1kΩ (150V)	3.8mΩ-37.5Ω (16V) 15mΩ-150Ω (80V) 0.375Ω-750Ω (150V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	500 / 2500 / 5000 W	600 / 3000 / 6000 W	800 / 4000 / 8000 W
Resolution	10 / 50 / 100 mW	10 / 50 / 100 mW	20 / 100 / 200 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.5mA/μs-5A/μs	0.5mA/μs-6A/μs	1mA/μs-8A/μs
	2mA/μs-17.5A/μs	2mA/μs-21A/μs	5mA/μs-24A/μs
	5mA/μs-35A/μs	5mA/μs-42A/μs	10mA/μs-48A/μs
Resolution	0.5 / 2 / 5 mA/μs	0.5 / 2 / 5 mA/μs	1 / 5 / 10 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[7]	10μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	12μF+0.14Ω(15W)	12μF+0.14Ω(15W)	16μF+0.105Ω(30W)

Model	**63210A-150-1000**	**63212A-150-1200**	**63215A-150-1500**
Voltage*[2]	0-150V		
Current	0-1000A	0-1200A	0-1500A
Power*[3]	10kW	12kW	15kW
Min. operating Voltage*[4]	1.8V @ 1000A	1.8V @ 1200A	1.8V @ 1500A
Constant Current			
Range	100 / 500 / 1000 A	120 / 600 / 1200 A	150 / 750 / 1500 A
Resolution	1 / 5 / 10 mA	1 / 5 / 10 mA	2 / 10 / 20 mA
Accuracy	0.05%+0.05F.S.		
Constant Voltage			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	2.5mΩ-25Ω (16V) 10mΩ-100Ω (80V) 0.25Ω-500Ω (150V)	2.5mΩ-25Ω (16V) 10mΩ-100Ω (80V) 0.25Ω-500Ω (150V)	1.7mΩ-16.67Ω (16V) 6.7mΩ-66.67Ω (80V) 0.167Ω-333.34Ω (150V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		

Constant Power			
Range	1000 /5000 / 10000 W	1200 / 6000 / 12000 W	1500 / 7500 / 15000 W
Resolution	20 / 100 / 200 mW	20 / 100 / 200 mW	40 / 200 / 400 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	1mA/μs-10A/μs	1mA/μs-12A/μs	2mA/μs-15A/μs
	5mA/μs-27.5A/μs	5mA/μs-30A/μs	10mA/μs-32A/μs
	10mA/μs-55A/μs	10mA/μs-60A/μs	20mA/μs-64A/μs
Resolution	1 / 5 / 10 mA/μs	1 / 5 / 10 mA/μs	2 / 10/ 20 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[7]	10μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	20μF+0.084Ω(30W)	24μF+0.07Ω(30W)	32μF+0.056Ω(45W)

Model	**63218A-150-1800**	**63220A-150-2000**	**63224A-150-2000**
Voltage*[2]	0-150V		
Current	0-1800A	0-2000A	0-2000A
Power*[3]	18kW	20kW	24kW
Min. operating Voltage*[4]	1.8V @ 1800A	1.8V @ 2000A	1.8V @ 2000A
Constant Current			
Range	180 / 900 / 1800 A	200 / 1000 / 2000 A	200 / 1000 / 2000 A
Resolution	2 / 10 / 20mA	2 / 10 / 20 mA	2 / 10 / 20 mA
Accuracy	0.05%+0.05%F.S.		
Constant Voltage			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	1.7mΩ-16.67Ω (16V) 6.7mΩ-66.67Ω (80V) 0.167Ω-333.34Ω (150V)	1.3mΩ-12.5Ω (16V) 5mΩ-50Ω (80V) 0.125Ω-250Ω (150V)	1.3mΩ-12.5Ω (16V) 5mΩ-50Ω (80V) 0.125Ω-250Ω (150V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	1800 / 9000 / 18000 W	2000 / 10000 / 20000 W	2400 / 12000 / 24000 W
Resolution	40 / 200 / 400 mW	40 / 200 / 400 mW	100 / 500 / 1000 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		

Accuracy	1μs+100ppm		
Slew Rate	2mA/μs-18A/μs	2mA/μs-20A/μs	2mA/μs-20A/μs
	10mA/μs-36A/μs	10mA/μs-40A/μs	10mA/μs-40A/μs
	20mA/μs-72A/μs	20mA/μs-80A/μs	20mA/μs-80A/μs
Resolution	2 / 10/ 20 mA/μs	2 / 10/ 20 mA/μs	2 / 10/ 20 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[7]	10μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	36μF+0.05Ω(45W)	40μF+0.036Ω(60W)	48μF+0.03Ω(60W)

Model	**63202A-600-140**	**63203A-600-210**	**63204A-600-280**
Voltage*[2]	0-600V		
Current	0-140A	0-210A	0-280A
Power*[3]	2kW	3kW	4kW
Min. Operating Voltage*[4]	14V @ 140A	14V @ 210A	14V @ 280A
Constant Current			
Range	14 / 70 / 140 A	21 / 105 / 210 A	28 / 140 / 280 A
Resolution	0.2 / 1 / 2 mA	0.2 / 1 / 2 mA	0.4 / 2 / 4 mA
Accuracy	0.05%+0.05%F.S.		
Constant Voltage			
Range	80 / 150 / 600 V		
Resolution	0.5m / 1m / 5m V		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	0.15Ω-1500Ω (80V) 0.6Ω-6000Ω (150V) 6Ω-12000Ω (600V)	0.1Ω-1000Ω (80V) 0.4Ω-4000Ω (150V) 4Ω-8000Ω (600V)	75mΩ-750Ω (80V) 300mΩ-3kΩ (150V) 3Ω-6kΩ (600V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	200 / 1000 / 2000 W	300 / 1500 / 3000 W	400 / 2000 / 4000 W
Resolution	5 / 20 / 50 mW	5 / 20 / 50 mW	10 / 50 / 100 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.2mA/μs-0.6A/μs	0.2mA/μs-0.9A/μs	0.4mA/μs-1.2A/μs
	1mA/μs-3A/μs	1mA/μs-4.5A/μs	2mA/μs-6A/μs
	2mA/μs-6A/μs	2mA/μs-9A/μs	4mA/μs-12A/μs
Resolution	0.2/ 1 / 2 mA/μs	0.2/ 1 / 2 mA/μs	0.4/ 2 / 4 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[8]	20μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	2.2μF+1.25Ω(8W)	3.3μF+0.83Ω(8W)	6.6μF+0.42Ω(15W)

Model	**63205A-600-350**	**63206A-600-420**	**63208A-600-560**
Voltage*[2]	0-600V		
Current	0-350A	0-420A	0-560A
Power*[3]	5kW	6kW	8kW
Min. Operating Voltage*[4]	14V @ 350A	14V @ 420A	14V @ 560A
Constant Current			
Range	35/ 175/ 350 A	42/ 210/ 420 A	56/ 280/ 560 A
Resolution	0.4/ 2 / 4 mA	0.4/ 2 / 4 mA	0.5/ 2 / 5 mA
Accuracy	0.05%+0.05%F.S.		
Constant Voltage			
Range	80 / 150 / 600 V		
Resolution	0.5 / 1 / 5 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	50mΩ-500Ω (80V) 200mΩ-2kΩ (150V) 2Ω-4kΩ (600V)	50mΩ-500Ω (80V) 200mΩ-2kΩ (150V) 2Ω-4kΩ (600V)	38mΩ-375Ω (80V) 150mΩ-1.5kΩ (150V) 1.5Ω-3kΩ (600V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	500 / 2500 / 5000 W	600 / 3000 / 6000 W	800 / 4000 / 8000 W
Resolution	10 / 50 / 100 mW	10 / 50 / 100 mW	20 / 100 / 200 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.4mA/μs-1.5A/μs	0.4mA/μs-1.8A/μs	0.5mA/μs-1.8A/μs
	2mA/μs-7.5A/μs	2mA/μs-9A/μs	2mA/μs-9A/μs
	4mA/μs-15A/μs	4mA/μs-18A/μs	5mA/μs-18A/μs
Resolution	0.4/ 2 / 4 mA/μs	0.4/ 2 / 4 mA/μs	0.5/ 2 / 5 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[8]	20μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	6.6μF+0.42Ω(15W)	6.6μF+0.42Ω(15W)	8.8μF+0.32Ω(30W)

Model	**63210A-600-700**	**63212A-600-840**	**63215A-600-1050**
Voltage*[2]	0-600V		
Current	0-700A	0-840A	0-1050A
Power*[3]	10kW	12kW	15kW
Min. Operating Voltage*[4]	14V @ 700A	14V @ 840A	14V @ 1050A
Constant Current			
Range	70 / 350 / 700 A	84 / 420 / 840 A	105 / 525 / 1050 A
Resolution	0.5 / 2.5 / 5 mA	1 / 5 / 10 mA	1 / 5 / 10 mA
Accuracy	0.05%+0.05%F.S.		
Constant Voltage			
Range	80 / 150 / 600 V		
Resolution	0.5 / 1 / 5 mV		

Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	25mΩ-250Ω (80V) 0.1Ω-1000Ω (150V) 1Ω-2000Ω (600V)	25mΩ-250Ω (80V) 0.1Ω-1000Ω (150V) 1Ω-2000Ω (600V)	17mΩ-166.67Ω (80V) 67mΩ-666.67Ω (150V) 0.67Ω-1333.34Ω (600V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	1000 / 5000 / 10000 W	1200 / 6000 / 12000 W	1500 / 7500 / 15000 W
Resolution	20 / 100 / 200 mW	20 / 100 / 200 mW	40 / 200 / 400 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.5mA/μs-2.1A/μs	1mA/μs-2.4A/μs	1mA/μs-2.7A/μs
	2.5mA/μs-10.5A/μs	5mA/μs-12A/μs	5mA/μs-13.5A/μs
	5mA/μs-21A/μs	10mA/μs-24A/μs	10mA/μs-27A/μs
Resolution	0.5/ 2.5 / 5 mA/μs	1 / 5 / 10 mA/μs	1 / 5 / 10 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[8]	20μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	11μF+0.25Ω(30W)	13.2μF+0.21Ω(30W)	17.6μF+0.16Ω(45W)

Model	**63218A-600-1260**	**63220A-600-1400**	**63224A-600-1680**
Voltage*[2]	0-600V		
Current	0-1260A	0-1400A	0-1680A
Power*[3]	18kW	20kW	24kW
Min. Operating Voltage*[4]	14V @ 1260A	14V @ 1400A	14V @ 1680A
Constant Current			
Range	126 / 630 / 1260 A	140 / 700 / 1400 A	168 / 840 / 1680 A
Resolution	1 / 5 / 10 mA	2 / 10 / 20 mA	2 / 10 / 20 mA
Accuracy	0.05%+0.05%F.S.		
Constant Voltage			
Range	80 / 150 / 600 V		
Resolution	0.5 / 1 / 5 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	17mΩ-166.67Ω (80V) 67mΩ-666.67Ω (150V) 0.67Ω-1333.34Ω (600V)	13mΩ-125Ω (80V) 50mΩ-500Ω (150V) 0.5Ω-1000Ω (600V)	13mΩ-125Ω (80V) 50mΩ-500Ω (150V) 0.5Ω-1000Ω (600V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	1800 / 9000 / 18000 W	2000 / 10000 / 20000 W	2400 / 12000 / 24000 W
Resolution	40 / 200 / 400 mW	100 / 500 / 1000 mW	100 / 500 / 1000 mW

Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	1mA/μs-3A/μs	2mA/μs-3.3A/μs	2mA/μs-3.6A/μs
	5mA/μs-15A/μs	10mA/μs-16.5A/μs	10mA/μs-18A/μs
	10mA/μs-30A/μs	20mA/μs-33A/μs	20mA/μs-36A/μs
Resolution	1 / 5 / 10 mA/μs	2/ 10/ 20 mA/μs	2/ 10/ 20 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[8]	20μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	19.8μF+0.14Ω(45W)	22μF+0.13Ω(60W)	26.4μF+0.1Ω(60W)

Model	**63202A-1200-80**	**63203A-1200-120**	**63204A-1200-160**
Voltage*[2]	0-1200V		
Current	0-80A	0-120A	0-160A
Power*[3]*[12]	2kW	3kW	4kW
Min. Operating Voltage*[4]	20V@80A	20V@120A	20V@160A
Constant Current			
Range	8 / 40 / 80 A	12 / 60 / 120 A	16 / 80 / 160 A
Resolution	0.1 / 0.5 / 1 mA	0.1 / 0.5 / 1 mA	0.2 / 1 / 2 mA
Accuracy	0.04%+0.06%F.S.		
Constant Voltage			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	0.3Ω-3kΩ (150V)	0.2Ω-2kΩ (150V)	0.15Ω-1.5kΩ(150V)
	1.2Ω-12kΩ (600V)	0.8Ω-8kΩ (600V)	0.6Ω-6kΩ(600V)
	30Ω-60kΩ (1200V)	20Ω-40kΩ (1200V)	15Ω-30kΩ(1200V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	200 / 1000 / 2000 W	300 / 1500 / 3000 W	400 / 2000 /4000 W
Resolution	5 / 20 / 50 mW	5 / 20 / 50 mW	10 / 50 / 100 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.1mA/μs-0.4A/μs	0.1mA/μs-0.6A/μs	0.2mA/μs-0.8A/μs
	0.5mA/μs-2A/μs	0.5mA/μs-3A/μs	1mA/μs-4A/μs
	1mA/μs-4A/μs	1mA/μs-6A/μs	2mA/μs-8A/μs
Resolution	0.1/ 0.5/ 1 mA/μs	0.1/ 0.5/ 1 mA/μs	0.2/ 1 / 2 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[9]	20μs (Typical)		

Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	2.2μF+1.25Ω(8W)	3.3μF+0.83Ω(8W)	6.6μF+0.42Ω(15W)

Model	**63205A-1200-200**	**63206A-1200-240**	**63208A-1200-320**
Voltage*[2]	0-1200V		
Current	0-200A	0-240A	0-320A
Power*[3]*[12]	5kW	6kW	8kW
Min. Operating Voltage*[4]	20V@200A	20V@240A	20V@320A
Constant Current			
Range	20 / 100 / 200 A	24 / 120 / 240 A	32 / 160 / 320 A
Resolution	0.2 / 1 / 2 mA	0.2 / 1 / 2 mA	0.4 / 2 / 4 mA
Accuracy	0.04%+0.06%F.S.		
Constant Voltage			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	0.1Ω-1kΩ(150V) 0.4Ω-4kΩ(600V) 10Ω-20kΩ(1200V)	0.1Ω-1kΩ(150V) 0.4Ω-4kΩ(600V) 10Ω-20kΩ(1200V)	75mΩ-0.75kΩ(150V) 0.3Ω-3kΩ(600V) 7.5Ω-15kΩ(1200V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	500 / 2500 / 5000 W	600 / 3000 / 6000 W	800 / 4000 / 8000 W
Resolution	10 / 50 / 100 mW	10 / 50 / 100 mW	20 / 100 / 200 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.2mA/μs-1A/μs	0.2mA/μs-1.2A/μs	0.4mA/μs-1.2A/μs
	1mA/μs-5A/μs	1mA/μs-6A/μs	2mA/μs-6A/μs
	2mA/μs-10A/μs	2mA/μs-12A/μs	4mA/μs-12A/μs
Resolution	0.2/ 1/ 2 mA/μs	0.2/ 1/ 2 mA/μs	0.4/ 2/ 4 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[9]	20μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	6.6μF+0.42Ω(15W)		8.8μF+0.32Ω(30W)

Model	**63210A-1200-400**	**63212A-1200-480**	**63215A-1200-600**
Voltage*[2]	0-1200V		
Current	0-400A	0-480A	0-600A
Power*[3]*[12]	10kW	12kW	15kW
Min. Operating Voltage	20V @ 400A	20V @ 480A	20V @ 600A
Constant Current			
Range	40 / 200 / 400 A	48 / 240 / 480 A	60 / 300 / 600 A

Resolution	0.4 / 2 / 4 mA	0.4 / 2 / 4 mA	0.5 / 2 / 5 mA
Accuracy	0.04%+0.06%F.S.		
Constant Voltage			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	50mΩ-0.5kΩ (150V) 0.2Ω-2kΩ (600V) 5Ω-10kΩ (1200V)	50mΩ-0.5kΩ (150V) 0.2Ω-2kΩ (600V) 5Ω-10kΩ (1200V)	34mΩ-0.34kΩ (150V) 0.14Ω-1.34kΩ (600V) 3.34Ω-6.67kΩ (1200V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			
Range	1000 / 5000 / 10000 W	1200 / 6000 / 12000 W	1500 / 7500 / 15000 W
Resolution	20 / 100 / 200 mW	20 / 100 / 200 mW	40 / 200 / 400 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.4mA/μs-1.4A/μs	0.4mA/μs-1.6A/μs	0.5mA/μs-1.8A/μs
	2mA/μs-7A/μs	2mA/μs-8A/μs	2mA/μs-9A/μs
	4mA/μs-14A/μs	4mA/μs-16A/μs	5mA/μs-18A/μs
Resolution	0.4 / 2 / 4 mA/μs	0.4 / 2 / 4 mA/μs	0.5 / 2 / 5 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[9]	20μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	11μF+0.25Ω(30W)	13.2μF+0.21Ω(30W)	17.6μF+0.16Ω(45W)

Model	**63218A-1200-720**	**63220A-1200-800**	**63224A-1200-960**
Voltage*[2]	0-1200V		
Current	0-720A	0-800A	0-960A
Power*[3]*[12]	18kW	20kW	24kW
Min. Operating Voltage*[4]	20V @ 720A	20V@800A	20V@960A
Constant Current			
Range	72 / 360 / 720 A	80 / 400 / 800 A	96 / 480 / 960 A
Resolution	0.5 / 2 / 5 mA	1 / 5 / 10 mA	1 / 5 / 10 mA
Accuracy	0.04%+0.06%F.S.		
Constant Voltage			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.025%+0.025%F.S.		
Constant Resistance			
Range	34mΩ-0.34Ω (150V) 0.14Ω-1.34Ω (600V) 3.34Ω-6.67Ω (1200V)	25mΩ-0.25kΩ (150V) 0.1Ω-1kΩ (600V) 2.5Ω-5kΩ (1200V)	25mΩ-0.25kΩ (150V) 0.1Ω-1kΩ (600V) 2.5Ω-5kΩ (1200V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.		
Constant Power			

Range	1800 / 9000 / 18000 W	2000 / 10000 / 20000 W	2400 / 12000 / 24000 W
Resolution	40 / 200 / 400 mW	100 / 500 / 1000 mW	100/ 500/ 1000 mW
Accuracy	0.2%+0.2%F.S.		
Dynamic mode			
Timing			
T1 & T2	0.020-99.999ms/100ms-99999ms		
Resolution	1μs/1ms		
Accuracy	1μs+100ppm		
Slew Rate	0.5mA/μs-2A/μs	1mA/μs-2.2A/μs	1mA/μs-2.4A/μs
	2mA/μs-10A/μs	5mA/μs-11A/μs	5mA/μs-12A/μs
	5mA/μs-20A/μs	10mA/μs-22A/μs	10mA/μs-24A/μs
Resolution	0.5 / 2 / 5 mA/μs	1 / 5 / 10 mA/μs	1 / 5 / 10 mA/μs
Accuracy	5% ± 10μs		
Min. Rise Time*[9]	20μs (Typical)		
Current			
Accuracy	0.2%F.S.	0.2%F.S.	0.2%F.S.
Other			
Input Capacity	19.8μF+0.14Ω(45W)	22μF+0.13Ω(60W)	26.4μF+0.1Ω(60W)

Model	**A632009**	**A632010**
Voltage*[2]	0-600V	0-1200V
Current	0-1680A	0-960A
Power*[3]*[12]	24kW	
Min. Operating Voltage*[4]	14V @ 1680A	20V@960A
Constant Current		
Range	168 / 840 / 1680 A	96 / 480 / 960 A
Resolution	2 / 10 / 20 mA	1 / 5 / 10 mA
Accuracy	0.05%+0.05%F.S.	0.04%+0.06%F.S.
Constant Voltage		
Range	80 / 150 / 600 V	150 / 600 / 1200 V
Resolution	0.5 / 1 / 5 mV	1 / 5 / 10 mV
Accuracy	0.025%+0.025%F.S.	0.025%+0.025%F.S.
Constant Resistance		
Range	13mΩ-125Ω (80V) 50mΩ-500Ω (150V) 0.5Ω-1000Ω (600V)	25mΩ-0.25kΩ (150V) 0.1Ω-1kΩ (600V) 2.5Ω-5kΩ (1200V)
Accuracy*[5]	Vin/Rset*(0.2%)+0.2% IF.S.	
Constant Power		
Range	2400 / 12000 / 24000 W	
Resolution	100/ 500/ 1000 mW	
Accuracy	0.2%+0.2%F.S.	
Dynamic mode		
Timing		
T1 & T2	0.020-99.999ms/100ms-99999ms	
Resolution	1μs/1ms	
Accuracy	1μs+100ppm	
Slew Rate	2mA/μs-3.6A/μs	1mA/μs-2.4A/μs
	10mA/μs-18A/μs	5mA/μs-12A/μs
	20mA/μs-36A/μs	10mA/μs-24A/μs

Resolution	2/ 10/ 20 mA/μs	1 / 5 / 10 mA/μs
Accuracy	5% ± 10μs	
Min. Rise Time*[8]*[9]	20μs (Typical)	
Current		
Accuracy	0.2%F.S.	
Other		
Input Capacity	26.4μF+0.1Ω(60W)	

Measurement Specifications

Model	**63206A-60-1000**
Voltage read back	
Range	6 / 30 / 60 V
Resolution	0.1 / 0.1 / 0.5 mV
Accuracy	0.015%+0.015%F.S.
Input Resistance	600kΩ(Typical)
Current read back	
Range	100 / 500 / 1,000 A
Resolution	1 / 5 / 10 mA
Accuracy	0.05%+0.05%F.S.
Power read back	
Range	0-6,000W
Accuracy*[6]	0.1%+0.1%F.S.

Model	**63202A-150-200**	**63203A-150-300**	**63204A-150-400**
Voltage read back			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	800kΩ(Typical)		
Current read back			
Range	20 / 100 / 200 A	30 / 150 / 300 A	40 / 200 / 400 A
Resolution	0.2 / 1 / 2 mA	0.2 / 1 / 2 mA	0.4 / 2 / 4 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-2,000W	0-3,000W	0-4,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63205A-150-500**	**63206A-150-600**	**63208A-150-800**
Voltage read back			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	800kΩ(Typical)		
Current read back			
Range	50 / 250 / 500 A	60 / 300 / 600 A	80 / 400 / 800 A
Resolution	0.5 / 2 / 5 mA	0.5 / 2 / 5 mA	1 / 5 / 10 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-5,000W	0-6,000W	0-8,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63210A-150-1000**	**63212A-150-1200**	**63215A-150-1500**
Voltage read back			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	800kΩ(Typical)		
Current read back			
Range	100 / 500 / 1000 A	120 / 600 / 1200 A	150 / 750 / 1500 A
Resolution	1 / 5 / 10 mA	1 / 5 / 10 mA	2 / 10 / 20 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-10,000W	0-12,000W	0-15,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63218A-150-1800**	**63220A-150-2000**	**63224A-150-2000**
Voltage read back			
Range	16 / 80 / 150 V		
Resolution	0.1 / 0.5 / 1 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	800kΩ(Typical)		
Current read back			
Range	180 / 900 / 1800 A	200 / 1000 / 2000A	200 / 1000 / 2000A
Resolution	2 / 10 / 20 mA	2 / 10 / 20 mA	2 / 10 / 20 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-18,000W	0-20,000W	0-24,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63202A-600-140**	**63203A-600-210**	**63204A-600-280**
Voltage read back			
Range	80 / 150 / 600 V		
Resolution	0.5 / 1 / 5 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	1MΩ(Typical)		
Current read back			
Range	14 / 70 / 140 A	21 / 105 / 210 A	28 / 140 / 280 A
Resolution	0.2 / 1 / 2 mA	0.2 / 1 / 2 mA	0.4 / 2 / 4 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-2,000W	0-3,000W	0-4,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63205A-600-350**	**63206A-600-420**	**63208A-600-560**
Voltage read back			
Range	80 / 150 / 600 V		
Resolution	0.5 / 1 / 5 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	1MΩ(Typical)		
Current read back			

Range	35 / 175 / 350 A	42 / 210 / 420 A	56 / 280 / 560 A
Resolution	0.4 / 2 / 4 mA	0.4 / 2 / 4 mA	0.5/ 2 / 5 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-5,000W	0-6,000W	0-8,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63210A-600-700**	**63212A-600-840**	**63215A-600-1050**
Voltage read back			
Range	80 / 150 / 600 V		
Resolution	0.5 / 1 / 5 V		
Accuracy	0.015%+0.015%F.S..		
Input Resistance	1MΩ(Typical)		
Current read back			
Range	70 / 350 / 700 A	84 / 240 / 840 A	105 / 525 / 1050 A
Resolution	0.5 / 2.5 / 5 mA	1 / 5 / 10 mA	1 / 5 / 10 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-10,000W	0-12,000W	0-15,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63218A-600-1260**	**63220A-600-1400**	**63224A-600-1680**
Voltage read back			
Range	80 / 150 / 600 V		
Resolution	0.5 / 1 / 5 mV		
Accuracy	0.015%+0.015%F.S..		
Input Resistance	1MΩ(Typical)		
Current read back			
Range	126 / 630 / 1260 A	140 / 700 / 1400 A	168 / 840 /1680 A
Resolution	1 / 5 / 10 mA	2 / 10/ 20 mA	2 / 10 / 20 mA
Accuracy	0.04%+0.04%F.S.		
Power read back			
Range	0-18,000W	0-20,000W	0-24,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63202A-1200-80**	**63203A-1200-120**	**63204A-1200-160**
Voltage read back			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	2MΩ(Typical)		
Current read back			
Range	8 / 40 / 80 A	12 / 60 / 120 A	16 / 80 / 160 A
Resolution	0.1 / 0.5 / 1 mA	0.1 / 0.5 / 1 mA	0.2 / 1 / 2 mA
Accuracy	0.04%+0.06%F.S.		
Power read back			
Range	0-2,000W	0-3,000W	0-4,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63205A-1200-200**	**63206A-1200-240**	**63208A-1200-320**
Voltage read back			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	2MΩ(Typical)		
Current read back			
Range	20 / 100 / 200 A	24 / 120 / 240 A	32 / 160 / 320 A
Resolution	0.2 / 1 / 2 mA	0.2 / 1 / 2 mA	0.4 / 2 / 4 mA
Accuracy	0.04%+0.06% F.S.		
Power read back			
Range	0-5,000W	0-6,000W	0-8,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63210A-1200-400**	**63212A-1200-480**	**63215A-1200-600**
Voltage read back			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	2MΩ(Typical)		
Current read back			
Range	40 / 200 / 400 A	48 / 240 / 480 A	60 / 300 / 600 A
Resolution	0.4 / 2 / 4 mA	0.4 / 2 / 4 mA	0.5 / 2 / 5 mA
Accuracy	0.04%+0.06% F.S.		
Power read back			
Range	0-10,000W	0-12,000W	0-15,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**63218A-1200-720**	**63220A-1200-800**	**63224A-1200-960**
Voltage read back			
Range	150 / 600 / 1200 V		
Resolution	1 / 5 / 10 mV		
Accuracy	0.015%+0.015%F.S.		
Input Resistance	2MΩ(Typical)		
Current read back			
Range	72 / 360 / 720 A	80 / 400 / 800 A	96 / 480 / 960 A
Resolution	0.5 / 2 / 5 mA	1 / 5 / 10 mA	1 / 5 / 10 mA
Accuracy	0.04%+0.06% F.S.		
Power read back			
Range	0-18,000W	0-20,000W	0-24,000W
Accuracy*[6]	0.1%+0.1%F.S.		

Model	**A632009**	**A632010**
Voltage read back		
Range	80 / 150 / 600 V	150 / 600 / 1200 V
Resolution	0.5 / 1 / 5 mV	1 / 5 / 10 mV
Accuracy	0.015%+0.015%F.S..	
Input Resistance	1MΩ(Typical)	2MΩ(Typical)
Current read back		
Range	168 / 840 /1680 A	96 / 480 / 960 A

Resolution	2 / 10 / 20 mA	1 / 5 / 10 mA
Accuracy	0.04%+0.04%F.S.	0.04%+0.06% F.S.
Power read back		
Range	0-24,000W	
Accuracy*[6]	0.1%+0.1%F.S.	

Input Power and Dimension

Model	**63202A**	**63203A**
AC input range	100-240VAC / 50-60Hz	
Max. VA	150VA(max)	
Fuse	2A	
Weight	27kg / 59.5lbs	30kg / 66.1lbs
Dimension HxWxD*	150.1 x 428 x 650mm / 5.91 x 16.85 x 25.59 inch	
Air flow max. (CFM)	170	
Noise*[10]	78.5 dB(max)	

Model	**63204A**	**63205A & 63206A**
AC input range	100-240VAC / 50-60Hz	
Max. VA	200VA(max)	
Fuse	2.5A	
Weight	30kg / 66.1lbs	35kg / 77.2lbs
Dimension HxWxD*	195 x 428 x 650mm / 7.68 x 16.85 x 25.59 inch	
Air Flow max. (CFM)	290	
Noise*[10]	78.5 dB(max)	

Model	**63208A**	**63210A**	**63212A**
AC input range	100-240VAC / 50-60Hz		
Max. VA	400VA(max)		
Fuse	5A		
Weight	60kg / 132.3lbs	65kg /143.3lbs	70kg / 154.3lbs
Dimension HxWxD*	414.8 x 428.6 x 757.5mm / 16.33 x 16.87 x 29.82 inch		
Air flow max. (CFM)	580		
Noise*[10]	72.3 dB(max)		

Model	**63215A**	**63218A**
AC input range	100-240VAC / 50-60Hz	
Max. VA	600VA(max)	
Fuse	8A	
Weight	92kg / 202.8lbs	97kg / 213.8lbs
Dimension HxWxD*	547.5 x 428.6 x 757.5mm / 21.56 x 16.87 x 29.82 inch	
Air flow max. (CFM)	870	
Noise*[10]	75.6 dB(max)	

Model	**63220A**	**63224A& A632009 & A632010**
AC input range	100-240VAC / 50-60Hz	
Max. VA	800VA(max)	
Fuse	10A	
Weight	120kg / 264.6lbs	125kg / 275.6lbs lbs
Dimension HxWxD*	680 x 428.6 x 757.5 mm / 26.77 x 16.87 x 29.82 inch	
Air flow max. (CFM)	1180	
Noise*[10]	75.9 dB(max)	

63200A Series System Specifications

Battery Discharge			
Range	1s-100,000s		
Resolution	1s		
End Trigger	Voltage level		
Accuracy	0.01%		
Presentation	Elapse: s Charge: AH Energy: WH		
Program mode			
Sequence No.	255 / Program		
Dwell / SEQ	0.1ms - 30s (Resolution:0.1ms)		
Spec Check	Voltage / Current / Power		
Ext Wave			
Mode	CC, CR, CV		
Range	as mode range		
Level	0 - 10V		
Accuracy	0.4%F.S.		
CC mode BW	20kHz		
Input impedance	10kΩ		
Resolution	4mV		
Monitor			
Voltage Range	0~L_range F.S.	0~M_range F.S.	0~H_range F.S.
Current Range	0~L_range F.S.	0~M_range F.S.	0~H_range F.S.
Output	0-10V		
Bandwidth	20kHz		
Accuracy	0.5%F.S.		
Output impedance	10kΩ		
Resolution	4mV		
Protection			
Over Current	Yes (Settable)		
Over Power	Yes (Settable)		
Over Temperature	Yes		
Over Voltage Alarm	Yes		
Reverse Alarm	Yes		
Short*[11]			
Mode	CC, CR, CV, CP		
Other			
Operating Temp	0-40°C		
Storage Temp	-20-80°C		
Relative operating humidity	30%~90%		

Relative storage humidity	10%~90%
Temperature Coefficient	100ppm/°C (Typical)
Withstand Voltage	1500Vdc
Isolation Resistance	50 MΩ, 1000VDC / 25°C / 50% RH
EMC & Safety	CE

A632009 & A632010 System Specifications

Protection	
Over Current	Yes (Settable)
Over Power	Yes (Settable)
Over Temperature	Yes
Over Voltage Alarm	Yes
Reverse Alarm	Yes
Other	
Operating Temp	0-40°C
Storage Temp	-20-80°C
Relative operating humidity	30%~90%
Relative storage humidity	10%~90%
Temperature Coefficient	100ppm/°C (Typical)
Withstand Voltage	1500Vdc
Isolation Resistance	50 MΩ, 1000VDC / 25°C / 50% RH
EMC & Safety	CE

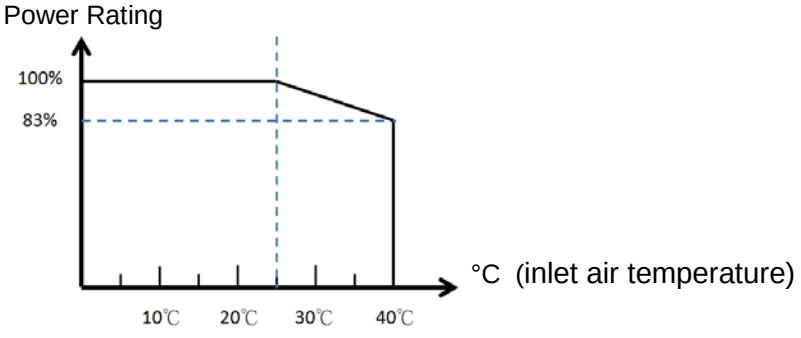
*The height indicated here does not include the stand 17.8mm/0.7 inch and the depth does not include the protective cover 63.41mm/2.5 inch.

1 The equipment is for indoor use only.
2 The altitude up to 2,000 meters is allowed to use the equipment.
3 The pollution degree of the equipment is 2.
4 TRANSIENT OVERVOLTAGES up to the levels of overvoltage CATEGORY II.

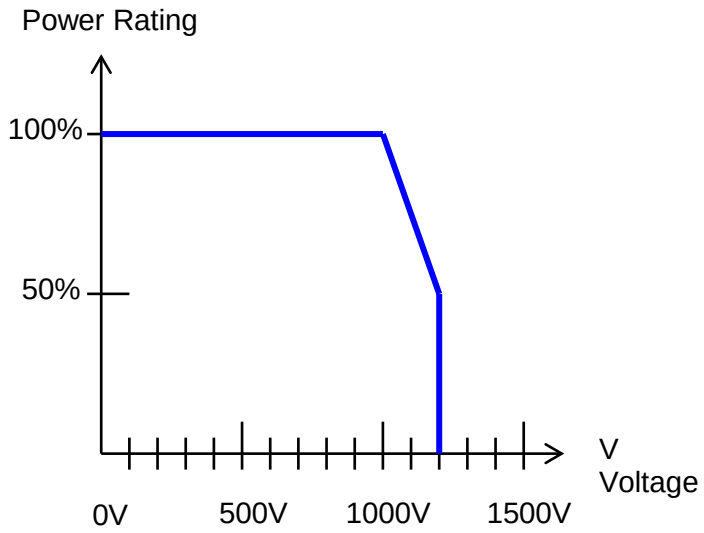
CAUTION This equipment is not intended for performing measurements on CAT II, III or IV.

Notice

1. The specifications are guaranteed to meet specified performance at temperature range of 25±5°C.
2. If the operating voltage exceeds the rated voltage for 1.1 times, it would cause permanent damage to the device.
3. The power rating specifications at inlet air temperature = 25°C and see the diagram below for power derating.



4. The specification is only applicable when the loading current is >25%F.S.
5. The accuracy calculation of 63200A Series CR mode is based on current.
   Example :
   63205A-150-500
   Vin=25V
   Rset=2.5Ω
   IF.S=500A (I Range:High)
   I=25V/2.5Ω
   I_min=25V/2.5Ω-(25V/2.5Ω*(0.2%)+0.2%*500A)
   I_max=25V/2.5Ω+(25V/2.5Ω*(0.2%)+0.2%*500A)
   I_min < I < I_max
6. Power F.S. = Vrange F.S. × Irang F.S.
7. The specification is valid only for loading current >4%F.S.
8. The specification is valid only for loading current >3%F.S.
9. The specification is valid only for loading current >5%F.S.
10. The measured maximum noise is tested under the condition of 40°C ambient temperature with full power for 5 minutes and 1 meter away from the frame.
11. The short circuit function is to simulate full power loading and is unable to do mechanical short circuit.
12. For the power rating specifications of 1200V model, see the diagram below for power drop.



13. OTP: The temperature of 63200A series vent is about 70°C~75°C.

1.5 Dimensions of Electronic Loads

- Model 63203A (Unit: mm)

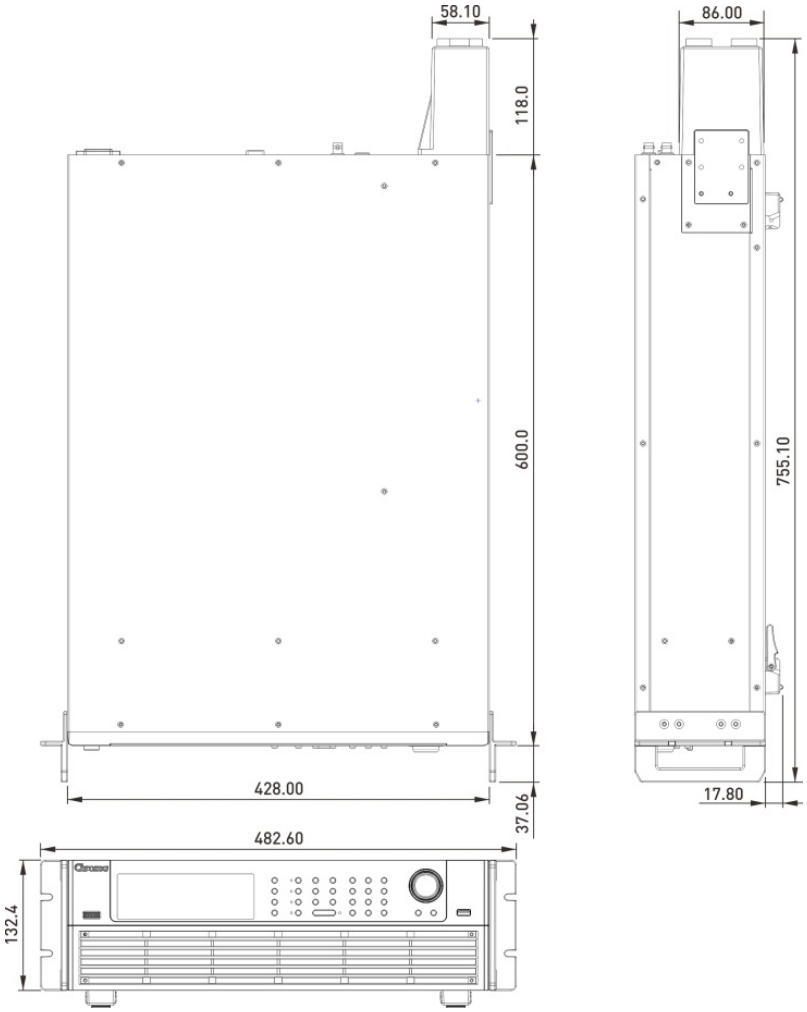


Figure 1-2 Dimension of Model 63203A

- Models 63204A~63206A (Unit: mm)

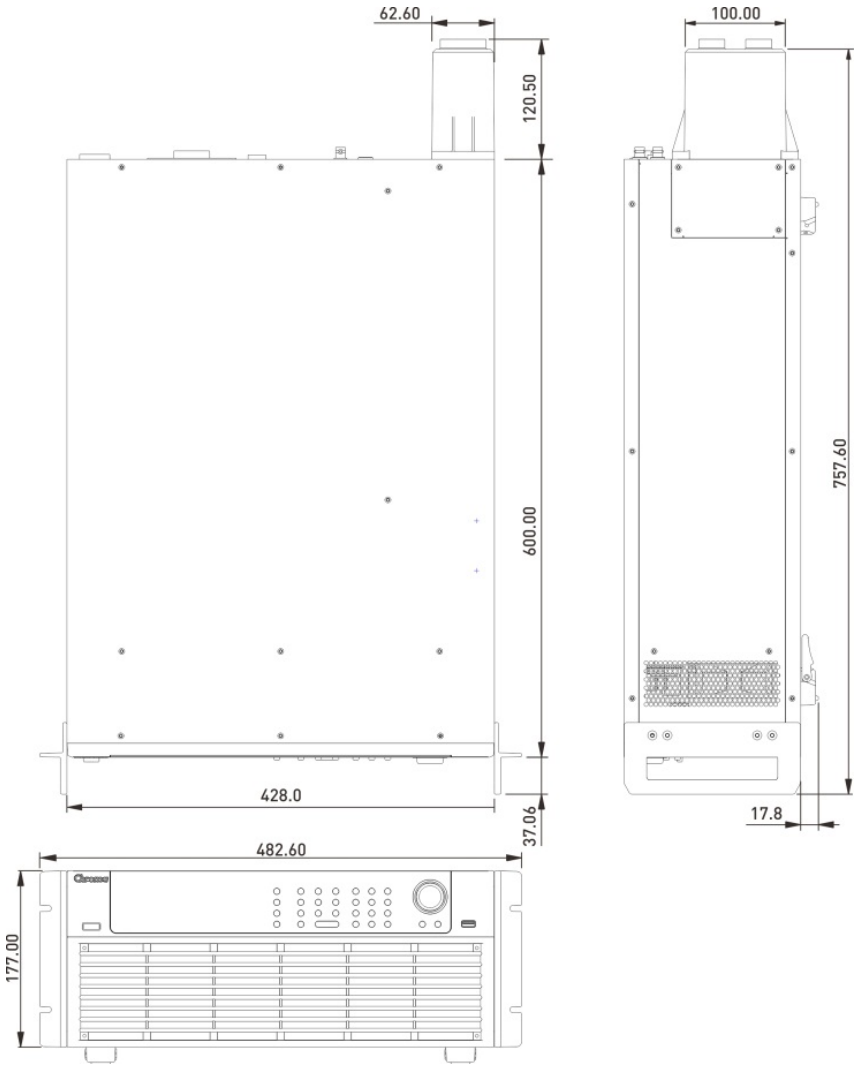


Figure 1-3 Dimension of Models 63204A~63206A

- Model 63212A (Unit: mm)

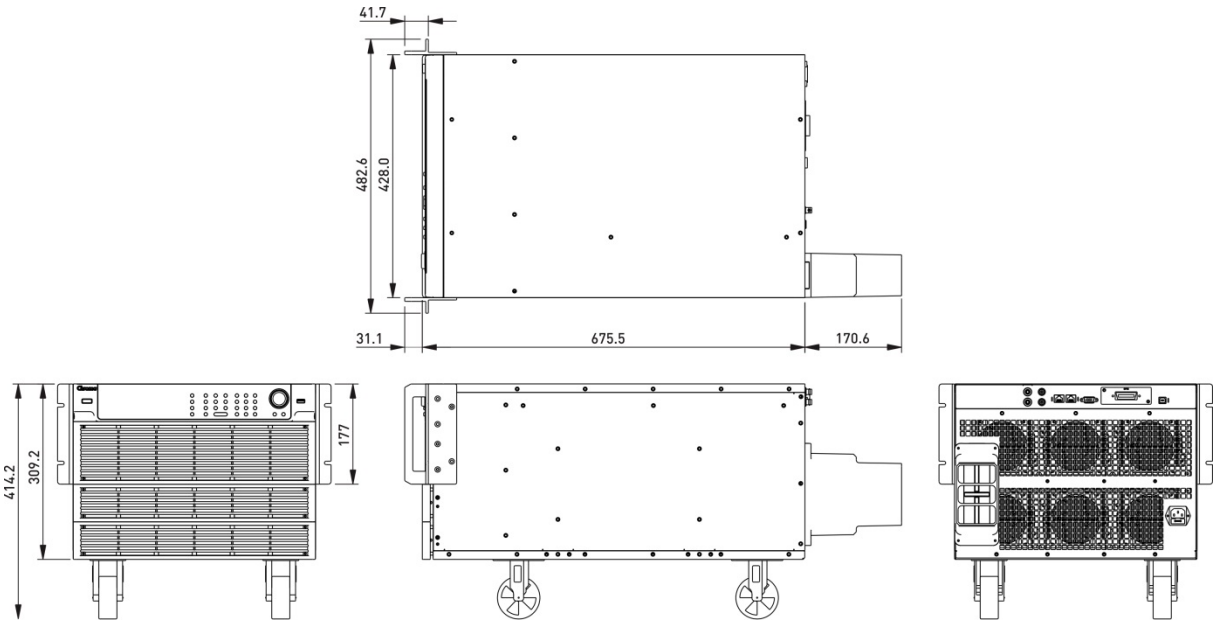


Figure 1-4 Dimension of Model 63212A

- Model 63218A (Unit: mm)

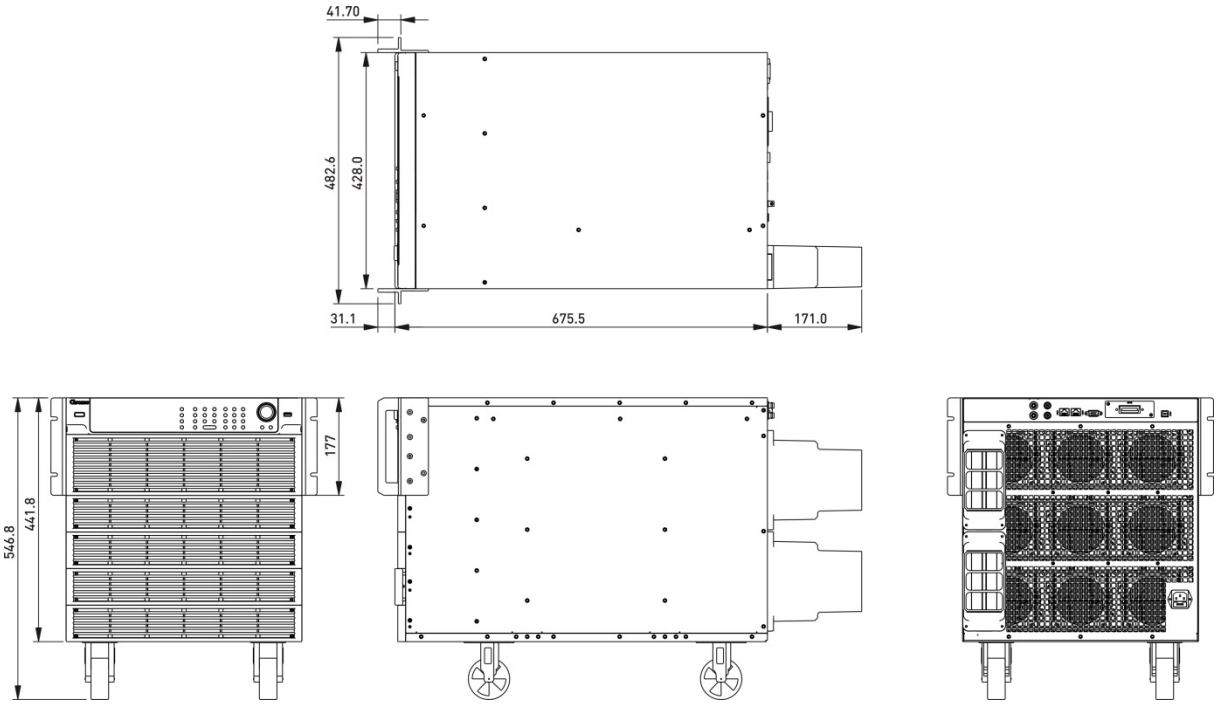


Figure 1-5 Dimension of Model 63218A

- Model 63224A (Unit: mm)

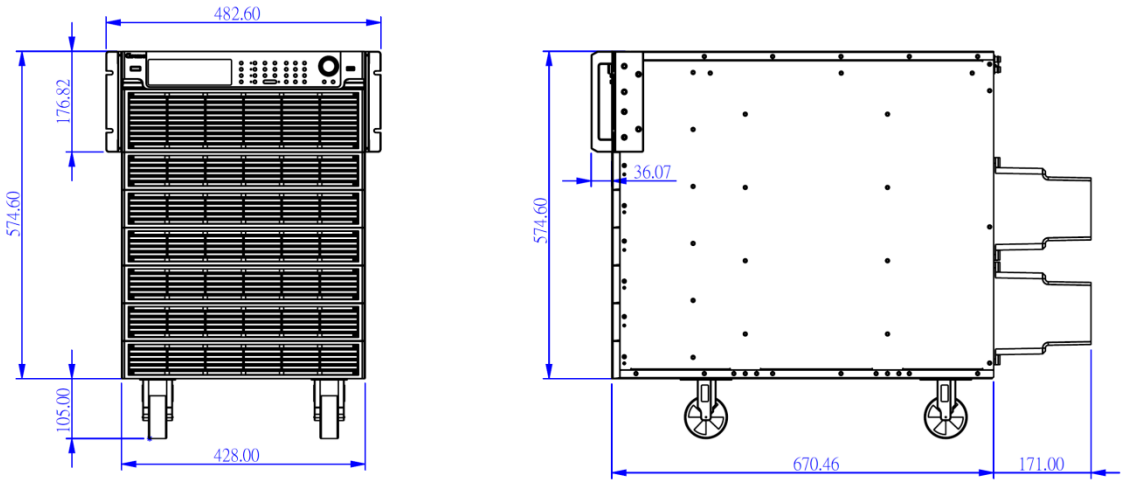


Figure 1-6 Dimension of Model 63224A

- Model A632009 & A632010 (Unit: mm)

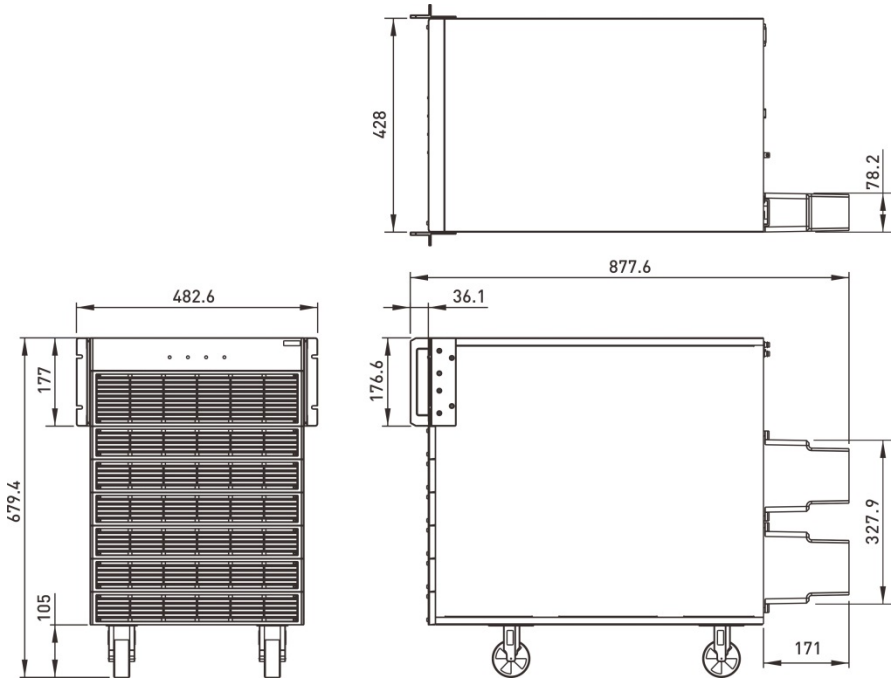


Figure 1-7 Dimension of Model A632009 & A632010

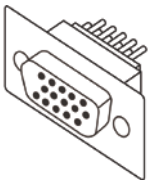
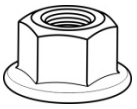
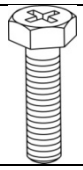
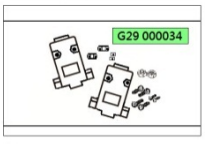
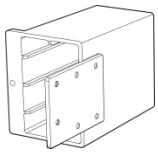
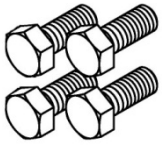
2. Installation

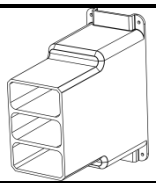
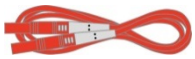
2.1 Introduction

This chapter discusses how to install the 63200A Series Electronic Loads. It also discusses turn-on check procedure and application considerations as well.

2.2 Inspection

Diagram of 63200A Series Standard Package:

				
F30 000221 User's manual CD	W31 422009 Network cable system bus	W38 000326 Red/Black test wire	H81 431002 Flat washer M4	N22 000034 D-SUB 3 rows 15P
				
W34 000903 BNC	W38 034000 USB	G32 005010 Mounting bracket (USB)	G32 005011 Mounting bracket (RJ45)	H79 606000 Flange nut M6
				
H61 602031 Screw M6x20L	H81 601300 Flat washer M6	H82 631002 Spring washer M6	H61 300845 Screw M3x8	G51 000415 Output protective cover (Model 63204A ~ 63206A)
				
G29 000034 Connector cover	G51 000414 Output protective cover (Model 63203A)	H61 802530 Screw M8*25	H71 805800 Nut M8	H82 871501 Spring washer M8

				
H81 821601 Flat washer M8	H69 301640 M3x16	G51 000365 Output protective cover	H69 401540 Screw M4x15 Black	H61 401243 Screw M4x12
				
W38 000547 Digital I/O cable	W38000075 Test wire (red)	W38000076 Test wire (black)		

As soon as the instrument is unpacked, inspect any damage that might have occurred in shipping. Keep all packing materials in case that the instrument has to be returned. If any damage is found, please file a claim to the carrier immediately. Do not return the instrument to Chroma without prior approval.

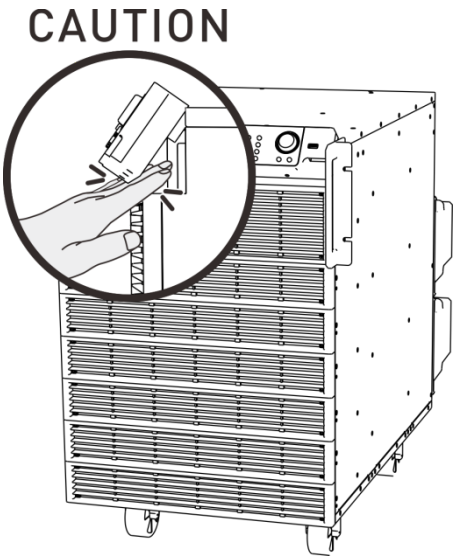
Be sure that the following items listed by respective model are received completely.

Item	Name	Quantity of Standard Accessories					
		63202A 63203A	**63204A 63205A 63206A**	**63208A 63210A 63212A**	**63215A 63218A**	**63220A 63224A**	**A632009 A632010**
1.	F30 000221 User's manual CD	1	1	1	1	1	1
2.	W31 422009 Network cable system bus	2	2	2	2	2	2
3.	W38 000326 Red/Black test wire	1	1	1	1	1	--
4.	H81 431002 Flat washer M4	--	4	--	--	--	--
5.	N22 000034 D-SUB 3 rows 15P	2	2	2	2	2	--
6.	W34 000903 BNC	2	2	2	2	2	2
7.	W38 034000 USB	1	1	1	1	1	1
8.	G32 005010 Mounting bracket (USB)	1	1	1	1	1	1
9.	G32 005011 Mounting bracket (RJ45)	2	2	2	2	2	2
10.	H79 606000 Flange nut M6	2	2	--	--	--	--
11.	H61 602031 Screw M6x20L	2	2	--	--	--	--
12.	H81 601300 Flat washer M6	4	4	--	--	--	--

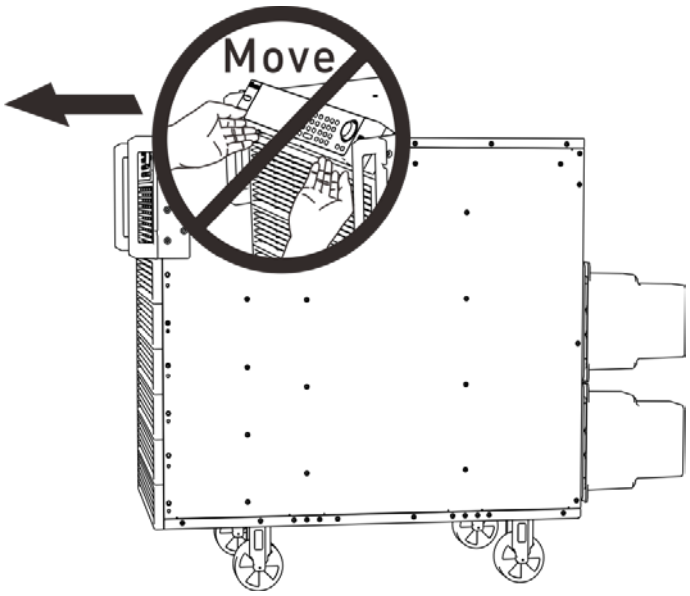
13.	H82 631002 Spring washer M6	2	2	--	--	--	--
14.	H61 300845 Screw M3*8L	4	4	--	--	--	--
15.	G51 000415 Output insulation sleeve (Model 63204A~63206A)	--	1	--	--	--	--
16.	G29 000034 Connector protective cover	2	2	2	2	2	--
17.	G51 000414 Output insulation sleeve (Model 63203A	1	--	--	--	--	--
18.	H61 802530 Screw M8*25	--	--	4	6	6	6
19.	H71 805800 Nut M8	--	--	4	6	6	6
20.	H82 871501 Spring washer M8	--		8	12	12	12
21.	H81 821601 Flat washer M8	--	--	8	12	12	12
22.	H69 301640 Screw M3x16	--	--	4	8	8	8
23.	G51 000365 Output insulation sleeve (Model 63208A~63224A)	--	--	1	2	2	2
24.	H69 401540 Screw M4x15 black	--	4	--	--	--	--
25.	H61 401243 Screw M4x12	1	--	--	--	--	--
26.	W38 000547 Digital I/O cable	--	--	--	--	--	1
27.	W38000075 Test wire (red)	--	--	--	--	--	1
28.	W38000076 Test wire (black)	--	--	--	--	--	1

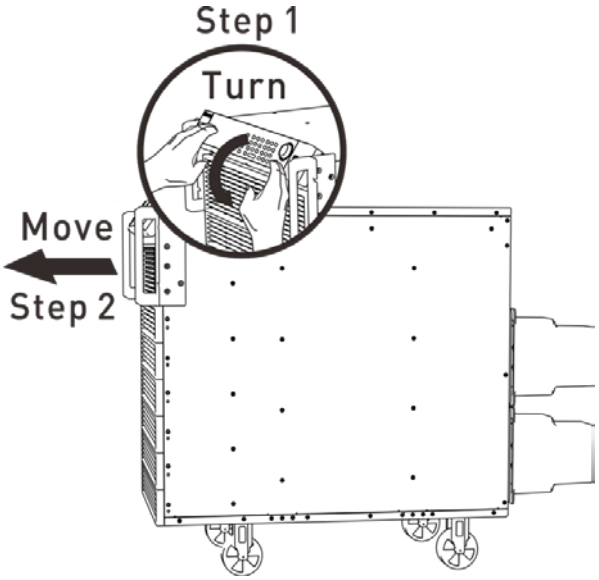
2.3 Precautions during Installation

CAUTION Be careful not to catch your fingers when opening or closing the flip down panel.

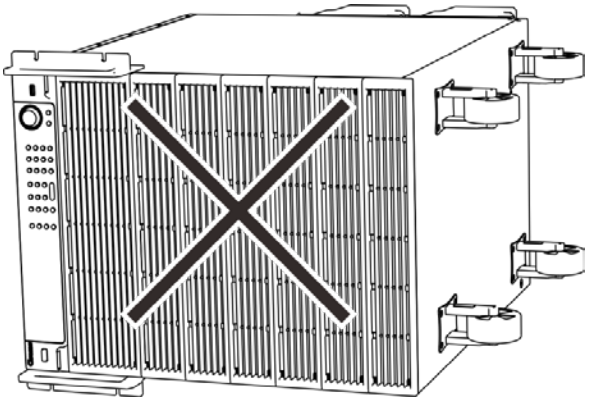


CAUTION Be sure to put the panel back in place when moving the electronic load. Do not drag the panel.

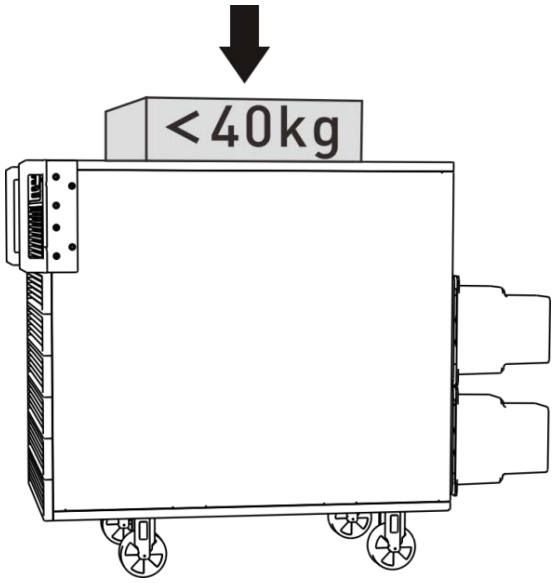




CAUTION Do not overturn the device to avoid damaging the electronic load.

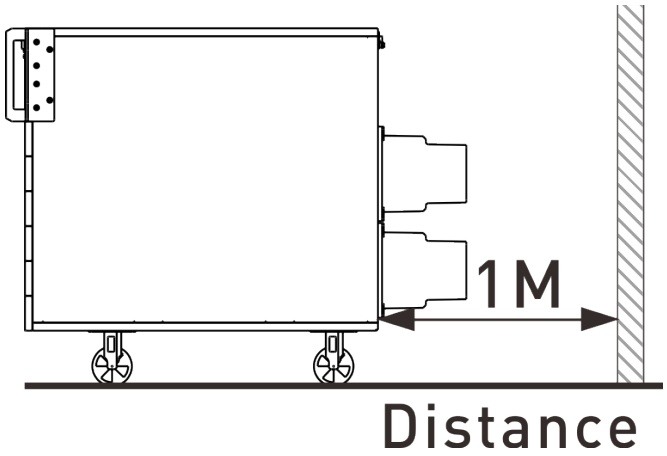


CAUTION Do not place objects heavier than 40 kg on the device to avoid damaging the electronic load.



CAUTION

1. When the inlet air temperature of 63200A Series is over 25°C, the operating power has derating limit.
2. Avoid the 63200A Series air outlet temperature to flow back to the air inlet.
3. It is suggested that the distance between the 63200A series and wall or other objects should be 1 meter at least.



2.4 Installing the Communication Interface Expansion Slot

The 63200A Series Electronic Load uses GPIB bus (option) to do remote control. The installation of GPIB card and change of its address as well as the operations are described in Chapter 4.

CAUTION

Load module can be damaged by electronic discharge (static electricity). Use standard anti-static work practices when you handle and install modules. Avoid touching the connector and the circuit board.

2.4.1 Line Voltage

The Electronic Load can operate with a 100-240 Vac input as indicated on the rear LINE label. The detailed line voltage input range is shown in section 1.4. The Electronic Load can automatically switch correct line voltage range to correspond to your nominal line voltage, when you connect the power cord to correct line voltage and turn on the Electronic Load.

Notice

Line fuses do not need to be changed when the line voltage is changed. The line fuses will protect the Electronic Load from incorrect voltage setting.

2.4.2 Turn-On Self-Test

Check the following before turning on the Load.

1. The nominal line voltage of the AC input socket is in the range of 100-240 Vac.
2. The power cord is connected to the AC input socket.

⚠WARNING The power cord supplies a chassis ground through a third connector. Be sure that your outlet is of three-conductor type with the correct pin connected to ground.

Power on the Load by the front panel switch and observe the display. Immediately after turning on, the Electronic Load executes a self-test that checks firmware and communication. The Load Module displays the model no. and firmware version.

Figure 2-1

2.5 Application Connection

2.5.1 Load Connections

Input connections are made to the + and – terminal connectors on the rear panel of each load. The major considerations for input connections are the wire size, length and polarity. The minimum wire size required to avoid overheating may not be enough to maintain good regulation. The wires should be large enough to limit the voltage drop. The wires should be as short as possible, and bundled or tied together to minimize inductance and noise. Connect the wire from the PLUS (+) terminal to the HIGH potential output terminal of the power supply (UUT) and the MINUS (–) terminal the LOW potential output terminal of the power supply (UUT). Figure 2-2, Figure 2-3 and Figure 2-4 illustrate the typical setup of the Electronic Load to the UUT.

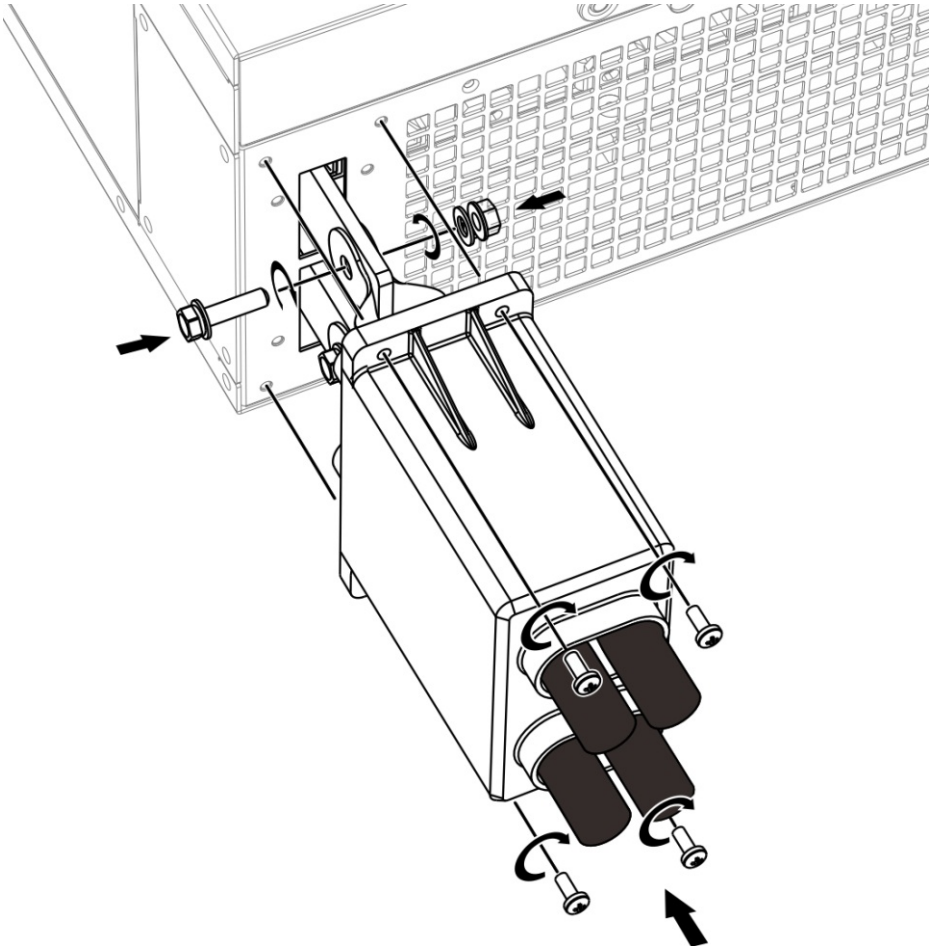


Figure 2-2 Load Connection of Models 63203A~63206A

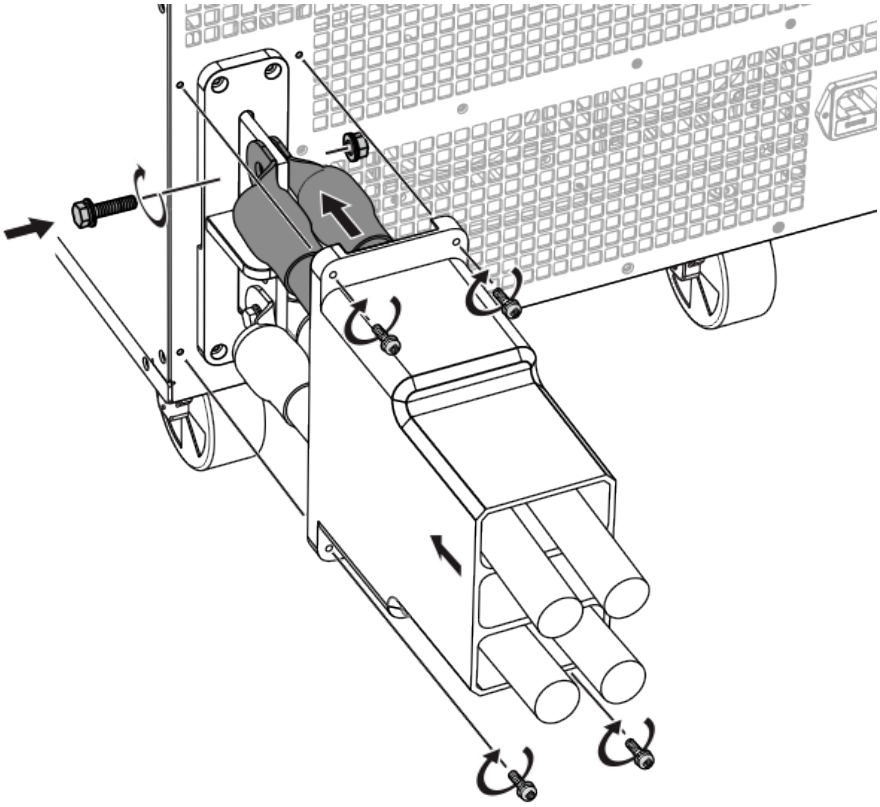


Figure 2-3 Load Connection of Model 63212A

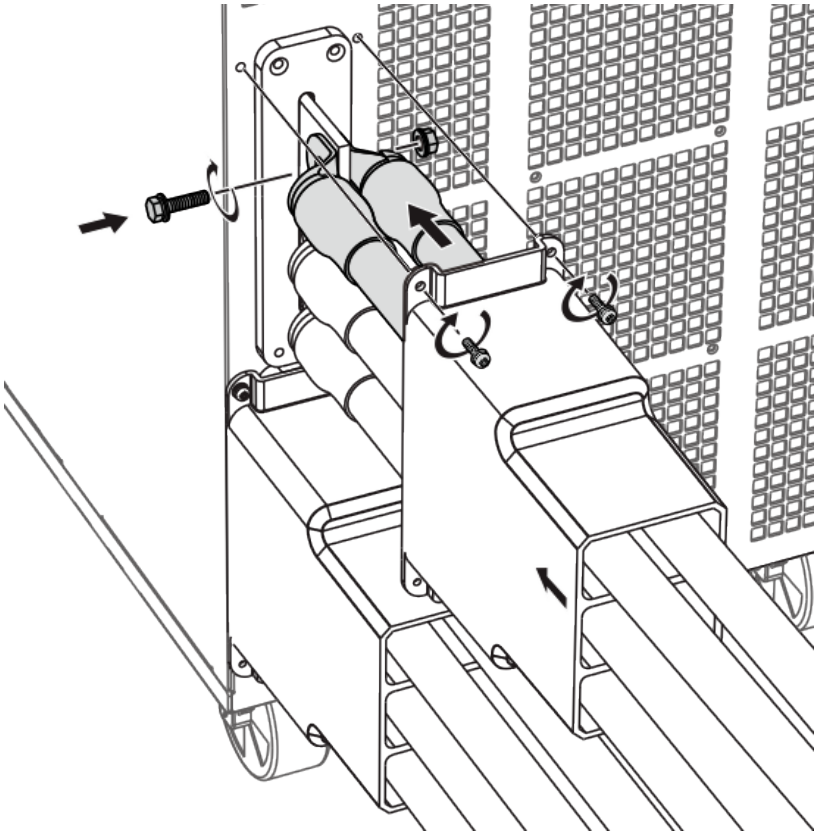


Figure 2-4 Load Connection of Models 63218A, 63224A, A632009 and A632010

CAUTION The Electronic Load should be operated in an environment with good heat dissipation. Moreover, if the load is installed in a rack, a well-ventilated rack should be used to avoid poor heat sink.

Notice To satisfy our higher slew rate load spec requirement and performance, load wires from the UUT to our load must be low inductive. We have made the adaptable load cables along with the Load. They are better for application connection being the interface between UUT and the load.

WARNING To satisfy safety requirements, load wires must be heavy enough not to overheat while carrying the short-circuit output current of the device connected to the Electronic Load. Polarity + and – are marked on the Load connector and the + terminal potential should be higher than the – terminal.

WARNING If errors occurred when using the Electronic Load, it could be short-circuited if the condition is severe which may cause the UUT current to input continuously and cannot be stopped. The user should consider adding an external circuit for protection. To prevent the error input caused by reverse connection, an external forward-conducting component can be added.

2.5.2 Vsense Remote Sensing Connections

There are two sensing points in the Electronic Load. One is measurement at Load terminal, and another is at Vsense. The Load will automatically switch to Vsense when Vsense terminals are connected to UUT, otherwise it will measure at Load terminals. Remote sensing compensates the measured voltage drop in applications that require long lead lengths; however, it cannot compensate the voltage drop caused by load effect from UUT to load terminal. It is useful when operating in CV or CR mode or precise measurement is needed. Figure 2-5 illustrates a typical setup for remote sensing operation.

The remote sense connection of 63200A Series, A632009 and A632010 Vsense:

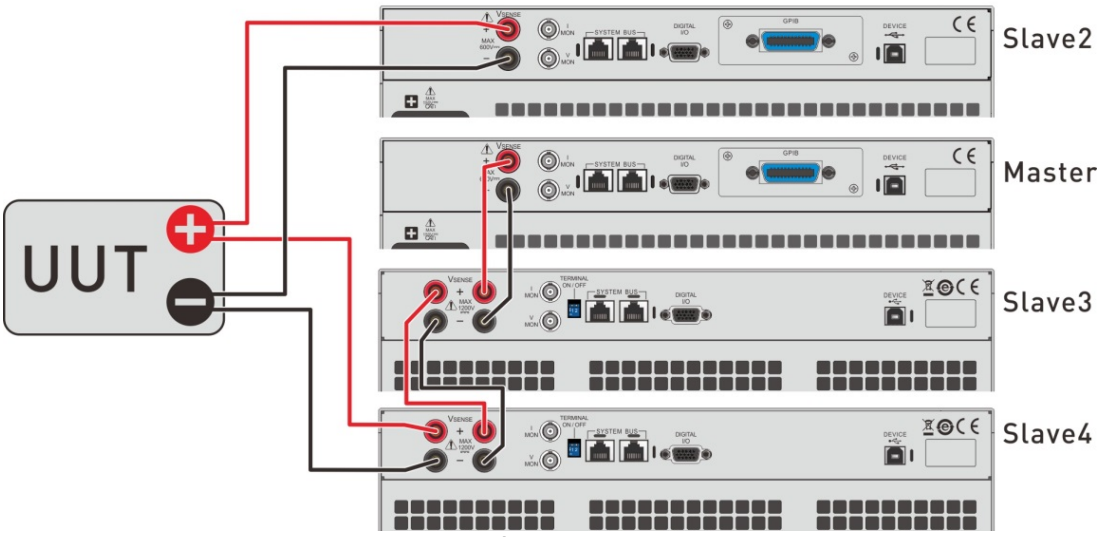


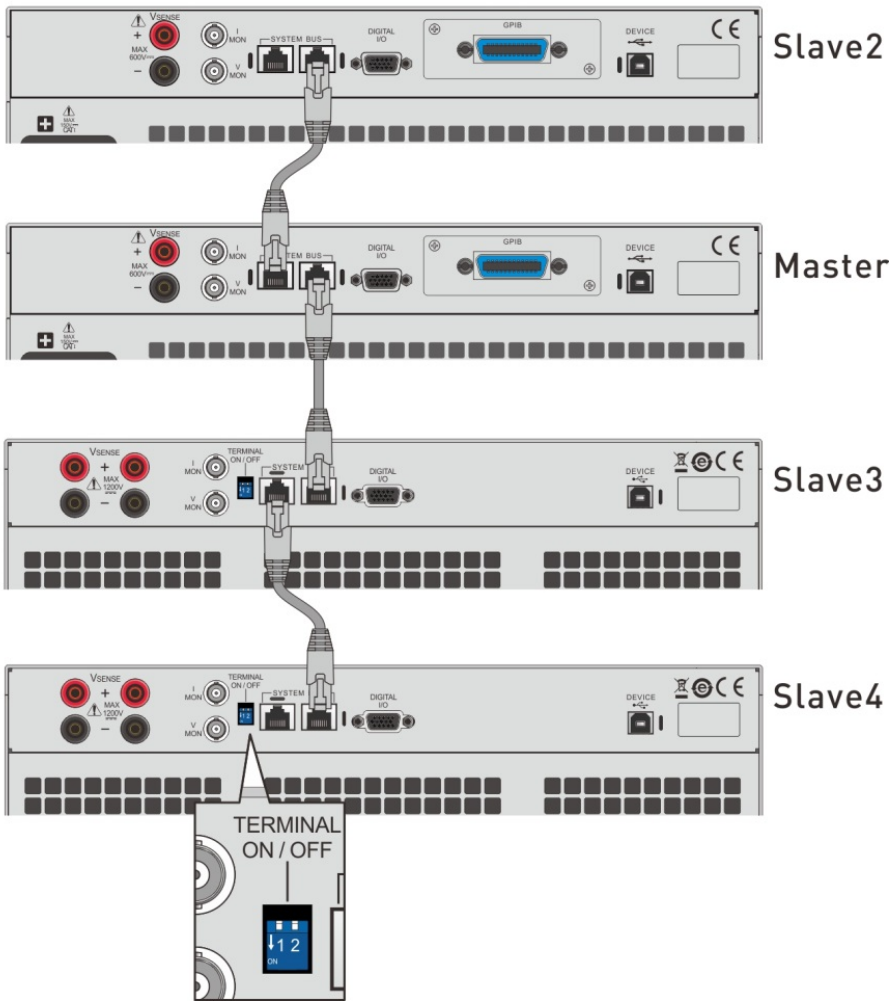
Figure 2-5

Notice As shown in Figure 2-5, the Master and Slave2 is 63200A Series, and Slave3~4 is A632009 (or A632010).

CAUTION When using remote sensing, the Vsense red connector should connect to the UUT high potential output side while the black connector should connect to the UUT low potential output side. When using the Electronic Load UUT Vsense for voltage measurement, the V-sense must connect to the negative terminal.

2.5.3 Parallel Connection

Figure 2-6 illustrates how Electronic Load can be paralleled to increase power dissipation. Electronic Loads can be directly paralleled in CC, CR, CV or CP mode.



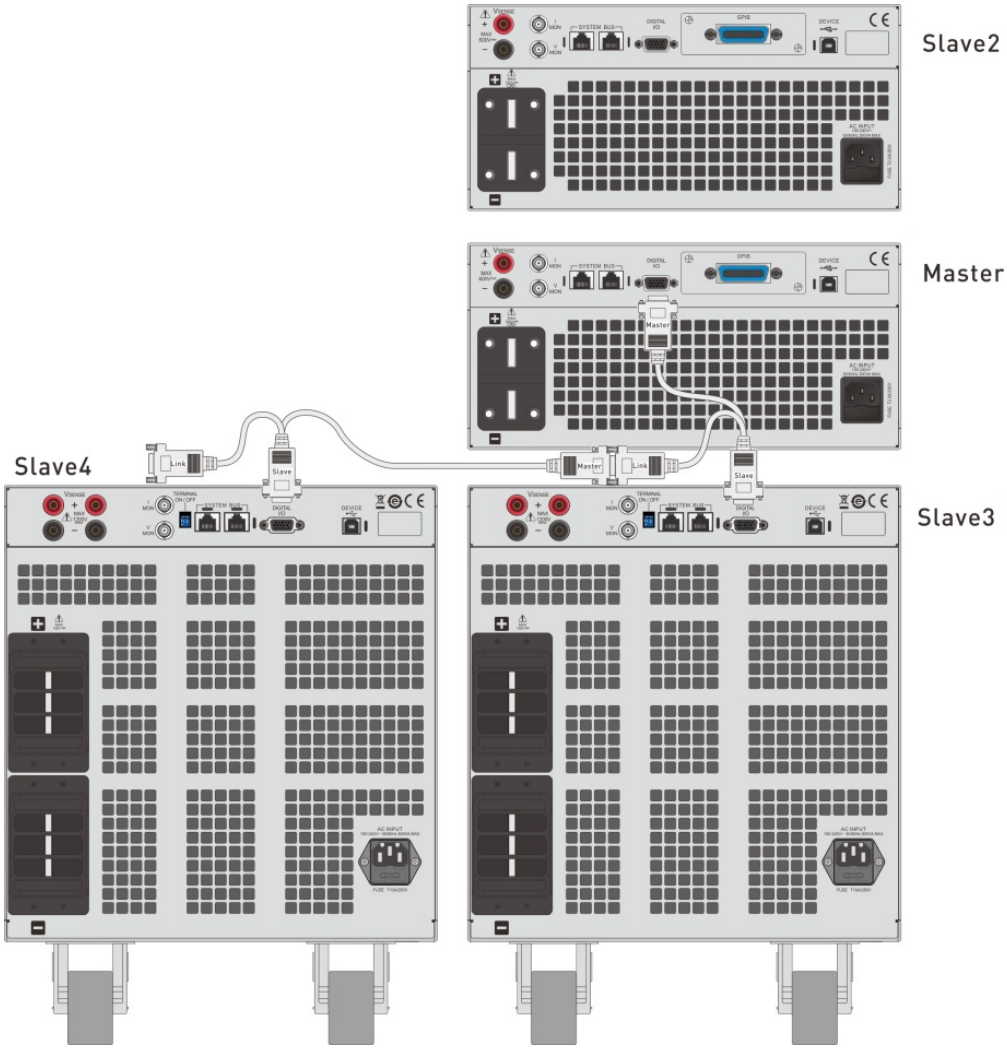


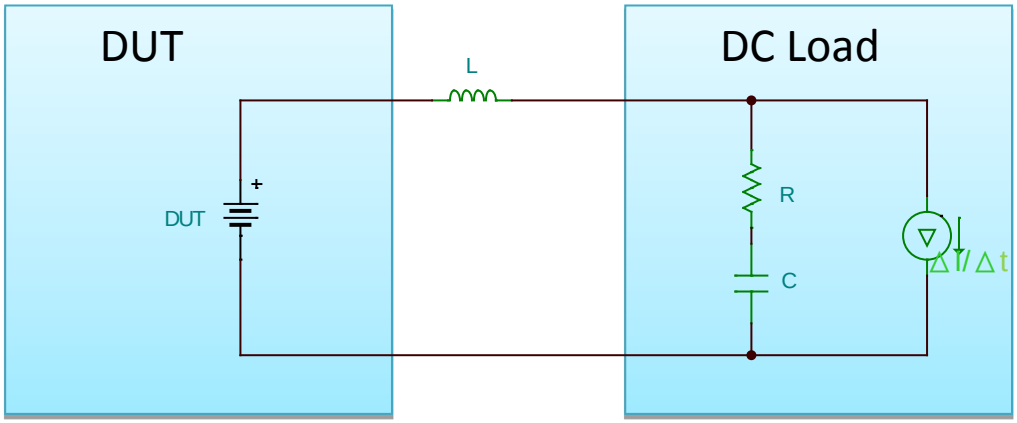
Figure 2-6 Parallel Connection

Notice

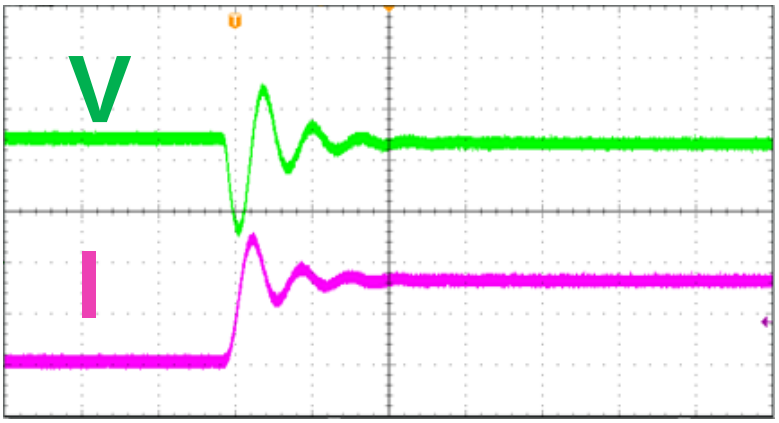
1. As shown in Figure 2-6, the Master and Slave2 are 63200A Series, Slave3 and 4 are A632009 (or A632010).
2. The first and last load need to turn on the terminating resistor (switch no.1 down to ON) when paralleling the 632000A Series. In Figure 2-6, the Slave 2 (see section 3.5.3) and Slave 4 (see section 3.3.6 to switch no.1 down to ON) both need to set the terminating resistor.
3. The power of A632009 & A632010 is mainly turned on by Master (63200A) via Digital I/O control (use standard cable, P/N W38 000547). When the parallel mode of 63200A is set to Master, it can control the Slave power. The power of Slave model (A632009 or A632010) will be turned on following the connecting sequence.
4. The A632009 and A632010 in 63200A Series are Slave models, and only support parallel function when the 63200A Series F/W version is Host(A):1.30 LOAD(C):1.30 or above.

2.5.4 Effect of Wiring Electronic Load

The wiring from UUT to electronic load should be short and twisted as possible to reduce the line sense impact on the system stability.



For the internal R&C of DC load, please refer to the Input Capacity in specification table.



2.6 Remote Control Connection

The remote operation of Load can be done through GPIB, Ethernet, CAN BUS or USB interface. These connectors on the rear panel connect the Load to computer. Connect the Remote Controller to the Electronic Load before powering it on.

Notice

The GPIB, Ethernet and CAN BUS interfaces of Electronic Load are options for purchase. Do not hot-swap the GPIB, Ethernet and CAN BUS card.

2.7 Maintenance and Cleaning

Unplug the power cord of the hardware device first before cleaning. Use a brush to clean the dust on it. Use volatile liquid (such as Cleaning Naphtha) to clean the stain on the chassis if it cannot be brushed off. Do not wipe the chassis with any corrosive liquid to avoid damaging the case. Please use a slightly damp cloth to clean the front panel display. For internal

cleaning, please use a low-pressure air gun to clean the dust inside the device or send it back to the distributors or agents of Chroma for cleaning.

*It is recommended to clean the device regularly once a year.

2.8 Calibration and Verification

Be sure to verify the device accuracy annually on a regular basis. The verification procedures are described in Chapter 6. If repair service is required for the 63200A or out of specification, be sure to contact the sales distributors and service location worldwide listed in Chroma's web page http://www.chromaate.com/english/contact/default.asp.

3. Operation Overview

3.1 Introduction

The Chroma 63200A Series Electronic Loads are suitable for design, manufacturing, testing and quality assurance for electronic products. The load contains a set of front panel keypad, a VFD, two system bus ports, two USB ports, a GPIB card (optional), an Ethernet card (optional) or a CAN BUS card (optional). The user is able to use the built-in remote control functions to readback the current, voltage and other status. The store and recall functions can save up to 255 files, 10 programs and a group of default settings, and all data can be saved in the FLASH memory of Electronic Load for later use.

The Electronic Load is equipped with heat sink fans that can control the temperature intelligently to reduce overall noise level when the Load temperature rises or falls.

A load can operate independently in CC, CR, CV and CP mode. If your application requires the power or current capacity more than an Electronic Load can provide, multiple Electronic Loads can be used by connecting in parallel.

The Electronic Load allows the user to input the UUT spec including V and I for GO/NG check. Moreover, the VFD shows the measurements and deviation of specifications in real time to lead the user to adjust the setting parameters.

This chapter covers the descriptions of front and rear panels, initial settings and load operations in different modes.

Notice The A632009 and A632010 in 63200A Series are Slave models, and only support parallel function when the 63200A Series F/W version is Host(A):1.30 LOAD(C):1.30 or above.

3.2 Front Panel

The front panel contains a power switch, a VFD, hot keys, function keys, numeric keys, arrow keys, a push button rotary and a USB HOST connector as the model 63205A-150-500 shown in Figure 3-1.

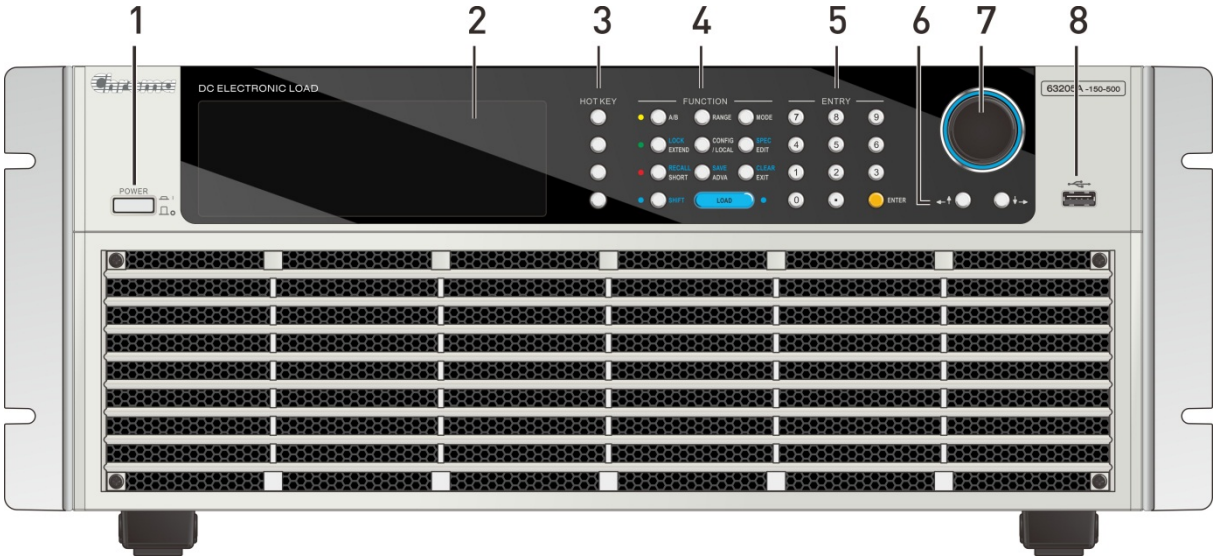


Figure 3-1 Front Panel of Model 63205A-150-500

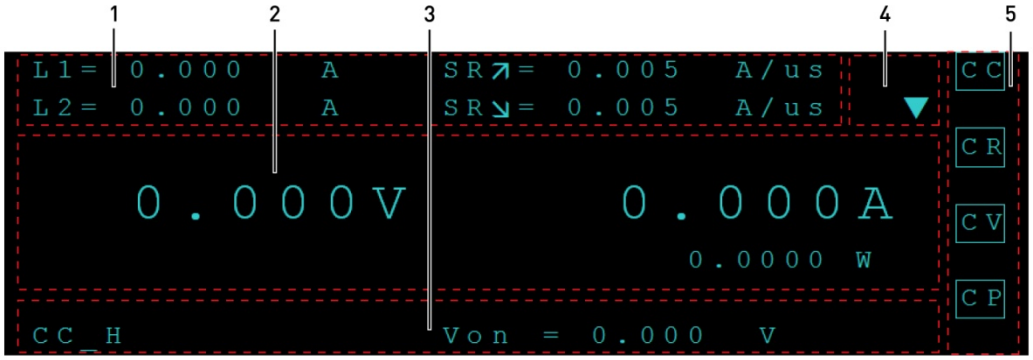
Table 3-1 Front Panel Description

Item	Name	Description	Refer to
1	Power switch	The AC power switch of Electronic Load.	
2	VFD	The display shows the setting and measurement information.	3.2.1
3	HOTKEY	The shortcut keys for switching loading modes.	3.2.2
4	FUNCTION keys	There are A/B, RANGE, MODE, EXTEND (not support yet), LOCK, Config/Local, EDIT, SPEC, SHORT, RECALL, ADVA, SAVE and CLEAR keys.	3.2.3
5	Entry keys	The numeric keys and ENTER key.	
6	Arrow keys	These two keys are used to change the setting page and select the desired form. They are also used to move the cursor to the desired position when editing parameters.	3.2.4
7	Push Button Rotary	Press down the push button rotary to enter into the parameter setting page. When the settings are done, press the push button rotary again to confirm the setting.	3.2.4
8	USB HOST	USB HOST (not fully support yet).	

3.2.1 VFD

The loading mode is displayed as below:

1. Parameter setting lines: The setting parameters of each mode.
2. Reading display: It displays the measured voltage (V), current (I) and power (W).
3. Status line: It shows the mode, range, Load ON, Short ON and Von status.
4. Up and down scroll: When a down arrow appears, it means there are parameters in the next page for setting.
5. HOTKEY: The shortcut for entering the mapped loading mode.



HOTKEY
There are 4 HOTKEYS that can switch the load mode rapidly. When in a load mode (such as basic or Advance mode), simply press a HOTKEY can switch to the mode indicated.

3.2.2 HOTKEY

Changing the HOTKEY

Press the HOTKEY for 2~3 seconds to switch the HOTKEY to the current operating mode and the HOTKEY display will change as well.

Notice It can set the frequently used mode as a HOTKEY to facilitate operation.

3.2.3 Function Keys

Table 3-2 Function Keys Description

Name	Description
A/B	It switches the load to A and B two types. A yellow indicator is located on the left of the function key.
RANGE	It switches the loading mode range through the cycle of H/M/L.
MODE	The menu for basic load modes.
EXTEND	This function is not available at present.
CONFIG/	It configures the function by setting up the parameters. It can also return to

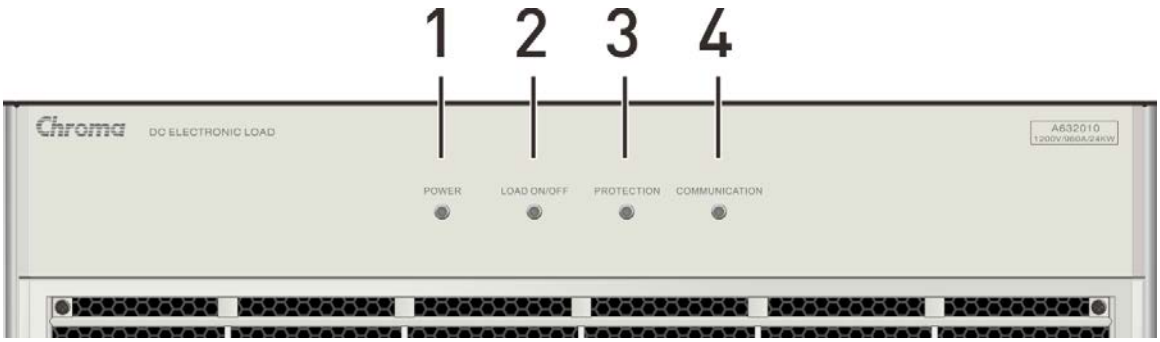
LOCAL	local control when in remote mode.
EDIT	The parameter editing function.
SHORT	It simulates the short circuit function. A red indicator is located on the left of the function key.
ADVA	The menu for advanced functions.
EXIT	It returns to the setup in previous level and exits the parameter input status.
SHIFT	It can execute the SHIFT composite function keys. A blue indicator is located on the left of the function key.
LOAD	The loading and unloading function key. The key has a blue indicator located on the right.

To enable the SHIFT composite function, press SHIFT first and the mapped function key.

Table 3-3 SHIFT Composite Function Keys

Name	Description
LOCK	It locks and unlocks the function. Any input is prohibited when lock is enabled.
SPEC	It provides GO/NG to test loading specification when enabled.
SAVE	It saves the settings of all modes to a specified file (1 to 10).
RECALL	It recalls the settings from the specified file (1 to 10).
CLEAR	It clears the input parameters.

A632009 and A632010 front panel:



No.	Name	Description
1	POWER	It shows the power on status.
2	LOAD ON/OFF	It shows LOAD ON or OFF status.
3	PROTECTION	It shows the protection status.
4	Communication	It shows the communication status. It is on when controlled and off when not, and blinking means it is designated.

3.2.4 Arrow Keys and Push Button Rotary

The arrow keys can be used to change the parameters and select the menu. When entering numeric values, pressing the “Left/Up” arrow key can be treated as backspace.

The push button rotary has push-down function. Pressing down the rotary can enter into the parameter setting page. Use the arrow keys to move the cursor to the desired parameter and then use the push button rotary to tune the setting value. When the parameter setting is done, press the push button rotary again to confirm it.

Notice

1. When entering numeric values, pressing the “Left/Up” arrow key can be treated as backspace.
2. The push button rotary has push-down function that can perform editing and confirmation functions.

3.3 Rear Panel

The rear panel has 2 System Bus ports, 1 USB port, 1 extended communication interface slot, 1 system I/O port, 1 AC LINE socket , 1 fuse holder and ventilation holes.

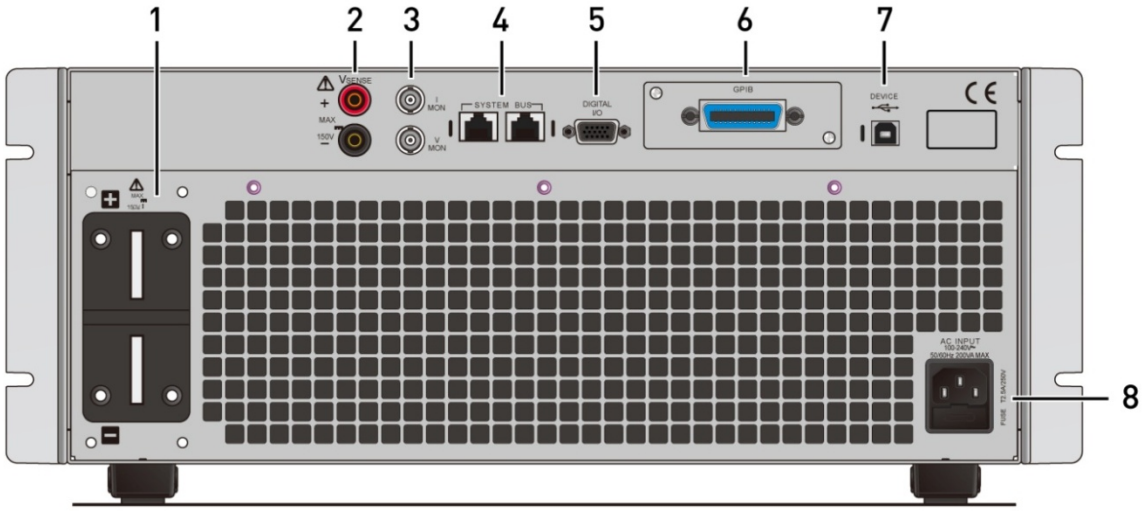
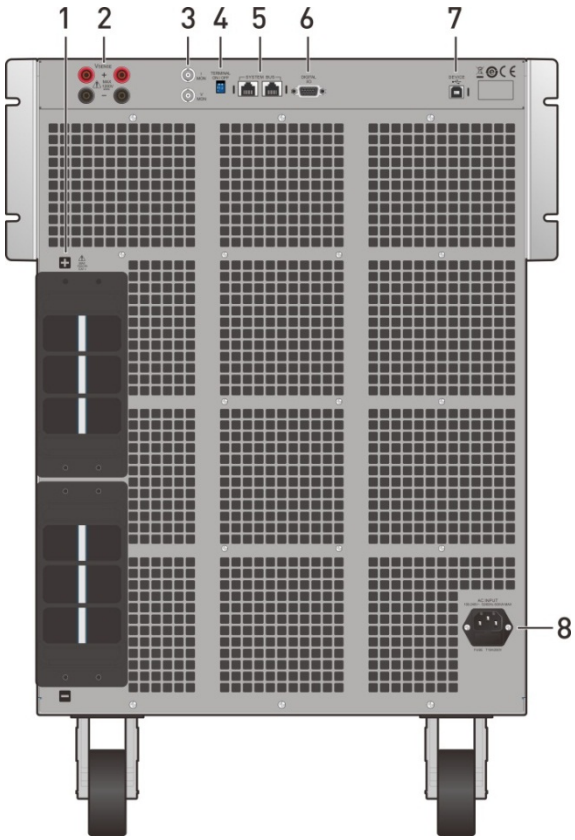


Figure 3-2 Rear Panel of 63205A-150-500 High Power Electronic Load

Item	Description	Refer to
1	The DC Load positive and negative terminals.	2.5.1
2	Vsense terminal: When the Vsense terminal connects to UUT, the Electronic Load will automatically switch to Vsense; otherwise, it will use the load terminal to perform the measurement.	2.5.2
3	V/I Mon: Two separate BNC connector to simulate the load voltage and current. VMON is 0~10V that map to 0V~full scale voltage while IMON is 0~10V that map to 0A~full scale current.	3.3.1
4	System Bus: The connectors for connecting multiple 63200A Series Load in parallel or series.	3.3.2
5	DIGITIAL I/O: The connector for external waveform input and digital system input/output signals. The digital system input/output signals are TTL compatible.	3.3.3
6	Extended communication interface: There are GPIB, Ethernet and CAN BUS interfaces for extension.	3.3.4
7	USB Device: It connects the PC and remote controller.	3.3.5
8	The power fuse.	

A632009 and A632010 rear panel:



Item	Description	Refer to
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3	V/I Mon: Two separate BNC connector to simulate the load voltage and current. VMON is 0~10V that map to 0V~full scale voltage while IMON is 0~10V that map to 0A~full scale current.	3.3.1
4	Terminating resistor: The last one needs to turn on the terminating resistor (switch no.1 down to ON) when paralleling the A632009 and A632010.	3.3.6
5	System Bus: The connectors for connecting multiple 63200A Series Load in parallel or series.	3.3.2
6	DIGITIAL I/O: The connector for external waveform input and digital system input/output signals. The digital system input/output signals are TTL compatible.	3.3.3
7	USB Device: It connects the PC and remote controller.	3.3.4
8	The power fuse.	3.3.5

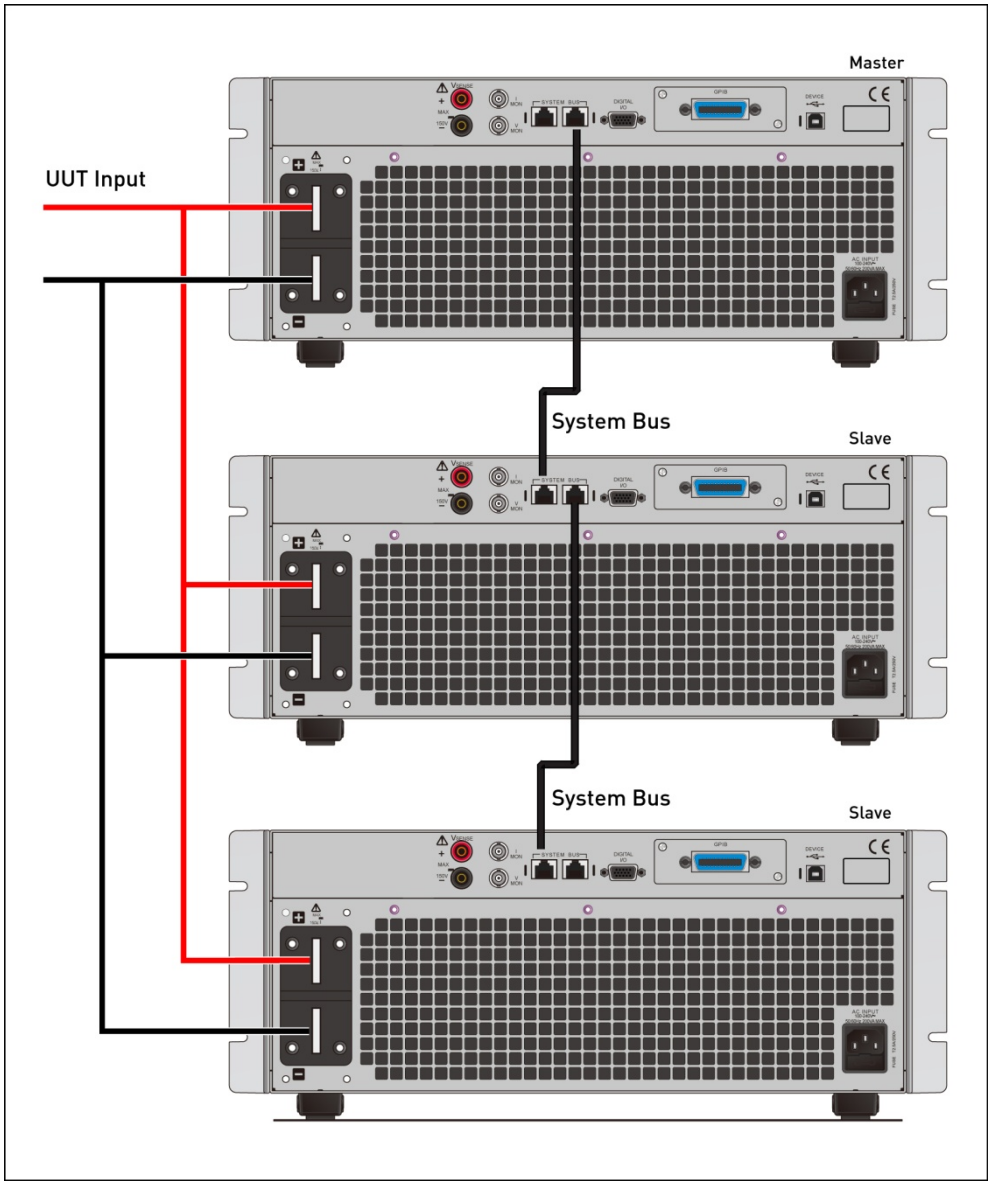
3.3.1 Voltage and Current Monitoring (V/I Mon)

Each channel on the load has two independent BNC connectors to monitor the voltage and current, also to output signals to I MON and V MON. The connectors are located on the rear panel. A 0V to 10V output signal is mapping to a 0 to full scale input range.

3.3.2 System Bus Port

A System Bus is a common used parallel port for 63200A Series Electronic Loads. The two System Bus ports are 10-pin connectors (RJ-45 male connector.) Be sure to use the cable of Chroma's standard accessory and ensure the load input power is connected correctly before connecting the System Bus.

See section 3.5.3 for the detailed parameter settings of System Bus.



⚠WARNING The chassis is grounded through the 3rd pin of power cord. Be sure the power socket is 3-pin type and the pin is properly grounded. The parallel cable is a standard Chroma accessory. Do not use the cable of other brand to avoid damaging the equipment. The System Bus is a parallel connecting port of 63200A Series Electronic Load; do not connect it with other devices to avoid damaging the equipment.

3.3.3 DIGITIAL IO

The IO port is a 15-pin D-SUB male connector on the rear panel of 63200A Series Electronic Load. It contains 0-10V_{DC} external input analog signals and digital I/O signals. The digital I/O signals are TTL compatible and defined as below:

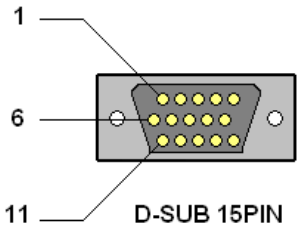


Figure 3-3 63200A Series I/O Port Connector

Table 3-4 Pin Assignments of 63200A Series I/O Port Connector

Pin	Signal	Pin	Signal	Pin	Signal
1	EXT_WAVE_I	**6**	LOAD_ON_ST	**11**	DI1
2	EXT_WAVE_V	**7**	TRIG_SEQ	**12**	DI2
3	GND	**8**	DO1	**13**	DI3
4	SHORT_ST	**9**	DO2	**14**	GND
5	TRIG_DIGI	**10**	DO3	**15**	GND

Notice

1. Pin [1:2]: EXT_WAVE[I:V]→ the external waveform input signal with input range from 0 to 10V.
2. Pin [3:14:15]: the GND signal.
3. Pin [4]: SHORT ST→ the Short ON output signal, TTL Level and Active High.
4. Pin [5]: the trigger source for TRIG_DIGI external trigger input signal to be become digital. TTL Level, falling edge and pulse width are ≥1μs.
5. Pin [6]: the Load ON output signal, TTL Level and Active High.
6. Pin [7]: TRIG_ SEQ → the external input signal is automatically triggered in the following sequence: TTL Level, falling edge, and pulse width are ≥1μs.
7. Pin [8:9]: DO[1:2]→ the binary digital output signal, high level: 4.7kΩ resistance increases to 5V, low level <0.6V, loading current = 10mA.
8. Pin [10]: DO3 is a reserved pin.
9. Pin [11:12]: DI[1:2] provides External Load ON/OFF function so that the user can use the input signal to control Load ON/OFF externally. When DI1 and DI2 are both set to External Load ON/OFF, both signals need to be HIGH to Load OFF, and on the contrary both signals need to be LOW to Load ON.
   When DI1 (or DI2) is set to Remote Inhibit and Low, all channels in the electronic load are Load OFF and a message of REMOTE INHIBIT will appear. If this protection is not cleared, even the DI1 (or DI2) is High, Load on cannot be executed.
   When DI1 (or DI2) is set to Safety Interlock, the Low signal is ON and High signal is OFF. It will start loading when Load on is enabled on the panel and DI1 (or DI2) is ON. It will stop loading if any one of them is OFF.
   DI1 and DI2 are for communication control and the action time

should be less than 5ms.

10. Pin [13]: DI3 is the power input of A632009 and A632010.

3.3.4 Extended Communication Interface

The GPIB, Ethernet, and CAN BUS communication interface can be expanded. The user should know and set the GPIB, Ethernet and CAN BUS addresses when using PC with GPIB, Ethernet or CAN BUS to remote programming the Electronic Load. Every device that connects to the GPIB interface will be assigned a unique address.

See section 3.5.6 *Setting Remote Communication Interface* for the parameter settings of GPIB communication interface.

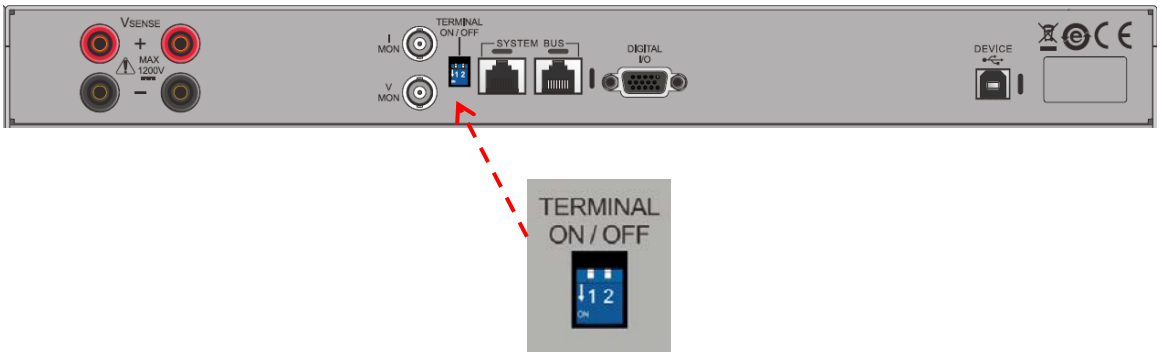
Notice A632009 and A632010 do not support GPIB, Ethernet and CAN BUS interfaces.

3.3.5 USB Remote Control

The Universal Serial Bus (USB) port on the rear panel is a 4-pin USB connector that can be used to connect the remote controller or PC for remote control.

3.3.6 Terminating Resistor

The last A632009 and A632010 paralleled device needs to turn on the terminating resistor (switch no.1 down to ON).

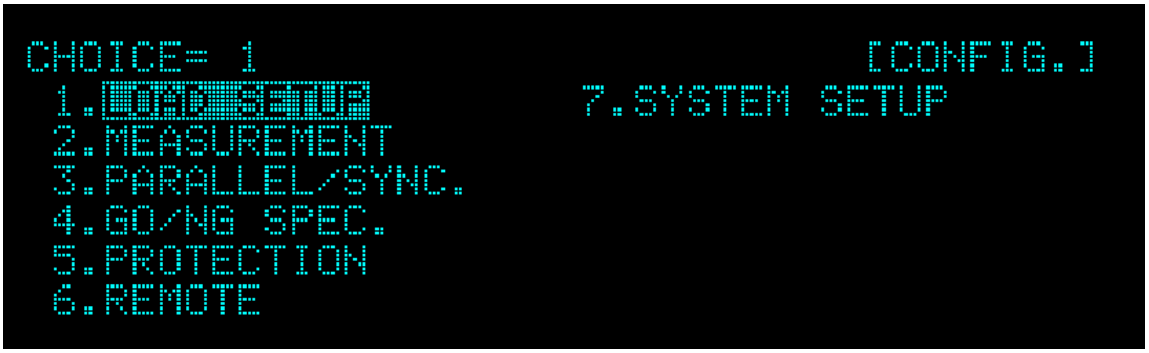


3.4 Local/Remote Control

Local (front panel) control effects right after the device is powered on. The keys and display on the front panel can be operated manually. The remote control begins when the 63200A Series Electronic Load receives commands via GPIB/Ethernet/USB/ CAN BUS interface. Only the PC/ Remote Controller can control the Load when remote control is in effect. The front panel keys are all invalid except **LOCAL** key. The user can press **LOCAL** to return to local control mode.

The detailed descriptions of basic remote programming are listed in Chapter4.

3.5 Configure



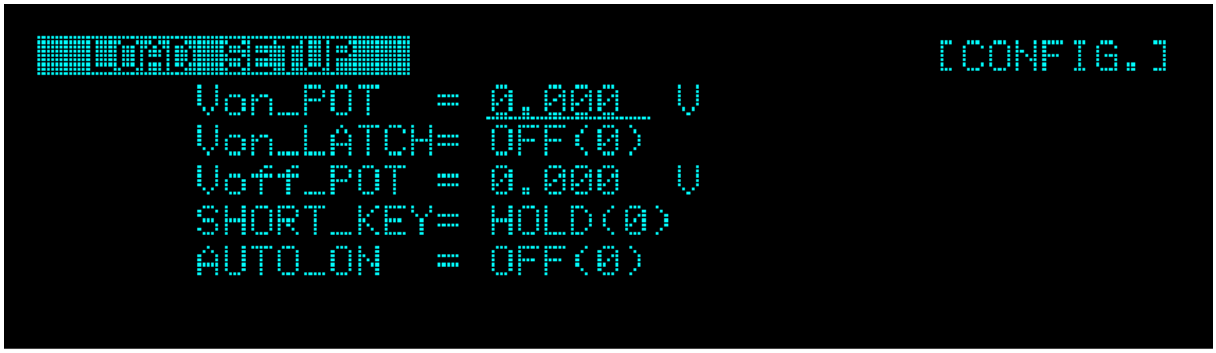
Main function setup description:

	Main Function	Description	Refer to
Configure	Load Setup	Setup for load parameters.	3.5.1
	Measurement	Setup for measurement parameters.	3.5.2
	Parallel and Sync.	Setup for parallel and sync. functions.	3.5.3
	GO/NG Spec	Setup for spec inspection parameters.	3.5.4
	Protection	Setup for current, power protection parameters.	3.5.5
	Remote	Setup for communication interface.	3.5.6
	System Setup	Setup for system functions.	3.5.7

Sub function setup description:

Main Function	Sub Function	Description
Load Setup	Von_POT	Set the start loading voltage.
	Von Latch	Lock the start loading voltage.
	Von_Voff	Set the voltage to unload.
	Short Key	Set short circuit simulation function.
	Auto On	Set auto loading at power on.
Measurement	Window T	Set the average measurement time.
	Sign of Voltage	Set the voltage sign for display.
	Digitizing	Set the data capturing function.
Parallel and Sync.	Address	Set the communication address.
	Terminator	Set the terminal resistor.
	Sync.	Set the synchronization function.
	Parallel	Set the parallel function.
	PARA. NUM	Set the parallel number.
	INITIAL	Initialization for parallel.
Protection	OCP	Over current protection defined by user.
	OPP	Over power protection defined by user.
Remote	GPIB	Set the GPIB communication interface.
	Ethernet	Set the Ethernet communication interface.
	Digital I/O	Set the I/O function.
	CAN	Set the CAN BUS communication interface.
System Setup	Enter Key	Switch to the input parameter.
	Sound	Set the button to beep when pressed.
	Brightness	Adjust the VFD brightness.
	Factory Default	Restore to factory default.
	Information	Show the production information.
	Calibration	Set the calibration function.

3.5.1 Load Setup



Von_POT, set the start loading voltage level
The current will start loading when the Electronic Load is in Load ON state and the UUT output voltage reaches the start loading voltage level (Von).

Von_LATCH, lock the start loading voltage
Latch ON means Load will continue loading current when it reaches Von.
Latch OFF means loading current will stop when the UUT voltage is lower than Von.
The Von latch default is OFF.

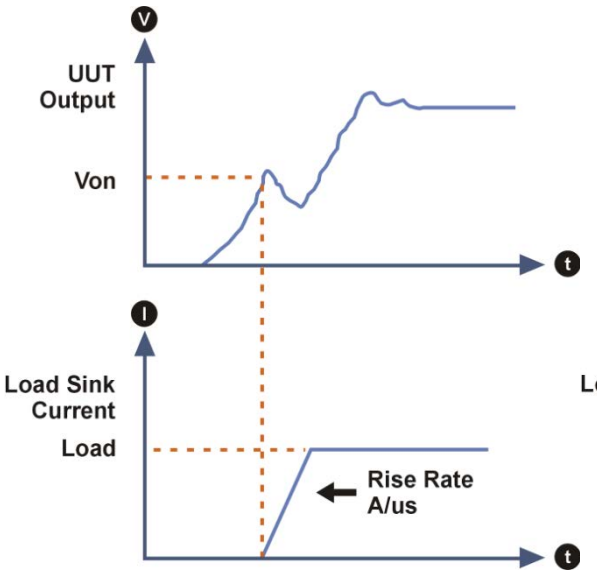
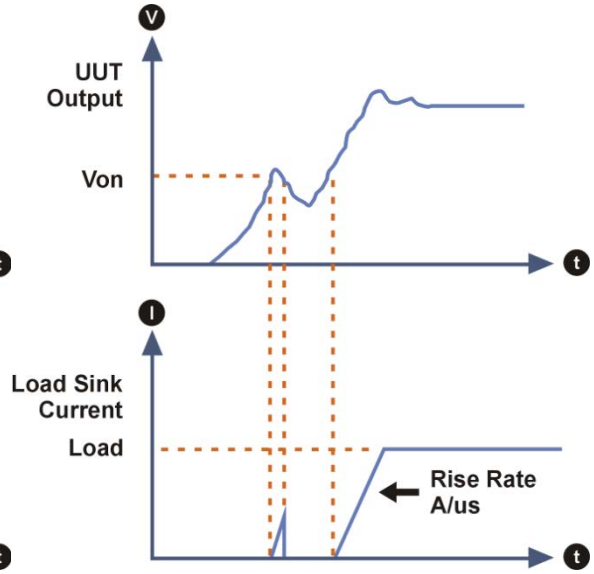


Figure 3-4 Von LATCH ON Current Waveform



Von LATCH OFF Current Waveform

Voff_POT, set the unload voltage level
The Electronic Load will close the loading state (Load OFF) when the UUT output is dropped to Voff. The Voff default is 0V.

CAUTION

1. The Electronic Load is able to simulate the loading conditions. When the UUT output voltage reaches Von, the Electronic Load will start or stop loading current. The Electronic Load starts loading current when it is ON and the input voltage exceeds Von and stops loading when it is OFF or the input voltage is lower than Von. To avoid logic error, Voff should be smaller than or equal to Von.
2. If Von_POT is set lower than the UUT minimum operating voltage, it could cause the UUT unable to turn on or to generate overshoot voltage or current when the load is set too high. Therefore, it is

necessary to consider if the UUT minimum operating voltage spec is met when setting Von_POT.

3. Voff can only be used when Von latch is on. Please note that Voff must be lower than Von.

Short Key, set for short circuit
Before using the short circuit function, the user has to set it first so that it can be controlled by the Short key on the front panel or remotely. The settings are described as below.

Disable:	Turn off the SHORT key function.
HOLD:	Press and hold the SHORT key to function. The Short state is cleared when released.
TOGGLE:	Press SHORT key to enter into Short state and press SHORT key again to clear the state.

The default is Disable.

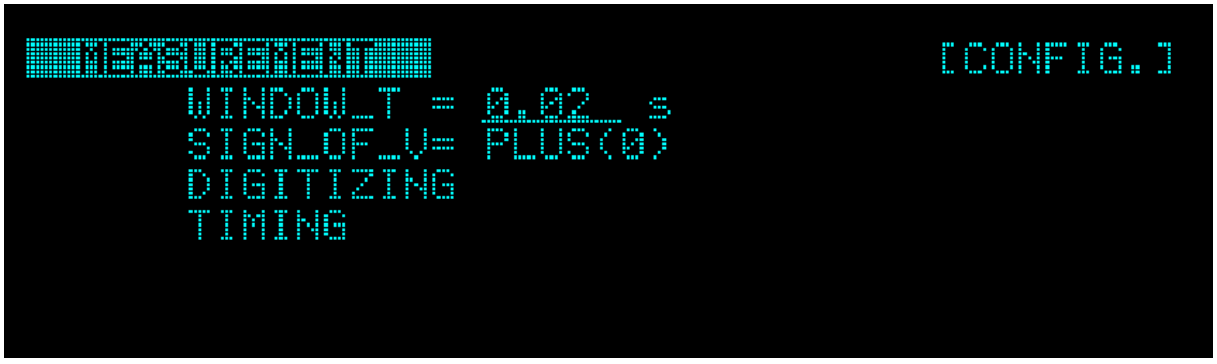
Notice

1. When operating in Short mode, the Load uses the maximum rated current and power of the range to simulate the short circuit.
2. It will not affect the programmed settings when Short is on, and the Load input will return to the previous programmed value when Short is off.

AUTO ON, set for auto loading at power on
When Auto is on, the Load will apply the loading parameters and mode set last time before turned off for loading when power on next time. The default is OFF.

3.5.2 Measurement

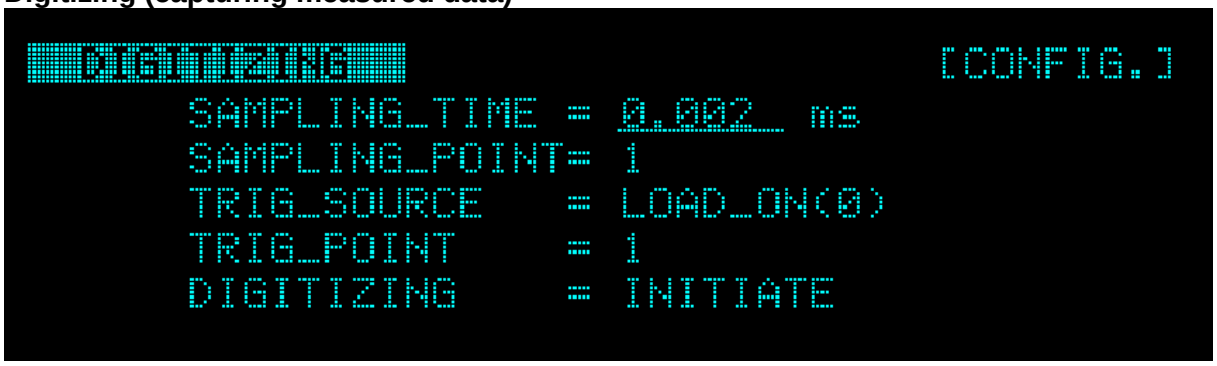
Window Time



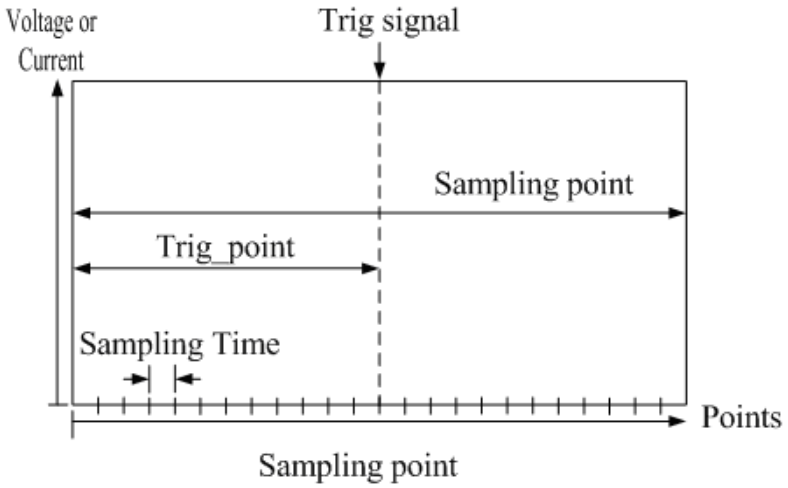
This function adjusts the average measurement time.
The setting range is 0.02s~61s and the default is 0.02s.

Sign of Voltage
This function changes the voltage sign for display.
The voltage shows a negative sign when MINUS is selected and shows no sign if PLUS is selected. The default is PLUS.

Digitizing (capturing measured data)



The 63200A Series Electronic Load provides data capturing function for measured data to record the waveform. It can record the measured data during loading via this function.



Parameters:

Sampling Time:	The sampling time for measured data.
Sampling Point:	The total sampling point for measured data.
Trig Source:	The trigger conditions for data capturing. There are Load ON, Load OFF, TTL (DIGITAL IO:TRIG_DIGI signal), BUS trigger and Manual trigger available for triggering. The default is Load ON.
Trig Point:	Set the trigger point.
DIGITIZING:	Trigger the data capturing.

3.5.3 Parallel and Sync.

The Electronic Load is able to set for parallel and synchronization. First, follow the steps described in section 2.5.3 to connect the SYSTEM BUS on the rear panel. For parallel, simply set the MASTER and it can control the loading on the MASTER and SLAVE in the parallel group. For the details of parallel and synchronization setting, please see *Appendix B Parallel Procedure and Example*.

For synchronization, the loading values need to be set separately for all MASTER and SLAVE; however, the synchronization of LOAD ON/OFF is controlled by MASTER.

ADDRESS
In the SYSTEM BUS network, all Electronic Load has to set a communication address without duplicates. The setting range is 1~10 and the default is 1.

Terminator
It sets the terminal resistor required for SYSTEM BUS. The terminator function needs to be enabled on the first and last Electronic Load in the SYSTEM BUS network. As to the devices in between, they need to be set to OFF. It can set to ON(1)/OFF(0) and the default is OFF(0).

SYNC MODE
Set the standalone device to be MASTER or SLAVE in a synchronization group. It can set to DISABLE(0), MASTER(1), SLAVE(2) and the default is OFF(0).

PARA MODE
Set the standalone device to be MASTER or SLAVE in a parallel group. It can set to DISABLE(0), MASTER(1), SLAVE(2), and the default is OFF(0).

PARA. NUM
Set the number for parallel at a maximum of 10. The setting of PARA. NUM is Master + Slave and the set number should be the same as the actual paralleled number.

INITIAL
It initializes for parallel. When ON is selected for INITIAL, the parallel communication will be connected and disconnected when OFF is selected.

Parallel and synchronization supporting mode list[*1*2*3]:

Mode	Parallel	Sync.
CC Mode	O	O
CR Mode	O	O
CV Mode	O	O
CP Mode	O	O
CCD Mode	O	O
CRD Mode	O	O
Battery Mode	O	O
Sine Wave Dynamic	O	O
OCP/OPP Test	O	O
Sweep	O	O
CZ Mode	X	X
CVCC	X	X
CRCC	X	X
CVCR	X	X
Auto Mode	X	X
Program	O [*4*5]	O
UDW	O [*4*6]	O
MPPT	X	O
External Waveform	X	O
Short Function	O	O

Parallel and synchronization functions list:

Function	Parallel	Sync.
DIGITIZING	X	X
TIMING	O	O
GO/NG SPEC.	X	O
PROTECTION	O	O
SAVE/RECALL	X	O

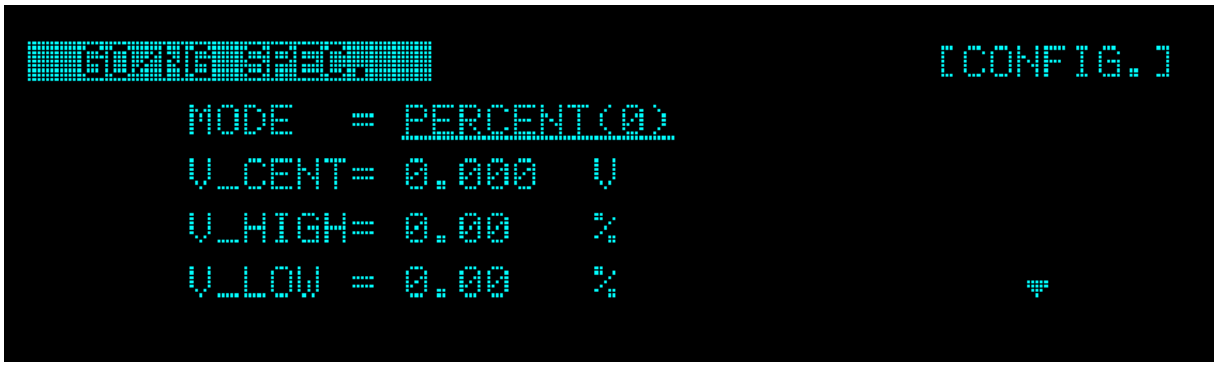
CAUTION

1. The terminator function needs to be enabled on the first and last Electronic Load in the SYSTEM BUS network. As to the devices in between, they need to be set to OFF. It could cause bad communication if the terminators are set wrong. When the 63200A Series Loads are paralleled, the Address must start from 1 to 10 sequentially without any skip. For example, if two 63200A Series Loads are paralleled, the first one is Master and the Address has to be 1, while the second one is Slave and the Address must be 2 with no number skipped.
2. Set NONE for the unit not to be paralleled. For instance, set the 6th and the unit followed to NONE when paralleling 5 units; otherwise, connection error may occur during parallel connection.
3. Only support parallel connection for models of the same voltage.
4. When paralleled, the loading current error time between Master and Salve is less than 20 μs in Program and UDW mode, and calibrate every cycle period.
5. The Program mode does not support Von Latch off when paralleled.
6. The minimum of INTERV parameter in UDW mode changes 0.03

ms when paralleled.
7. A632009 and A632010 only support parallel function.

3.5.4 GO/NG Spec. Testing

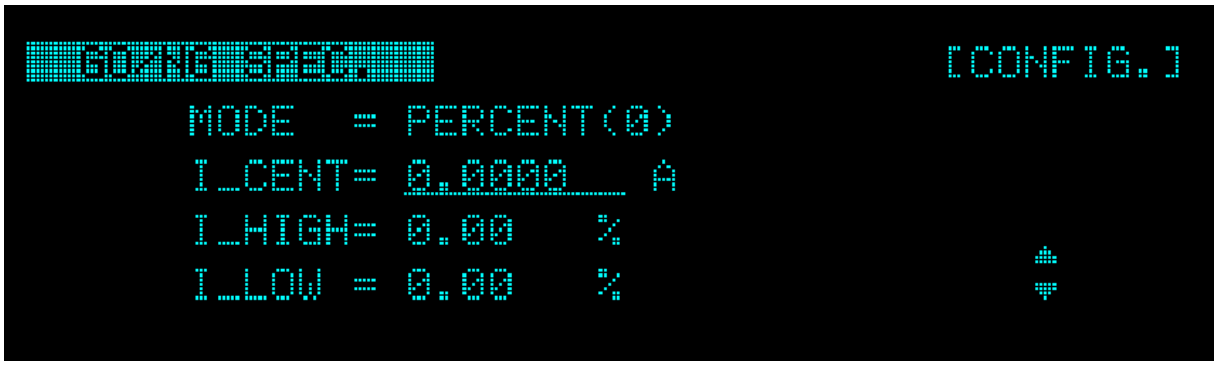
The Electronic Load GO/NG testing function allows the user to program the spec of voltage, current and power. Turn on the SPEC testing function during testing and the testing result can be displayed simultaneously. GO will show if the SPEC is met and NG will appear if not.



1. Setting the voltage spec.:

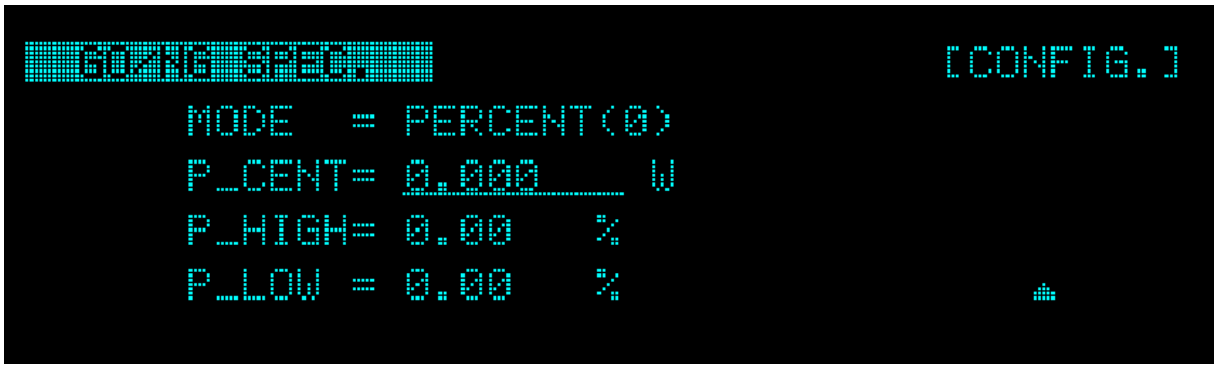
Parameters:
MODE: There are VALUE and PERCENT two modes for setting.
V_CENTER: The setting for input reference level.
V_HIGH: The parameter setting is voltage level when the MODE is set to VALUE and the percentage range (0 to 100%) when the MODE is set to PERCENT.
V_LOW: The parameter setting is voltage level when the MODE is set to VALUE and the percentage range (0 to 100%) when the MODE is set to PERCENT.

2. Setting the current spec.:



Parameters:
MODE: There are VALUE and PERCENT two modes for setting.
I_CENTER: The setting for input reference level.
I_HIGH: The parameter setting is current level when the MODE is set to VALUE and the percentage range (0 to 100%) when the MODE is set to PERCENT.
I_LOW: The parameter setting is current level when the MODE is set to VALUE and the percentage range (0 to 100%) when the MODE is set to PERCENT.

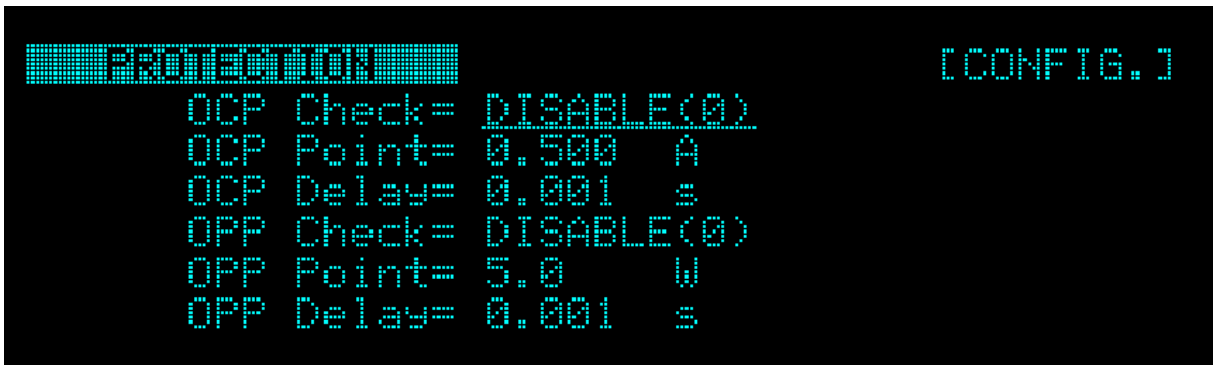
3. Setting the power spec.:



Parameters:
MODE: There are VALUE and PERCENT two modes for setting.
P_CENTER: The setting for input reference level.
P_HIGH: The parameter setting is power level when the MODE is set to VALUE and the percentage range (0 to 100%) when the MODE is set to PERCENT.
P_LOW: The parameter setting is power level when the MODE is set to VALUE and the percentage range (0 to 100%) when the MODE is set to PERCENT.

Notice The SPEC function can be enabled for GO/NG to test the loading spec. The user needs to press SHIFT first and then SPEC.

3.5.5 Customized Protection



OCP (over current protection defined by user)
The Electronic Load has over current protection that can be customized for different UUT to prevent them from being damaged due to error operation.

OPP (over power protection defined by user)
The Electronic Load has over power protection that can be customized for different UUT to prevent them from being damaged due to error operation.

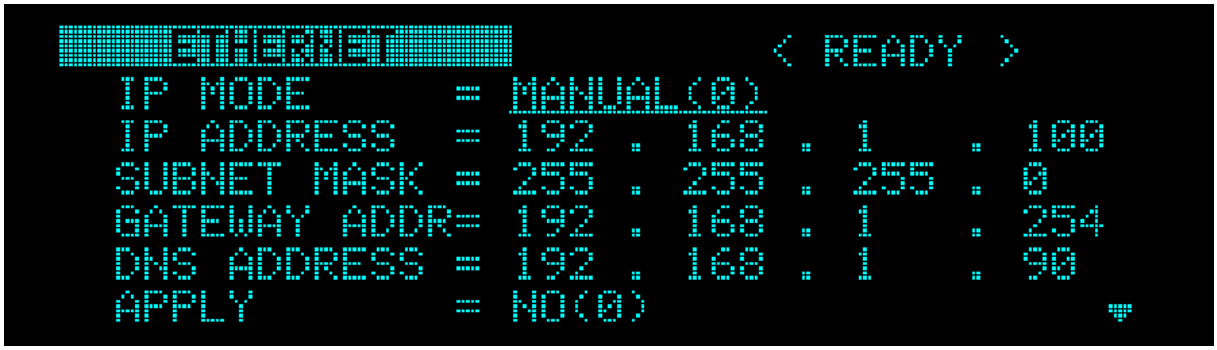
3.5.6 Setting Remote Communication Interface

GPIB
It sets the GPIB address.

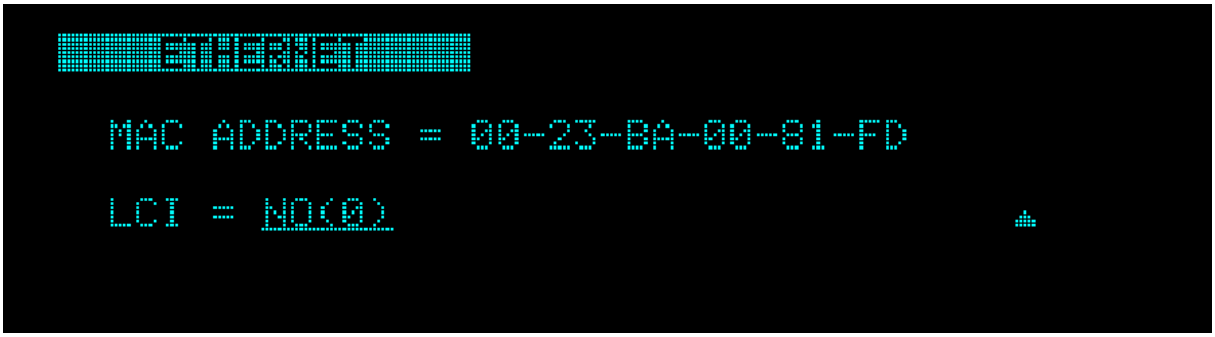
ETHERENT
It sets the ETHERENT address. The Ethernet supports the connection speed at 10 or 100 Mbit/s.

The ETHERNET IP setting can be changed via numeric keys to adjust the settings. When MANUAL (0) is set for IP MODE, the rest of the network settings will be applied. If AUTO (1) is set for IP MODE, the rest of the network settings will be ignored. When the modifications are done, go to APPLY and press 1(YES(1)) to start updating the network configuration. <READY> will appear when the settings are done.

The application NI-MAX (Measurement & Automation Explorer) from National Instruments can be used to communicate with the user's instrument for programming. If NI VISA is in use, it is necessary to open the VISA Session Resource Name format, TCPIP0::<IP address>::2101::SOCKET, ex.TCPIP0::10.1.7.100:: 2101::SOCKET. If NI VISA is not in use, specify the TCP/IP SOCKET PORT to 2101.

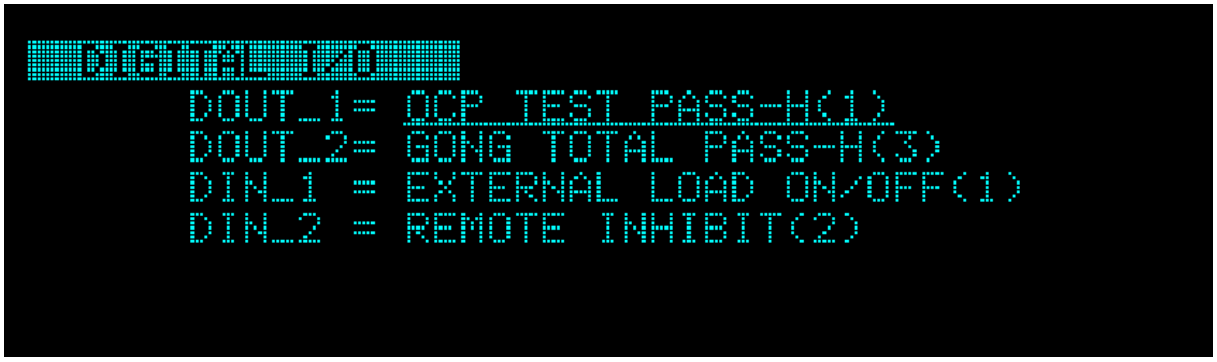


The ETHERNET 2/2 page shows the MAC ADDRESS and LCI (LAN Configuration Initialize) settings.



When YES(1) is set for LCI, a confirmation screen will appear. Select YES(1) and the network settings will restore to default.

Digital I/O
It sets the digital I/O for the system I/O port on the 63200A Series rear panel.



DOUT_1/DOUT_2 can set to the following status:

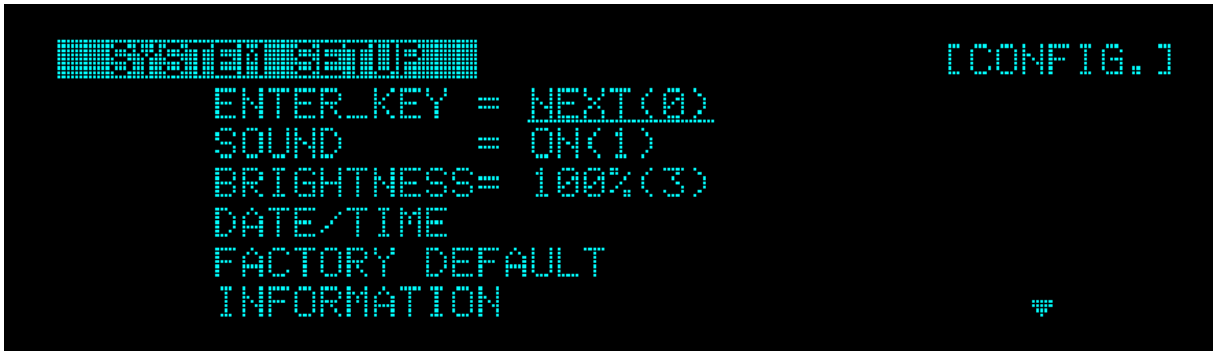
NONE(0)
OCP TEST PASS-H(1)
OCP TEST PASS-L(2)
GONG TEST PASS-H(3)
GONG TEST PASS-L(4)
OTP OVP OCP OPP REV-H(5)
BUS CTRL. ACTIVE_H(6)
BUS CTRL. ACTIVE_L(7)

DIN_1/DIN_2 can set to the following status:

NONE(0)
EXTERNAL LOAD ON/OFF(1)
REMOTE INHIBIT(2)

CAN BUS
It sets the ID, MASK, BAUD and SPCI ID functions

3.5.7 System Setup

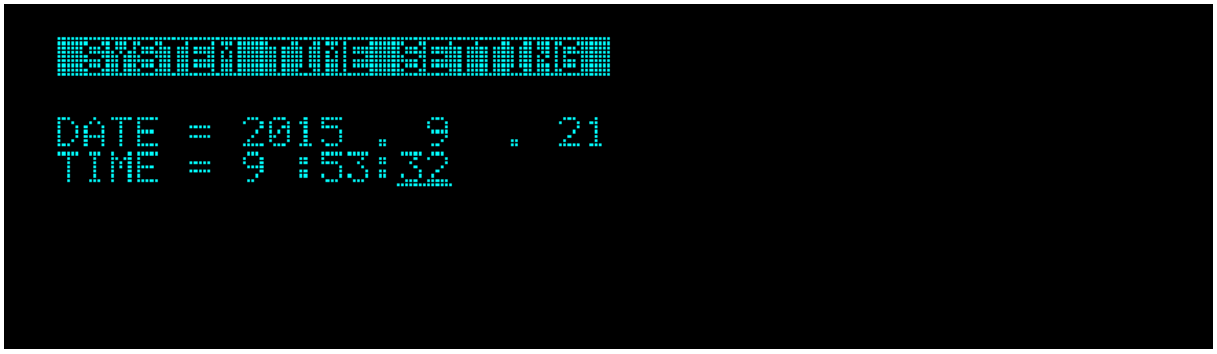


Enter Key
It automatically switches the parameter to the next item when pressed. It can set to NEXT or FIXED. The default is NEXT.

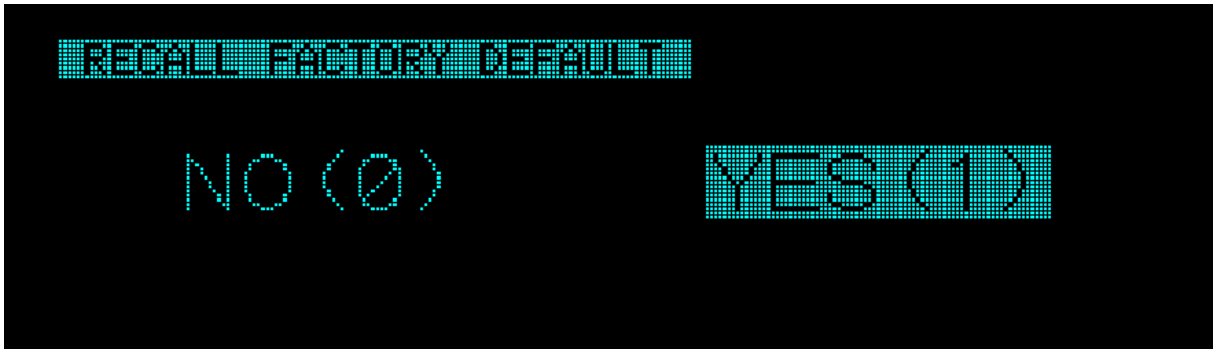
Sound
The key beeps when pressed. The default is ON.

Brightness
The VFD brightness adjustment: 25 % / 50% / 75% / 100%. The default is 100%.

DATE/TIME
It is for the user to set the date and time.



Factory Default
It returns to the factory default including the settings and parameters under Configure.



Information
The product information comprises model number, serial number and firmware version.

Notice When the 63200A is in parallel mode, the Master will display the Slave's model no., serial no., firmware version, voltage, current, and power information.

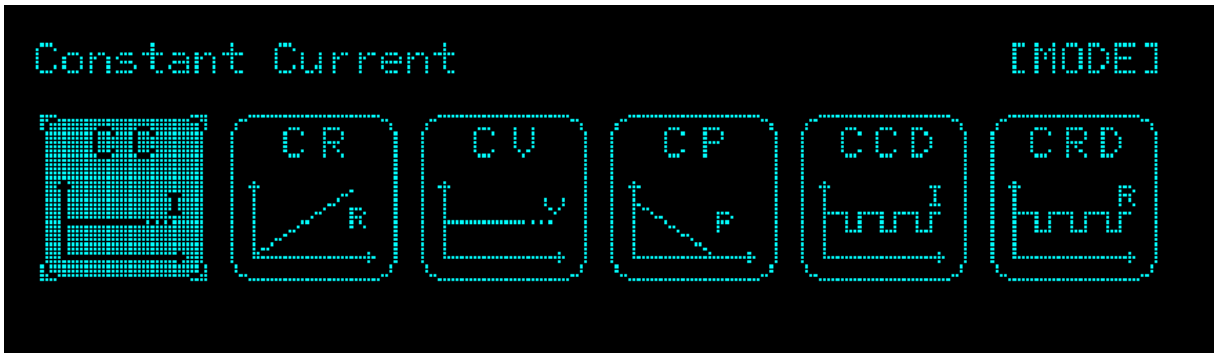
Calibration
It is the calibration function.

Notice Be sure to contact the technical service center of Chroma for any calibration requirements.

3.6 Basic Operation Modes

There are six modes of operation: Constant Current (CC), Constant Resistance (CR), Constant Voltage (CV), Constant Power (CP), Constant Current Dynamic (CCD) and Constant Resistance Dynamic (CRD).

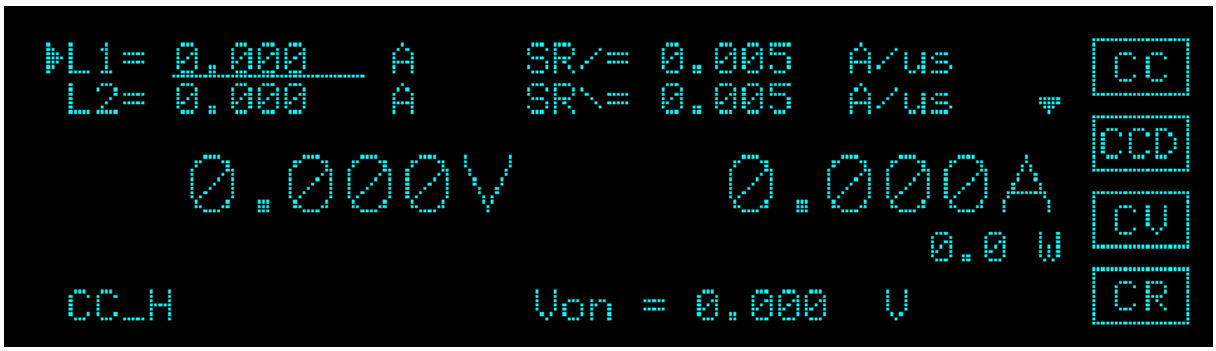
When you press MODE key to program a mode, the Load will change to a new mode. In change of modes the Load's input is momentarily disabled before a new mode is enabled. The parameters in current, resistance or voltage mode can be programmed easily when the mode is selected.



The parameter set in all modes will be rescaled to fit the resolution of that parameter. In local mode, any value can be set by the keypad. When the programmed parameter is over the boundary, the Load will set the maximum or minimum level. In remote mode the programmed value cannot be over boundary. An error will occur when the parameter is over the maximum or minimum value.

3.6.1 Constant Current Mode

In CC mode, the Load will sink a current in accordance with the programmed value regardless of the input voltage. To enter into the CC mode, press the MODE key and select **CC** mode.



Parameters:
L1: Set the loading value for A load.
L2: Set the loading value for B load.
SR↗: Set the current rise slew rate data.
SR↘: Set the current fall slew rate data.
Vrange: Set the voltage measurement range of Electronic Load. There are H, M and L for selection.
The push button rotary and arrow keys can be used to change the selection and the numeric keys can input the setting values.

Ranges (Low, Middle, High)
Current can be programmed in any of the three ranges, low range, middle range and high range. The low range provides better resolution at low current setting. If any value is over the maximum of low range, you must select the middle range. When any value is over the maximum of middle range, you must select the high range. To change the range, press the RANGE key few times until the VFD range indicator is active at you want to select. The mode change will affect the Load, so will the change of range. Both of them will cause the input to go through an off state. If the CC mode of Load is active, the new setting will change the input immediately at a rate determined by the slew rate setting.

A/B State Switch

The static function has two setting levels L1 and L2. Use the A/B key on the Load to manually switch between the two programmed states. Slew rate determines the rate at which Load level changes from one load level state to another. Figure 3-5 shows the current level of load after pressing A/B key.

State A=4A, State B=2A, Rise ⎍ =0.2A/μs, Fall ⎺_ =0.08A/μs

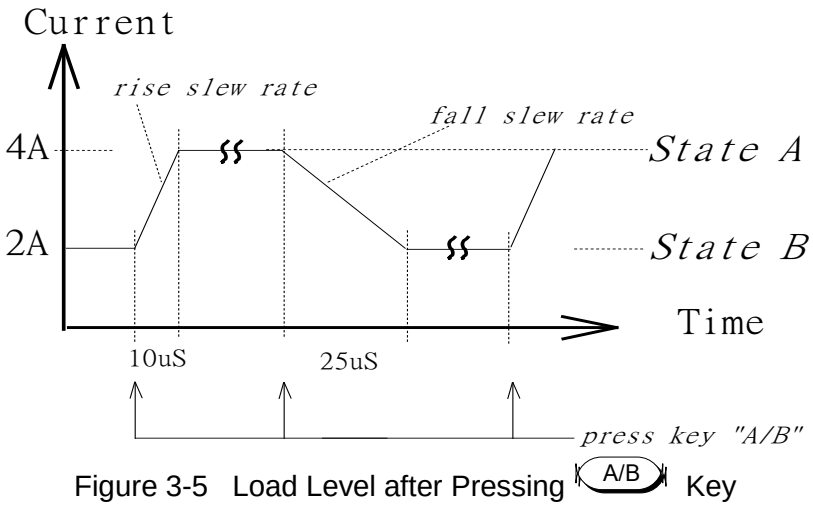
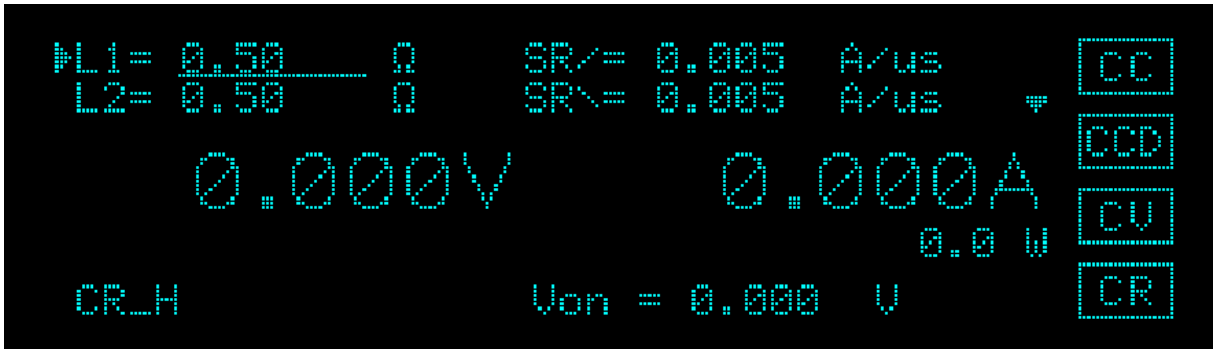


Figure 3-5 Load Level after Pressing A/B Key

3.6.2 Constant Resistance Mode

In CR mode, the Load will sink a resistance in accordance with the programmed value regardless of the input voltage. To enter into the CR mode, press the MODE key and select **CR** mode.



Parameters:
L1: Set the load value for A load.
L2: Set the load value for B load.
SR↗: Set the current rise slew rate data.
SR↘: Set the current fall slew rate data.
I_RANGE: Set the current measurement range of Electronic Load. There are H, M and L for selection.
The push button rotary and arrow keys can be used to change the selection and the numeric keys can input the setting values.

Ranges (Low, Middle, High)
Resistance can be programmed in any of the three ranges, low range, middle range and high range. The low range provides better resolution at low resistance setting. If any value is over the maximum of low range, you must select the middle range. When any value is over the maximum of middle range, you must select the high range. To change the range, press the RANGE key few times until the VFD range indicator is active at you want to select. The mode change will affect the Load, so will the change of range. Both of them will cause the input to go through an off state. If the CR mode of Load is active, the new setting will change the

input immediately at a rate determined by the slew rate setting.

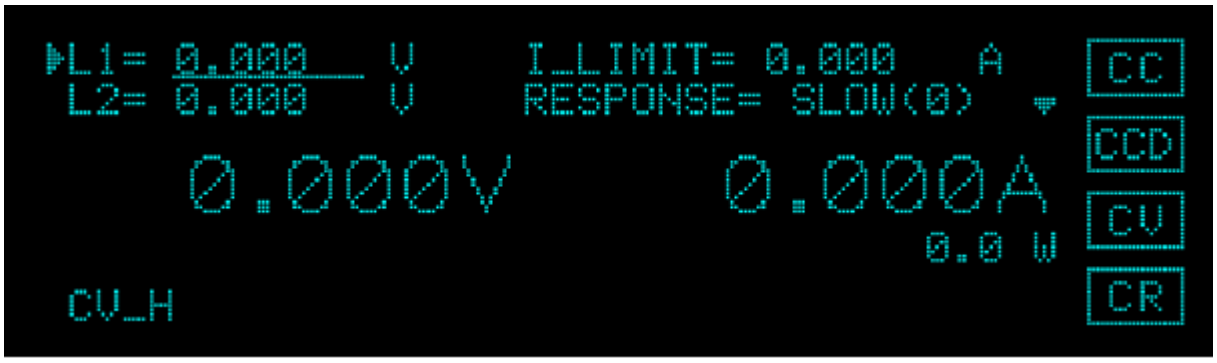
A/B State Switch

The static function has two setting levels L1 and L2. Use the A/B key on the Load to manually switch between the two programmed states. Slew rate determines the rate at which Load level changes from one load level state to another.

CAUTION It is suggested to use a remote sense cable to measure the UUT output voltage.

3.6.3 Constant Voltage Mode

In CV mode, the Load will sink current to control the voltage source in programmed value. Constant Voltage mode has 3 types of response speeds: fast, normal and slow. To enter into the CV mode, press the MODE key and select CV mode.



Parameters:
L1: Set the load value for A load.
L2: Set the load value for B load.
I_LIMIT: Set the maximum current for load.
RESPONSE: Set the Electronic Load response speed to FAST, NORMAL or SLOW.
I_RANGE: Set the current measurement range of Electronic Load. There are H, M and L for selection.
The push button rotary and arrow keys can be used to change the selection and the numeric keys can input the setting values.

Ranges (Low, Middle, High)

Voltage can be programmed in any of the three ranges, low range, middle range and high range. The low range provides better resolution at low voltage setting. If any value is over the maximum of low range, you must select the middle range. When any value is over the maximum of middle range, you must select the high range. To change the range, press the RANGE key few times until the VFD range indicator is active at you want to select. The mode change will affect the Load, so will the change of range. Both of them will cause the input to go through an off state. If the CV mode of Load is active, the new setting will change the input immediately at a rate determined by the slew rate setting.

A/B State Switch

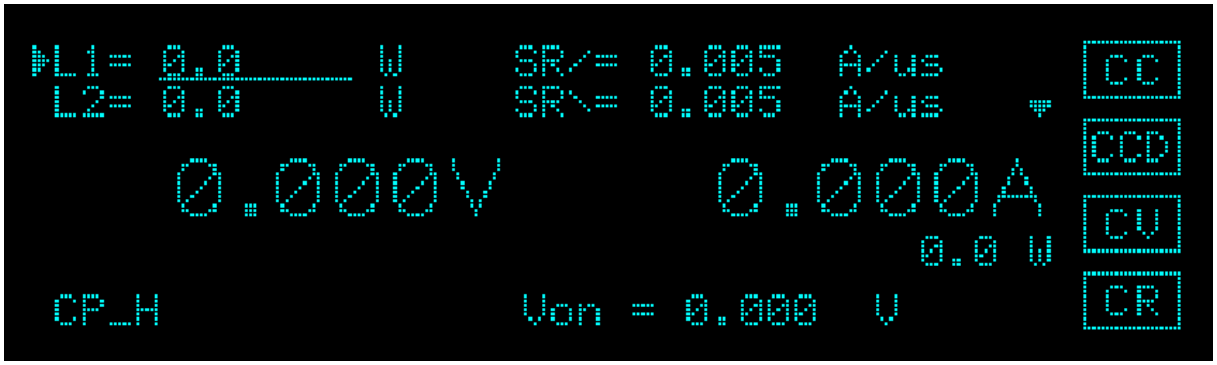
The static function has two setting levels L1 and L2. Use the A/B key on the Load to manually switch between the two programmed states. Slew rate determines the rate at which

Load level changes from one load level state to another.

CAUTION It is suggested to use a remote sense cable to measure the UUT output voltage.

3.6.4 Constant Power Mode

In CP mode, the Load will sink a current according to the programmed power. To enter into the CP mode, press the MODE key and select **CP** mode.



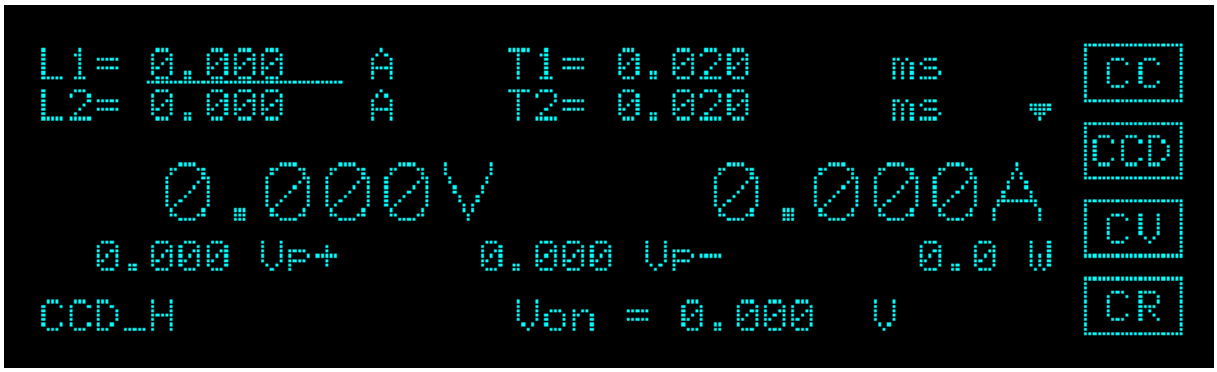
Parameters:
L1: Set the load value for A load.
L2: Set the load value for B load.
SR↗: Set the current rise slew rate data.
SR↘: Set the current fall slew rate data.
Vrange: Set the voltage measurement range of Electronic Load. There are H, M and L for selection.
The push button rotary and arrow keys can be used to change the selection and the numeric keys can input the setting values.

Ranges (Low, Middle, High)
Power can be programmed in any of the three ranges, low range, middle range and high range. The low range provides better resolution at low power setting. If any value is over the maximum of low range, you must select the middle range. When any value is over the maximum of middle range, you must select the high range. To change the range, press the RANGE key few times until the VFD range indicator is active at you want to select. The mode change will affect the Load, so will the change of range. Both of them will cause the input to go through an off state. If the CP mode of Load is active, the new setting will change the input immediately at a rate determined by the slew rate setting.

A/B State Switch
The static function has two setting levels L1 and L2. Use the A/B key on the Load to manually switch between the two programmed states. Slew rate determines the rate at which Load level changes from one load level state to another.

3.6.5 CCD Mode

In CCD mode, the Load will sink a dynamic current according to the programmed current and dynamic timing regardless of the input voltage. To enter into the CCD mode, press the MODE key and select **CCD** mode.



Parameters:
L1: Set the load value for Load1.
L2: Set the load value for Load2.
SR↗: Set the current rise slew rate data.
SR↘: Set the current fall slew rate data.
T1: Set the loading time for L1.
T2: Set the loading time for L2.
REPEAT: Set the number of time to repeat (0=infinite loop).
Vrange: Set the voltage measurement range of Electronic Load. There are H, M and L for selection.

Ranges (Low, Middle, High)
Current can be programmed in any of the three ranges, low range, middle range and high range. The low range provides better resolution at low current setting. If any value is over the maximum of low range, you must select the middle range. When any value is over the maximum of middle range, you must select the high range. To change the range, press the RANGE key few times until the VFD range indicator is active at you want to select. The mode change will affect the Load, so will the change of range. Both of them will cause the input to go through an off state. If the CCD mode of Load is active, the new setting will change the input immediately at a rate determined by the slew rate setting. In loading mode, it will measure the period average for maximum voltage Vp +, and the minimum voltage Vp-.

Load1=4A, Load2=2A, SR / =0.2A/μs, SR \ =0.2A/μs, T1=10ms, T2=10ms, RT=0

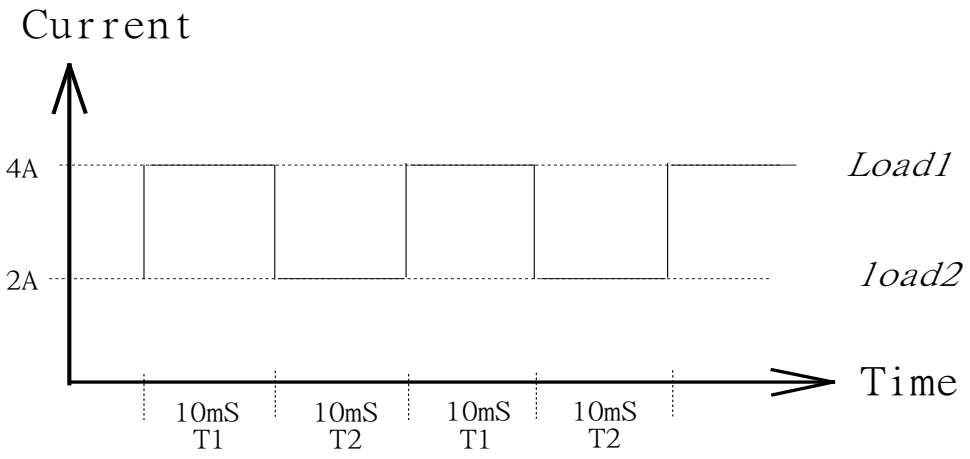
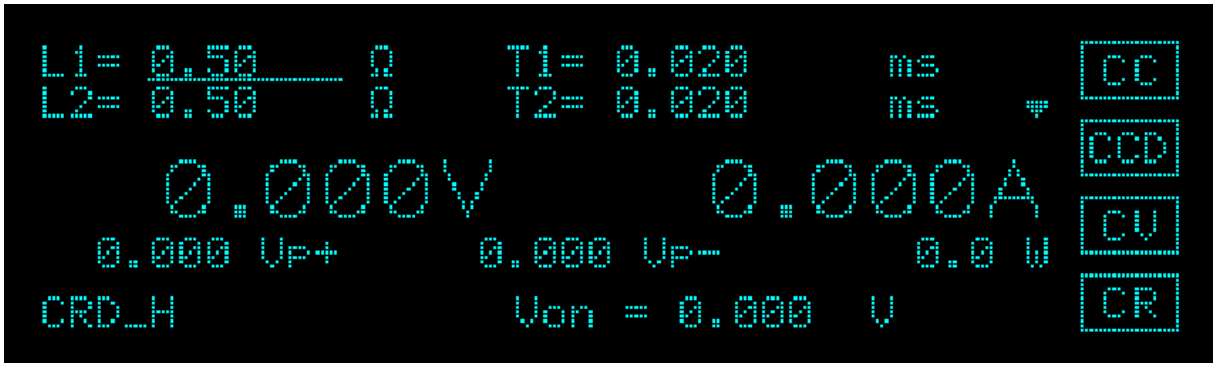


Figure 3-6 Dynamic Current Waveform

3.6.6 CRD Mode

In CRD mode, the Load will sink a dynamic resistance according to the programmed resistance and dynamic timing by the input voltage. To enter into the CRD mode, press the MODE key and select **CRD** mode.



Parameters:
L1: Set the load value for Load1.
L2: Set the load value for Load2.
SR↗: Set the current rise slew rate data.
SR↘: Set the current fall slew rate data.
T1: Set the loading time for L1.
T2: Set the loading time for L2.
REPEAT: Set the number of time to repeat (0=infinite loop).
I_RANGE: Set the current measurement range of Electronic Load. There are H, M and L for selection.

Ranges (Low, Middle, High)
Resistance can be programmed in any of the three ranges, low range, middle range and high range. The low range provides better resolution at low resistance setting. If any value is over the maximum of low range, you must select the middle range. When any value is over the maximum of middle range, you must select the high range. To change the range, press the RANGE key few times until the VFD range indicator is active at you want to select. The mode change will affect the Load, so will the change of range. Both of them will cause the input to

go through an off state. If the CRD mode of Load is active, the new setting will change the input immediately at a rate determined by the slew rate setting.

UUT: 20V
Load1=5Ω, Load2=10Ω, SR / =0.2A/μs, SR\ =0.2A/μs, T1=10ms, T2=10ms, RT=0

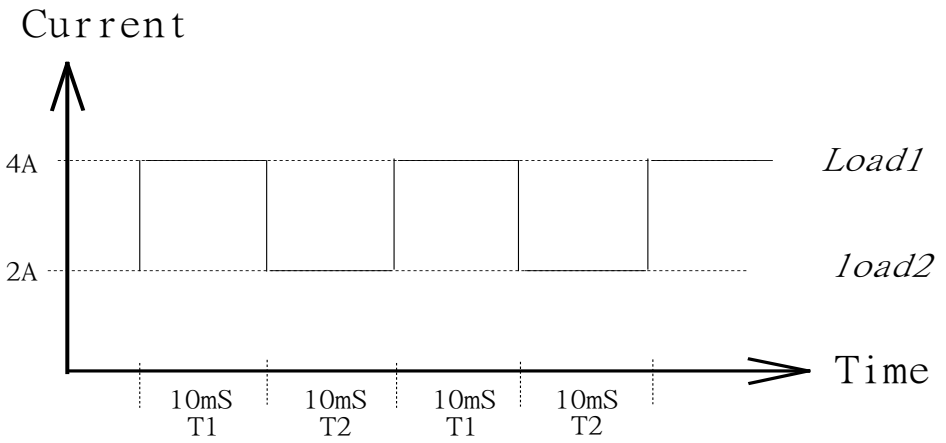
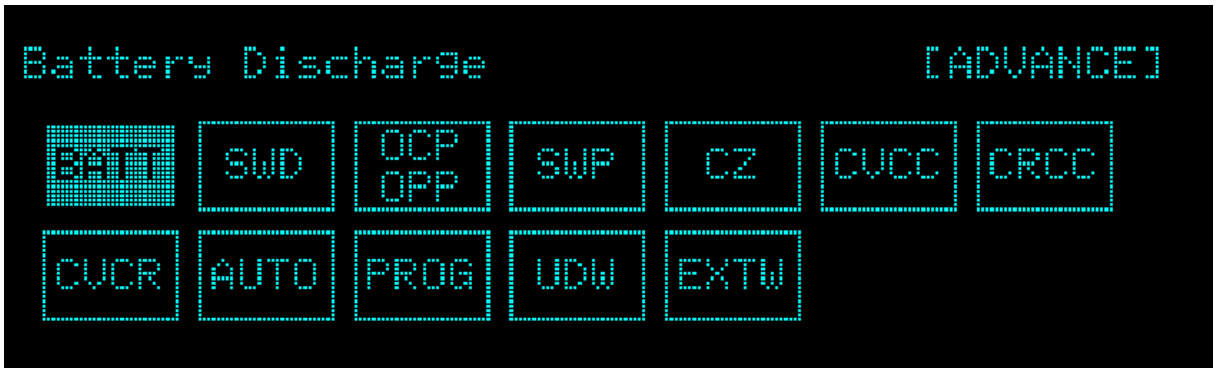


Figure 3-7

CAUTION It is suggested to use a remote sense cable to measure the UUT output voltage.

3.7 Advance Mode

The Electronic Load has useful advanced functions such as battery discharge and Sine Wave Dynamic measurement, etc. Press ADV to enter into Advance page and use left/right arrow key to select the desired mode and press Enter.

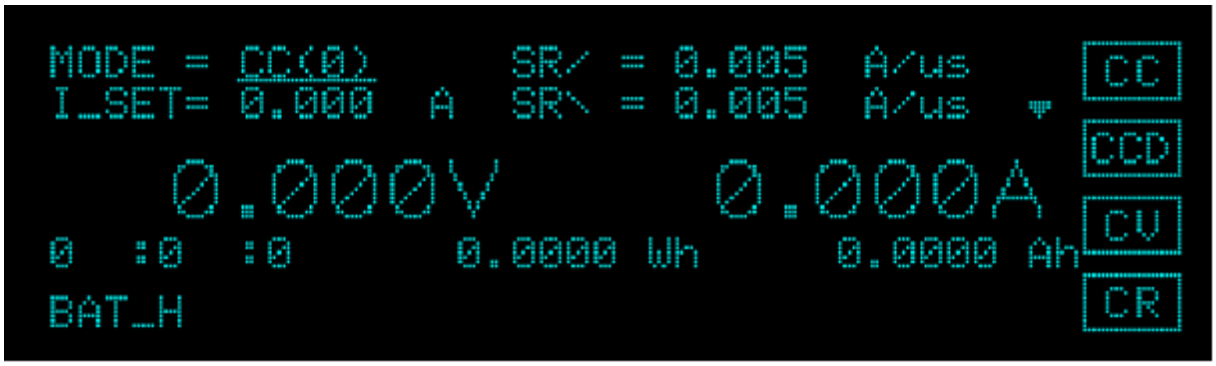


The parameter set in all modes will be rescaled to fit the resolution of that parameter. In local mode, any value can be set by the keypad. When the programmed parameter is over the boundary, the Load will set the maximum or minimum level. In remote mode, the programmed value cannot be over boundary. An error will occur when the parameter is over the maximum or minimum value.

3.7.1 BATT (Battery Discharge Timer)

The 63200A Series Electronic Load has a unique timer and measurement functions that can perform accurate time setting and measurement within the range of 00:00:00s to 27:46:39s. This feature allows the user to set the Final Voltage and Timeout during battery discharge testing and applications in similar.

To enter into BATT mode, press ADVA and select **BATT** and then press Enter.



Parameters:
MODE: Set the CC(0), CR(1) and CP(2) modes.
I_SET: Set the load parameter (R_SET for CR and P_SET for CP).
SR↗: Set the current rise slew rate data.
SR↘: Set the current fall slew rate data.
E_END: Set the cut-off voltage.
T_OUT: Set the time for Electronic Load to timeout. The range is 0 to 99,999s.
V_RANGE: Set the voltage measurement range of Electronic Load. There are H, M and L for selection.

The internal timer of 63200A Series Electronic Load is shown in Figure 3-8. When Load ON is pressed, the timer will enable automatically. When the voltage reaches the set final voltage or is timeout, the Electronic Load will stop loading and the timer will stop counting. The Battery Discharge default is OFF.

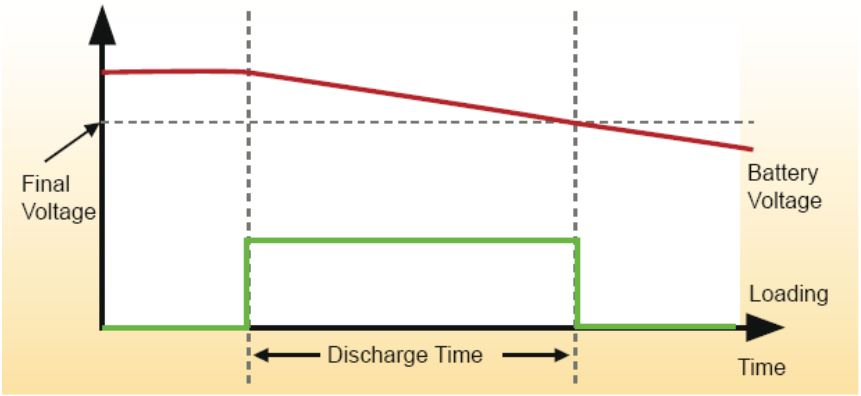


Figure 3-8 Timing Measurement Function

CAUTION For battery discharge test, to protect the Electronic Load from damage, be sure to refer to *Appendix A Precautions for Loading Battery*.

3.7.2 SWD (Sine Wave Dynamic)

The Load has a unique sine wave loading current that allows the user to set the loading current bias (I_DC), the loading sine wave (I_AC) and sine wave frequency (Frequency). The lowest point of sine wave cannot be smaller than 0 ampere. As Figure 3-9 shows Ch1 is the actual loading current waveform and Ch2 is the voltage waveform of the UUT (AC component.)

To enter into SWD mode, press ADVA and select **SWD** and then press Enter.

Parameters:
I_DC: Set the DC load current bias.
I_AC: Set the AC peak to peak load sine wave.
FREQ: Set the sine wave frequency 0~20 kHz.

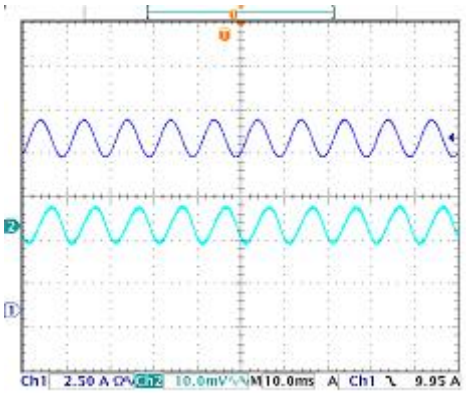
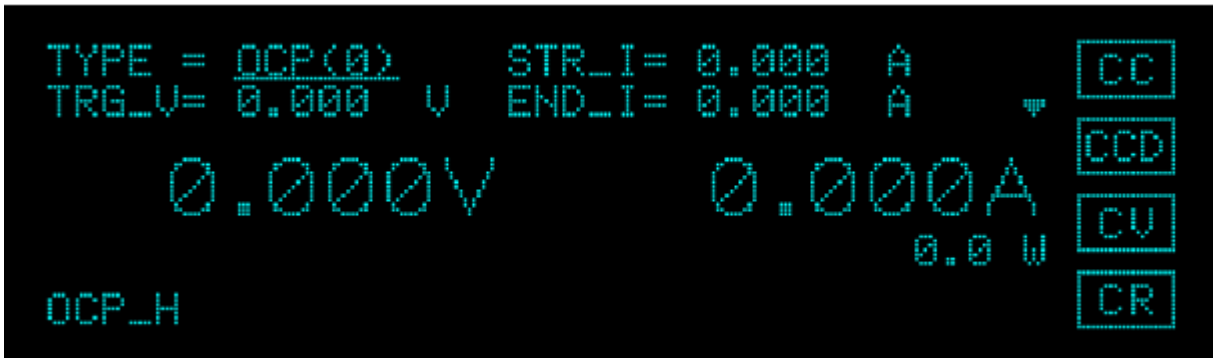


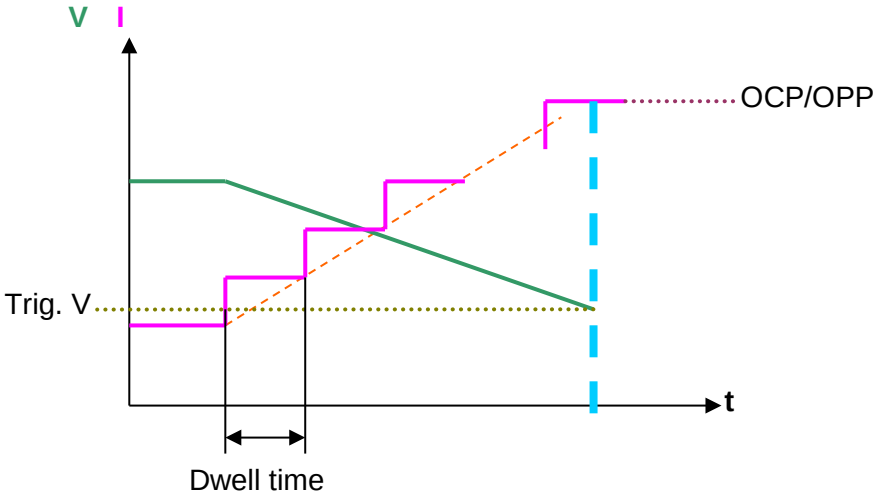
Figure 3-9

3.7.3 OCP and OPP

The OCP (or OPP) provides ramped up current (or power) for the Load to test the UUT voltage whether has reached trigger voltage level and to judge if the protection is acting normally or not.

To enter into OCP and OPP mode, press ADVA and select **OCP&OPP** and then press Enter.





Parameters:
TYPE: Set the OCP (0) and OPP (1) modes.
TRG: Set the trigger voltage. When the UUT output voltage is lower than the trigger level, the Load will stop loading current.
STR_I: Set the current start level.
EDN_I: Set the current end level.
STEP: Set the current change steps. The range is 1 to 1,000.
DWELL: Set the dwell time. The dwell time is the time from start to end of a set current level. The set range is 10μs to 1,000ms.
SPECH/L: Set the OCP spec to LOW or HIGH level.
LATCH: Set the OFF (0) and ON (1). When LATCH is ON, it will continue to sink when the test ends.

3.7.4 SWP (CC Dynamic Sweep)

In SWP mode, the Load provides a unique constant current dynamic sweep to use frequency conversion to find out the UUT voltage of worst case.

The CC dynamic sweep allows the user to program two load levels (Load1 and Load2), start frequency, end frequency, step frequency, dwell, duty and slew rate (rise and fall). During operation, the loading will switch between two load levels according to the specified value.

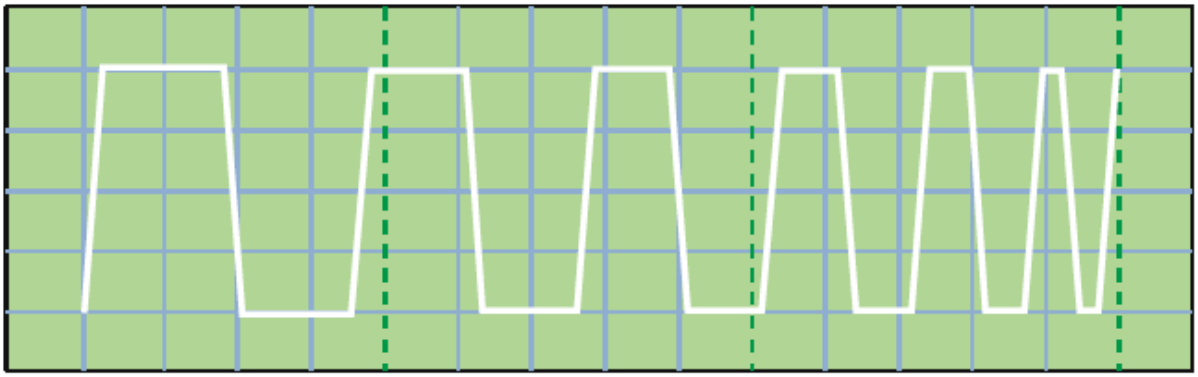


Figure 3-10 Current Waveform in CC Dynamic Sweep Mode

To enter into SWP mode, press ADVA and select **SWP** and then press Enter.

Parameters:
I_MAX: Set the maximum current level.
I_MIN: Set the minimum current level.
FSTER: Set the start frequency. The range is 0.01Hz to 50kHz.
FEND: Set the end frequency. The range is 0.01Hz to 50kHz.
FSTEP: Set the step frequency. The range is 0.01Hz to 50kHz.
DWELL: Set the dwell time. The dwell time is the time from start to end of a set step frequency. The set range is 1ms to 100s.
DUTY: Set the duty of load. The duty can set to 1%-99% but will be limited to the transient time between two load levels.
SR↗: Set the current rise slew rate data.
SR↘: Set the current fall slew rate data.

3.7.5 CZ Mode

In CZ mode, the Load will sink a current according to the programmed impedance. Impedance can be programmed by set the equivalent series resistance Rs, equivalent series inductance Ls, equivalent parallel load capacitance C_L, and equivalent parallel load resistance R_L parameters for loading when operating in this mode.

To enter into CZ mode, press ADVA and select **CZ** and then press Enter.

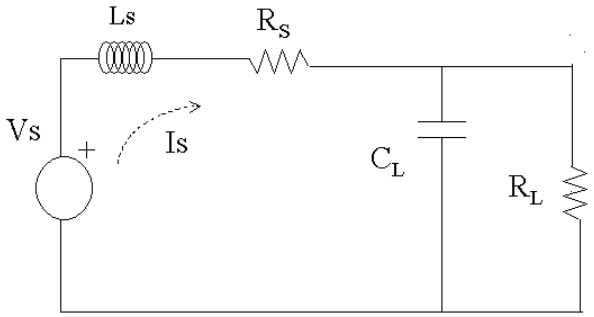


Figure 3-11 Constant Impedance Mode

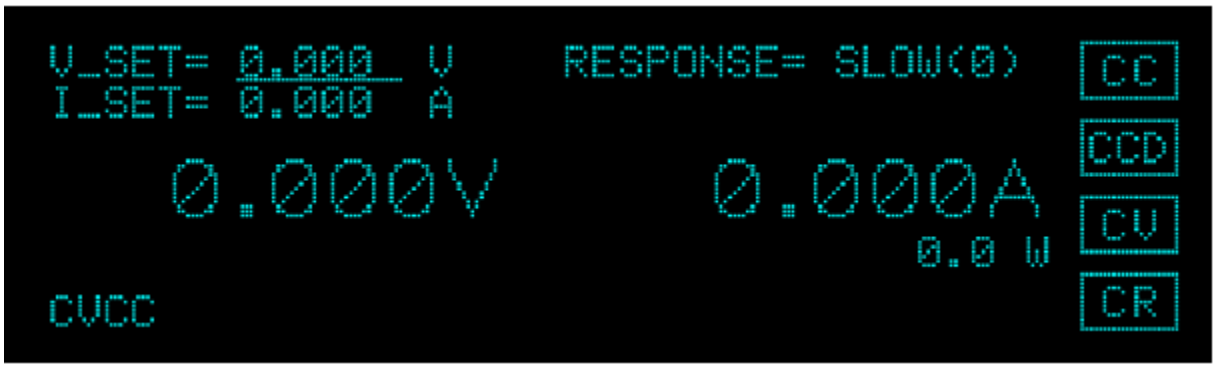
Parameters:
C_L: Set the level of equivalent parallel load capacitance C_L. The range is 30μF to 50,000μF.
R_L: Set the level of equivalent parallel load resistance R_L. The range is the same as the CR mode high range.
Ls: Set the level of equivalent series inductance Ls. The range is 0.1μH to 20μH.
Rs: Set the level of equivalent series resistance Rs. The range is 30mΩ to 20Ω.

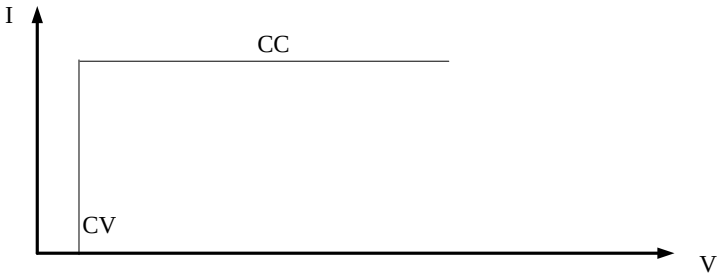
CAUTION It is suggested to use a remote sense cable to measure the UUT output voltage.

3.7.6 CVCC

In CVCC mode, the Load will adjust the sink current to control the output voltage of current source by the programmed voltage. Constant voltage has three types of response speed: fast, normal and slow.

To enter into CVCC mode, press ADVA and select **CVCC** and then press Enter.





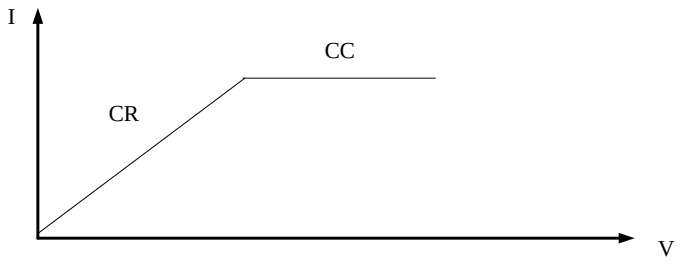
CV+CC mode: I/V Curve

Parameters:
V_SET: Set the voltage level.
I_SET: Set the current level.
RESPONSE: Set the Electronic Load response speed to FAST, NORMAL or SLOW.

3.7.7 CRCC

In CRCC mode, it has to program the constant resistance and constant current first and then start the UUT for output. When the UUT voltage starts to output, the Load will sink in CR mode according to the programmed resistance. When the voltage rises to exceed the set constant current for sinking, it will switch to CR mode for sinking.

To enter into CRCC mode, press ADVA and select **CRCC** and then press Enter.



CR+CC mode: I/V Curve

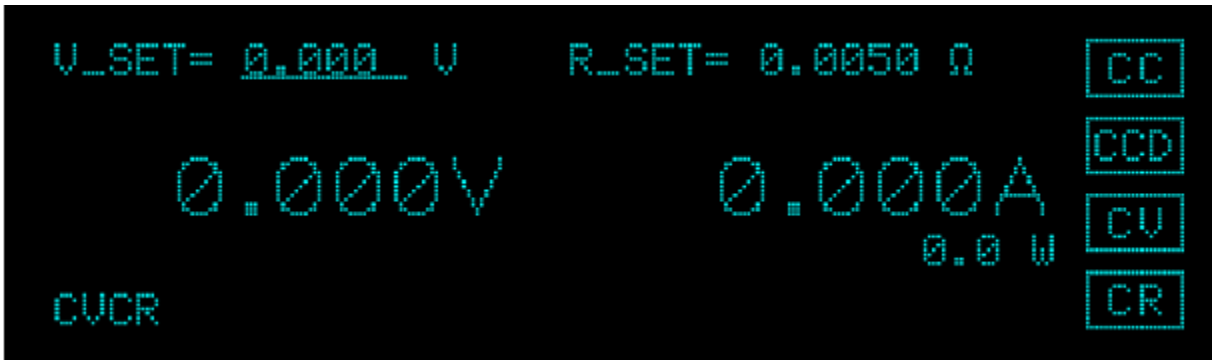
Parameters:
R_SET: Set the resistance level.
I_SET: Set the current level.

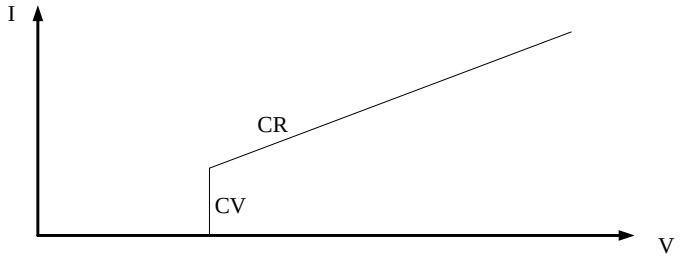
CAUTION This mode is suggested to be used in the UUT with CV output.
It is suggested to use a remote sense cable to measure the UUT output voltage.

3.7.8 CVCR

In CVCR mode, it has to program the constant voltage and constant resistance first and then start the UUT for output. When the UUT voltage starts to output, the Load will sink in CV mode according to the programmed constant voltage. When the voltage rises to exceed the set constant resistance for sinking, it will switch to CR mode for sinking.

To enter into CVCR mode, press ADVA and select **CVCR** and then press Enter.





CV+CR mode: I/V Curve

Parameters:
V_SET: Set the voltage level.
R_SET: Set the resistance level.

CAUTION This mode is suggested to be used in the UUT with CV output.
It is suggested to use a remote sense cable to measure the UUT output voltage.

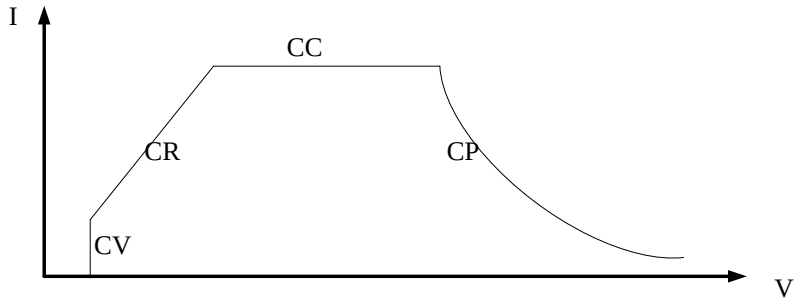
3.7.9 Auto Mode

In Auto mode, it has to program the constant voltage, constant resistance, constant current and constant power, and then start the UUT for output. When the UUT voltage starts to output, the Load will sink according to the programmed constant voltage in CV mode. When the voltage rises, it will automatically switch to CR mode and to the CC mode at last for sinking. It will switch to CP mode for sinking if the UUT outputs high voltage abnormally.

To enter into Auto mode, press ADVA and select **AUTO** and then press Enter.

Parameters:
V_SET: Set the voltage level.
R_SET: Set the resistance level.
I_SET: Set the current level.
P_SET: Set the power level.

Auto mode:



CAUTION This mode is suggested to be used in the UUT with CV output. It is suggested to use a remote sense cable to measure the UUT output voltage.

3.7.10 Setting a Program Sequence

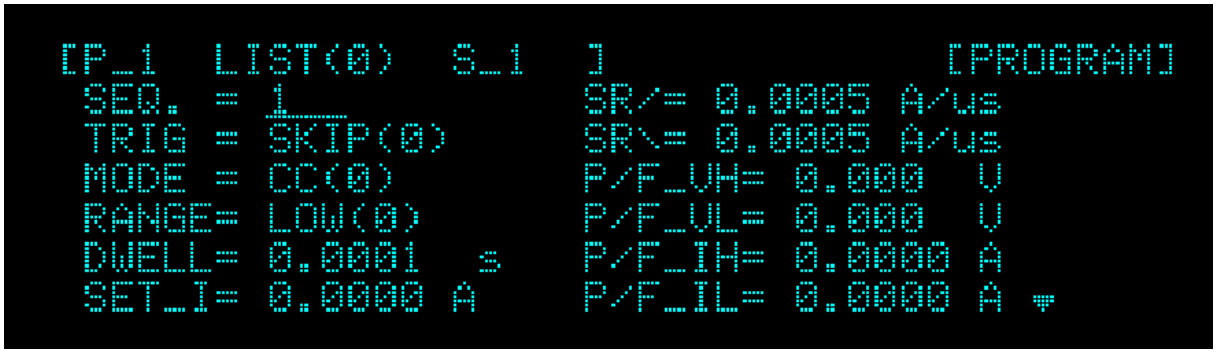
In PROG mode, the user can select the Electronic Load to do basic testing via the programmed sequences. Moreover, different program sequences can be linked for auto execution.

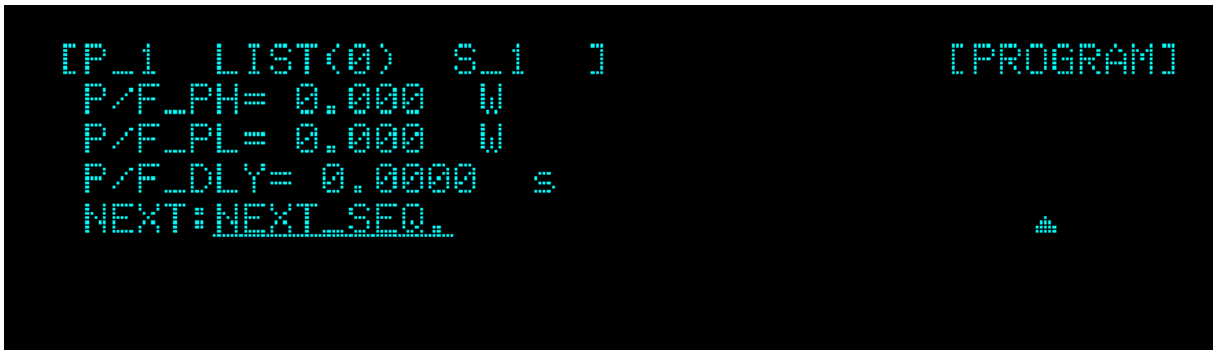
The function of program sequence is very powerful. The Electronic Load has 10 programs that can set up 255 sequences maximum. For instance, when program 1 is set up with 5 sequences and program 2 is set up with 8 sequences, the rest programs from 3 to 10 can set up the remaining 242 sequences. Or, it can set total 255 sequences in program 1. Different sequences combination can be created through the program chain.

For example, if program 1 has 5 sequences, program 2 has 8 sequences and program 3 has 15 sequences, it means the program 4 to 10 has 227 sequences left for editing. The user can use program chain to link program 1, 2 and 3 to execute the program sequence in 5→8→15, or to link program 2, 3 and 1 to execute the program sequence in 8→15→5. In other words,

the programs can be linked in any away as desired through the program chain.

To enter into PROG, press ADVA and select **PROG** and then press Enter.





Program chain parameters:
PROG: Set the program no. → total 10 programs (1-10) and maximum 255 sequences.
TYPE: Set the program type → List and Step.
CHAIN: Set the program chain → the program chain enables the user to link the programs to access more test sequences. It means there is no program chain if the program chain number is 0. The program chain can chain to itself for cycle tests or other programs.
REPEAT: Set the number of times for the program chain to repeat. Turn the LOAD push button rotary to change the number of times.
REMAIN_SEQ: Display the remaining unset sequence number → the Load shows the remaining unset sequences that is a deduction from the total 255 sequences.
CLEAR_SEQ: Clear the set sequence → turn the push button rotary to change the display to YES and clear the set sequence.
TOTAL_SEQ: Set the sequence → turn the push button rotary to change the display to set sequence in PROG page.

NEXT:SET_SEQ: Set the sequence mode to SKIP, AUTO, MANUAL or External.

SKIP:	Skip the sequence. The Load will not change the input state.
AUTO:	The Load will run next sequence automatically when the Dwell time exceeds.
MANUAL:	Press ENTER to confirm and the Load will run next sequence automatically.
External:	Use external signal TRIG_ SEQ to control the Load input on/off. When the TRIG_ SEQ signal rising edge is active, the Load will run next sequence automatically.

Sequence programming parameters:
MODE: Set the operation mode. There are CC, CR, CV and CP 4 modes for selection.
DWELL: Set the sequence dwell time. The range is 0.1ms to 30s.
RANGE: Set the range.
SET: Set the Load level.

Setting sequence P/F specification:
The Electronic Load allows the user to program the UUT specification for GO/NG verification in sequence. It will measure the UUT's performance for comparison when testing. The specification V, I and P can be set for the Load by the user. The specification has two levels: LOW and HIGH.
P/F_DLY: Set the Pass/Failure delay time when the Load state changes.
NEXT: SAVE the set parameter of this sequence.

It uses Excel for programming, see *Appendix D Using Program Mode* for detailed information.

3.7.11 UDW (User Defined Waveform)

The User Defined Waveform is able to simulate the actual sinking current and capture or edit the current through oscilloscope. The graphical operating software can easily save the waveform in the internal memory of 63200A Series Electronic Loads and the user-defined waveform can be sunk as desired.

To enter into UDW, press ADVA and select **UDW** and then press Enter.

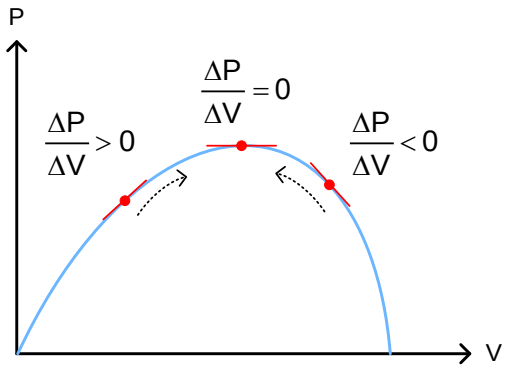
Parameters:
WAVE: Select the internal 10 stored memories.
INTERV: Set the interval for update.
REPEAT: Set the number of time to repeat.
INTERP: Set the open linear interpolation.
CHAIN: Set to link other memory.

See *Appendix C Using UDW Mode* for detailed usage description.

3.7.12 MPPT (Maximum Power Point Tracking)

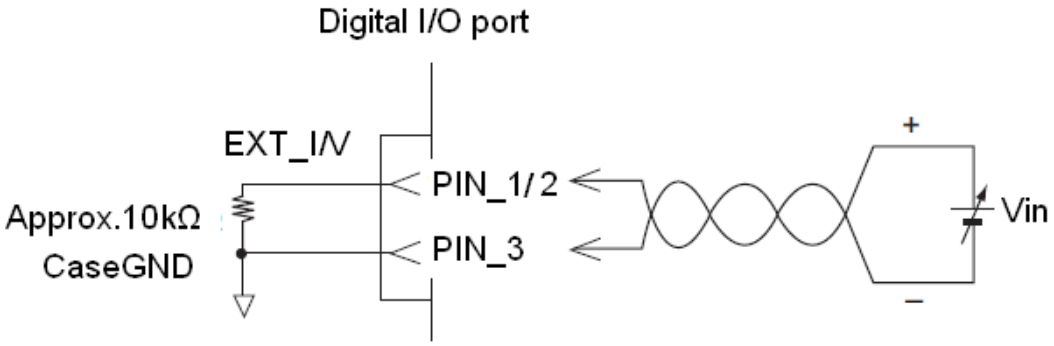
MPP (Maximum Power Point) indicates the maximum power on the solar panel power curve and MPPT (Maximum Power Point Tracking) is the way to find the maximum power. The electronic load uses constant voltage mode as the base to simulate it by changing the operating point.

The following is the MPPT function algorithm:



3.7.13 EXTERNAL WAVE Control

In External Wave Control mode, it will sink following the selected mode and external waveform. The EXT V/I input connector is located on the Digital IO of rear panel. The external signal 0 to 10V maps to the sinking condition from 0 to full scale. The external signal is also applicable for 0V to 10V DC voltage bias.



To enter into EXTW mode, press ADVA and select **EXTW**.

MODE: Able to set to CC, CR or CV mode.

CC mode

$$Iset = \frac{Ext\_I}{10V} \times I_{F.S.}$$

CR mode

$$Rset = \frac{10V}{Ext\_V} \times R_{F.S.(\min)}$$

CV mode

$$Vset = \frac{Ext\_V}{10V} \times V_{F.S.}$$

$$I\_Limit = \frac{Ext\_I}{10V} \times I_{F.S.}$$

Ranges (Low, Middle, High)
It can be programmed in any of the three ranges, low range, middle range and high range. The low range provides better resolution. If any value is over the maximum of low range, you must select the middle range. When any value is over the maximum of middle range, you must select the high range. To change the range, press the RANGE key few times until the VFD range indicator is active at you want to select. The mode change will affect the Load, so will the change of range. Both of them will cause the input to go through an off state. The new setting will change the input immediately at a rate determined by the slew rate setting.

3.7.14 Warnings

Warning	Description
OPP1	The device rated power is 1.03 times over.
OPP2	It is over the temperature derated power.
OPP3	It is over the user-defined power.
OV1	The voltage range is 1.1 times over. It is 1.02 times over for 1200V model in HIGH range.
OV2	The voltage range is 1.2 times over.
OCP1	The current range is 1.02 times over.
OCP2	The current range is 1.2 times over.
OCP3	It is over the user defined current.
OTP	Over temperature protection.
FAN FAIL	Fan failure protection.
VCC FAIL	Internal power error.
REV	Voltage reversed.

Notice When a warning occurs, the A632009 and A632010 panel light will show protection and the Master (63200A) panel will show the warning status.

4. Remote Operation

4.1 Overview

This section describes how to program the 63200A Series DC Electronic Loads remotely from a GPIB, Ethernet, CAN BUS or USB. The command set introduced here can be applied to all electronic loads of 63200A Series Electronic Loads that equipped with optional GPIB, Ethernet, CAN BUS card or USB.

GPIB, Ethernet, CAN BUS or USB can be used one at a time. If GPIB is used first in remote control, USB, CAN BUS and Ethernet will be disabled unless the machine is reset.

4.2 Introduction to Programming

4.2.1 Basic Definition

GPIB statement includes instrument control and query commands. A command statement sends an instruction to the electronic load, and a query command to request information from the electronic load.

Simple Command
A simple command statement consists of a command or keyword usually followed by a parameter or data:

```
      LOAD ON
or    TRIG
```

Compound Command
When two or more keywords are connected by colons (:), it creates a compound command statement. The last keyword usually is followed by a parameter or data:

```
      CURRent : STATic : L1 3
or    CONFigure : VOLTage : RANGe HIGH
```

Query Command
A simple query command consists of a keyword followed by a question mark:

```
      MEASure : VOLTage?
      MEASure : CURRent?
or    CHAN?
```

Forms of Keywords
There are two forms for a keyword as described below.

Long-Form
The word is spelled out completely to identify its function. For instance, CURRENT, VOLTAGE, and MEASURE are long-form keywords.

Short-Form
The word contains only the first three or four letters of the long-form. For instance, CURR, VOLT, and MEAS are short-form keywords.

In keyword definitions and diagrams, the short-form part of each keyword is emphasized in UPPER CASE letters to help you remember it. However, the electronic load will accept Volt, volt, voltage, VOLTAGE, volTAGE, etc. regardless of what form you have applied. However, if the keyword is incomplete, for example, “VOL” or “curre”, it will not be recognized.

4.2.2 Numerical Data Formats

Chroma 63200A Electronic Load accepts the numerical data type listed in Table 4-1. Numeric data may be followed by a suffix to specify the dimension of the data. A suffix may be preceded by a multiplier. Chroma 63200A makes use of the suffixes listed in Table 4-2 and multipliers listed in Table 4-3.

Table 4-1 Numerical Data Type

Symbol	Description	Example
NR1	Digits without decimal point. The decimal point is assumed to be at the right of the least-significant digit.	123, 0123
NR2	Digits with a decimal point.	123., 12.3, 0.123, .123
NR3	Digit with a decimal point and an exponent.	1.23E+3, 1.23E-3
NRf	Flexible decimal form that includes NR1 or NR2 or NR3.	123, 12.3, 1.23E+3
NRf+	Expanded decimal form that includes NRf and MIN, MAX. MIN and MAX are the minimum and maximum limit values for the parameter.	123, 12.3, 1.23E+3, MIN, MAX

Table 4-2 Suffix Elements

Mode	Class	Preferred Suffix	Secondary Suffix	Referenced Unit
CC	Current	A		Ampere
CR	Resistance	OHM		Ohm
CV	Amplitude	V		Volt
CP	Power	W		Watt
CZ	Inductance	H		Henry
	Capacitance	F		Farad
All	Time	S		Second
All	Frequency	Hz		Hertz
All	Slew Rate	A/μS		Amperes/micro Second

Table 4-3 Suffix Multipliers

Multiplier	Mnemonic	Definition
1E6	MA	mega
1E3	K	kilo
1E-3	M	milli
1E-6	U	micro
1E-9	N	nano

4.2.3 Character Data Formats

For command statements, the <NRf+> data format permits entry of required characters. For query statements, character strings may be returned in either of the forms shown in the following table. It depends on the length of the returned string.

Table 4-4

Symbol	Character Form
crd	Character Response Data. They permit the return up to 12 characters.
aard	Arbitrary ASCII Response Data. They permit the return of undelimited 7-bit ASCII. This data type is an implied message terminator (refer to *Separators and Terminators*).

4.2.4 Arbitrary Block Data Format

The arbitrary block data returned by query command may take either of the following forms:

<DLABRD> Definite Length Arbitrary Block Response Data:

The <DLABRD> is formatted as:
#<x><yy...y><byte1><byte2><byte3><byte4>…<byteN><RMT>

Where,
<x> is the number of characters in <yy…y>.
<yy…y> is the number of bytes to transfer.

For example, if <yy…y> = 01024, then <x> = 5 and <byte1><byte2><byte3>…<byte1024>

<ILABRD> Indefinite Length Arbitrary Block Response Data:

The <ILABRD> is formatted as:
#<0><byte1><byte2><byte3><byte4>…<byteN><RMT>

4.2.5 Separators and Terminators

In addition to keywords and parameters, GPIB program statements require the following:

Data Separators:
Data must be separated from the previous command keyword by a space. This is shown in examples as a space (CURR 3) and on diagrams by the letters *SP* inside a circle.

Keyword Separators:
Keywords (or headers) are separated by a colon (:), a semicolon (;), or both. For example:

- LOAD:SHOR ON
- MEAS:CURR?;VOLT?
- CURR:STAT:L1 3;:VOLT:L1 5

Program Line Separators:
A terminator informs GPIB that it has reached the end of a statement. Normally, this is sent automatically by your GPIB programming statements.

The termination also occurs with other terminator codes, such as EOI. In this guide, the terminator is assumed at the end of each example line of code. If it needs to be indicated, it is shown by the symbol <nl>, which stands for "new line" and represents the ASCII code byte 0A hexadecimal (or 10 decimal).

Traversing the Command Tree:

- The colon ":" separates keywords from each other, which represent changes in branch level to the next lower one. For example:

  CONF:VOLT:ON 5
  CONF is a root-level command, *VOLT* is the first branch, and *ON* is the second branch. Each ":" moves down command interpretation to the next branch.

- The semicolon ";" allows you to combine command statements into one line. It returns the command interpretation to the previous colon.

  For example: Combine the following two command statements:
  RES:RISE 100 <nl> and
  RES:L1 400 <nl>
  which can be formed into one command line as follows:
  RES:RISE 100;L1 400 <nl>

- To return to the root-level form you can
  1. Enter a new line character. This is symbolized as "<nl>" and can be linefeed "LF" or/and end of line "EOL". Or else,
  2. Enter a semicolon followed by a colon ";:".

  Please refer to the following figure.

  - (root):VOLT:L1: 30<nl>
    Starting a New Line to return to the Root.

  - (root):SPEC:VOLT:H 30;
    :L 5;:
    (root):RES:L1 400;
    :RISE 1000;:

4.3 Language Dictionary

Commands for operating the 63200A Electronic Load remotely are grouped into subsystems. Each command that belongs to the same subsystem is arranged in alphabetic order. A syntax chart of the subsystem that contains the commands in the same group is included. Sub- systems are ordered alphabetically according to their names in the following sections.

4.3.1 Common Commands

The common commands defined by IEEE488.2 standard are generic commands and queries. The first part of the language dictionary covers the commands. Each of them has a leading "*".

CLS Clear Status Command

Type: Device Status

Description: The *CLS command executes the following actions:

- Clear these registers
  <1> Channel Status Event registers for all channels
  <2> Channel Summary Event register
  <3> Questionable Status Event register
  <4> Standard Event Status Event register
  <5> Operation Status Event register
- Clear the Error Queue
- If "Clear Status Command" immediately follows a program message terminator (<nl>), the "Output Queue" and the MAV bit are also cleared.

Setting Syntax: *CLS

Setting Parameter: nil

ESE Standard Event Status Enable Command/Query

Type: Device Status

Description: This command sets the condition of the Standard Event Status Enable register to determine which event (see *ESR?) is allowed to set the ESB (Event Summary Bit) for the Status Byte register. A "1" in the bit position enables the corresponding event. All of the events that enabled by Standard Event Status register are logically ORed to cause the Status Byte register ESB (bit 5) to be set. See descriptions of these three registers in *Chapter* 5.

Setting Syntax: *ESE<space><NR1>

Setting Parameter: <NR1>, 0 ~ 255

Setting Example: *ESE 48 This command enables the CME and EXE events for the Standard Event Status register.

Query Syntax: *ESE?

Return Parameter: <NR1>

Query Example: *ESE? This query returns the current setting for "Standard Event Status Enable".

ESR? Standard Event Status Register Query

Type: Device Status

Description: This query reads the Standard Event Status register, which will be cleared after reading. See *Chapter* 5 for detailed explanation.

Standard Event Status Event Register

Bit Position	7	6	5	4	3	2	1	0
Condition	PON	0	CME	EXE	DDE	QYE	0	OPC
Bit Weight	128	64	32	16	8	4	2	1

Query Syntax: *ESR?
Return Parameter: <NR1>
Query Example: *ESR? Return the Standard Event Status register readings.
Return Example: 48

****IDN? Identification Query***

Type: System Interface
Description: This query requests the host to identify itself.
Query Syntax *IDN?
Return Parameter: <aard>
Query Example: *IDN?

String	***Information***
Chroma	Manufacture
63205A-150-500	Model
63205A000001	Serial number
1.00	HOST's version of F/W
1.00	HOST's version of FPGA
1.00	HOST's version of PCB

Return Example: Chroma,63205A-150-500,63205A000001,1.00,1.00,1.00

****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 Electronic Load has completed all pending operations.
Setting Syntax: *OPC
Setting Parameter: nil

****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 electronic load to a state that was previously stored in memory with the *SAV command to the specified location (see *SAV).
Setting Syntax: *RCL<space><NR1>
Setting Parameter: <NR1>, 0 ~ 10, 0: Factory default file, 1~10: User define file
Setting Example: *RCL 5

RST Reset Command

Type: Device State
Description: This command forces an ABORt, *CLS, LOAD:PROT:CLE command and sets the parameters to factory default.
Setting Syntax: *RST
Setting Parameter: nil

SAV Save Command

Type: Device Status
Description: This command stores the present state of the single electronic load and all channel states of multiple loads in a specified memory location.
Setting Syntax: *SAV<space><NR1>
Setting Parameter: <NR1>, 1 ~ 10
Setting Example: *SAV 5

SRE Service Request Enable Command/Query

Type: Device Status
Description: This command sets the condition of the Service Request Enable register to determine which event of the Status Byte register (see *STB) is allowed to set the MSS (Master Status Summary) bit. A "1" in the bit position is logically ORed to cause the Status Byte register Bit 6 (the Master Summary Status Bit) to be set. See details regarding the Status Byte register in *Chapter* 5.
Setting Syntax *SRE<space><NR1>
Setting Parameter: <NR1>, 0 ~ 255
Setting Example: *SRE 20 Enable the CSUM and MAV bit for Service Request.
Query Syntax: *SRE?
Return Parameter: <NR1>
Query Example: *SRE? Return current setting for "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 electronic 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. Refer to *Chapter* 5 for more information about this register.

Status Byte Register

Bit Position	7	6	5	4	3	2	1	0
Condition	0	MSS	ESB	MAV	QUES	CSUM	0	0
Bit Weight	128	64	32	16	8	4	2	1

Query Syntax: *STB?
Return Parameter: <NR1>
Query Example: *STB? Return the contents of "Status Byte".
Return Example: 20

4.3.2 Specific Commands

The 63200A series products are equipped with the following specific GPIB commands.

4.3.2.1 MODE Subsystem

MODE

Type: Channel-Specific
Description: This command sets the operational mode for the electronic load.
Setting Syntax: MODE<space><NRf>
Setting Parameter: <CRD>, CCL, CCM, CCH, CRL, CRM, CRH, CVL, CVM, CVH, CPL, CPM, CPH, CCDL, CCDM, CCDH, CRDL, CRDM, CRDH, BATL, BATM, BATH, SWDL, SWDM, SWDH, OCPL, OCPM, OCPH, CCSL, CCSM, CCSH, CZL, CZM, CZH, CVCC, CRCC, CVCR, AUTO, PROG, UDWL, UDWM, UDWH, EXTL, EXTM, EXTH, OPPL, OPPM, OPPH, MPPTL, MPPTM, MPPTH
Example:

MODE CCL	Set CC mode of low range.
MODE CCH	Set CC mode of high range.
MODE CCDL	Set CC dynamic mode of low range.
MODE CCDH	Set CC dynamic mode of high range.
MODE CRL	Set CR mode of low range.
MODE CRH	Set CR mode of high range.

Query Syntax: MODE?
Return Parameter: <CRD>, CCL, CCM, CCH, CRL, CRM, CRH, CVL, CVM, CVH, CPL, CPM, CPH, CCDL, CCDM, CCDH, CRDL, CRDM, CRDH, BATL, BATM, BATH, SWDL, SWDM, SWDH, OCPL, OCPM, OCPH, CCSL, CCSM, CCSH, CZL, CZM, CZH, CVCC, CRCC, CVCR, AUTO, PROG, UDWL, UDWM, UDWH, EXTL, EXTM, EXTH, OPPL, OPPM, OPPH, MPPTL, MPPTM, MPPTH
Query Example: MODE?

4.3.2.2 LOAD Subsystem

LOAD[:STATe]

Type: Channel-Specific
Description: The LOAD command makes the electronic load active/on or inactive/off.
Setting Syntax: LOAD[:STATe]<space><NRf>
Setting Parameter: <NRf>, OFF | 0, ON | 1
Setting Example:

LOAD ON	Activate the electronic load.
LOAD 0	Inactivate the electronic load.

Query Syntax: LOAD[:STATe]?
Return Parameter: <CRD>, OFF, ON
Query Example: LOAD?

LOAD:PROTection?

Type: Channel-Specific
Description: This command returns the status of electronic load.
Setting Syntax: None
Setting Parameter: None
Setting Example: None

Query Syntax: LOAD:PROTection?
Return Parameter: <NR1>

Bit Position	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Condition		MAX_LIM	RMT_INH	VCC	FAN	SYNC	OTP	OPP3	OPP2	OPP1	OCP3	OCP2	OCP1	REV	OV2	OV1
Bit Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Query Example: LOAD:PROT?

LOAD:PROTection:CLEar

Type: Channel-Specific
Description: This command resets the status of electronic load.
Setting Syntax: LOAD:PROTection:CLEar
Setting Parameter: None
Setting Example: LOAD:PROT:CLE
Query Syntax: None

LOAD:SHORt[:STATe]

Type: Channel-Specific
Description: Activate or inactivate short-circuited simulation.
Setting Syntax: LOAD:SHORt[:STATe]<space><NRf>
Setting Parameter: <NRf>, OFF | 0, ON | 1
Setting Example: LOAD:SHOR ON Activate short-circuited simulation.
LOAD:SHOR OFF Inactivates short-circuited simulation.
Query Syntax: LOAD:SHORt[:STATe]?
Return Parameter: <CRD>, OFF, ON
Query Example: LOAD:SHOR?

LOAD:SHORt:KEY

Type: Channel-Specific
Description: Set the mode of short key in the electronic load.
Setting Syntax: LOAD:SHORt:KEY<space><NRf>
Setting Parameter: <NRf>, HOLD | 0, TOGGLE | 1, DISABLE | 2
Setting Example: LOAD:SHOR:KEY TOGGLE Set the short key mode to Toggle.
LOAD:SHOR:KEY HOLD Set the short key mode to Hold.
Query Syntax: LOAD:SHORt:KEY?
Return Parameter: <CRD>, HOLD, TOGGLE
Query Example: LOAD:SHOR:KEY?

LOAD:ID?

Type: Channel-Specific
Description: This query requests the load to identify itself.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: LOAD:ID?
Return Parameter: <aard>, [Unit = None]
Query Example: LOAD:ID?

String	***Information***
Chroma	Manufacture
63205A-150-500	Model
63205A000001	Serial number

1.00	LOAD's version of F/W
1.00	LOAD's version of FPGA
1.00	LOAD's version of PCB

Return Example: Chroma,63205A-150-500,63205A000001,1.00,1.00,1.00

4.3.2.3 CONFIGURE Subsystem

CONFigure:VOLTage:RANGe

Type: Channel-Specific
Description: Set the voltage measurement range in CC mode.
Setting Syntax: CONFigure:VOLTage:RANGEe<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example: CONF:VOLT:RANG HIGH — Set voltage range to High.
CONF:VOLT:RANG M — Set voltage range to Middle.
CONF:VOLT:RANG 0 — Set voltage range to Low.
Query Syntax: CONFigure:VOLTage:RANGe?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: CONF:VOLT:RANG?

CONFigure:VOLTage:ON

Type: Channel-Specific
Description: Set the voltage of sink current on.
Setting Syntax: CONFigure:VOLTage:ON<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CONF:VOLT:ON 0.5 — Set Von = 0.5V
CONF:VOLT:ON 500mV — Set Von = 0.5V
CONF:VOLT:ON MAX — Set Von = maximum value.
CONF:VOLT:ON MIN — Set Von = minimum value.
Query Syntax: CONFigure:VOLTage:ON?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: CONF:VOLT:ON?
CONF:VOLT:ON? MAX
CONF:VOLT:ON? MIN

CONFigure:VOLTage:OFF

Type: Channel-Specific
Description: Set the voltage of sink current off.
Setting Syntax: CONFigure:VOLTage:OFF<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CONF:VOLT:OFF 0.5 — Set Voff = 0.5V
CONF:VOLT:OFF 500mV — Set Voff = 0.5V
CONF:VOLT:OFF MAX — Set Voff = maximum value.
CONF:VOLT:OFF MIN — Set Voff = minimum value.
Query Syntax: CONFigure:VOLTage:OFF?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: CONF:VOLT:OFF?
CONF:VOLT:OFF? MAX
CONF:VOLT:OFF? MIN

CONFigure:VOLTage:LATCh

Type: Channel-Specific
Description: Set the action type of Von.
Setting Syntax: CONFigure:VOLTage:LATCh<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: CONF:VOLT:LATC OFF Set Von latch function to OFF.
CONF:VOLT:LATC 1 Set Von latch function to ON.
Query Syntax: CONFigure:VOLTage:LATCh?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: CONF:VOLT:LATC?

CONFigure:VOLTage:LATCh:RESet

Type: Channel-Specific
Description: Resets the Von signal.
Setting Syntax: CONFigure:VOLTage:LATCh:RESet
Setting Parameter: None.
Setting Example: CONF:VOLT:LATC:RES Resets the Von Signal.

CONFigure:VOLTage:SIGN

Type: Channel-Specific
Description: Set the sign of voltage measurement to Plus/Minus.
Setting Syntax: CONFigure:VOLTage:SIGN<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, PLUS | 0, MINUS | 1
Setting Example: CONF:VOLT:SIGN PLUS Set sign of voltage to Plus.
CONF:VOLT:SIGN 1 Set sign of voltage to Minus.
Query Syntax: CONFigure:VOLTage:SIGN?
Return Parameter: <CRD>, PLUS, MINUS [Unit = None]
Query Example: CONF:VOLT:SIGN?

CONFigure:WINDow

Type: Channel-Specific
Description: Set the time of measure over which the window calculation is to be performed.
Setting Syntax: CONFigure:WINDow<space><NRf+>
Setting Parameter: <NRf+>, 0.02s ~ 61.00s, Resolution = 20ms, Unit = Second
Setting Example: CONF:WIND 0.5 Set times of window = 0.5s
CONF:WIND MAX Set times of window = maximum value.
CONF:WIND MIN Set times of window = minimum value.
Query Syntax: CONFigure:WINDow?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: CONF:WIND?
CONF:WIND? MAX
CONF:WIND? MIN

CONFigure:SYNChronous:MODE

Type: Channel-Specific
Description: Set the synchronization mode.
Setting Syntax: CONFigure:SYNChronous:MODE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, NONE | 0, MASTER | 1, SLAVE | 2
Setting Example: CONF:SYNC:MODE MASTER Set sync. mode to MASTER.
CONF:SYNC:MODE 0 Set sync. mode to NONE.
Query Syntax: CONFigure:SYNChronous:MODE?
Return Parameter: <CRD>, NONE, MASTER, SLAVE [Unit = None]
Query Example: CONF:SYNC:MODE?

CONFigure:PARAllel:INITial

Type: All Channel
Description: Set Load into/exit parallel mode.
Setting Syntax: CONFigure:PARAllel:INITial<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: CONF:PARA:INIT ON Set Load to into parallel mode.
CONF:PARA:INIT 0 Set Load to exit parallel mode.
Query Syntax: CONFigure:PARAllel:INITial?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: CONF:PARA:INIT?

CONFigure:PARAllel:MODE

Type: Channel-Specific
Description: Set the parallel mode.
Setting Syntax: CONFigure:PARAllel:MODE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, NONE | 0, MASTER | 1, SLAVE | 2
Setting Example: CONF:PARA:MODE MASTER Set parallel mode to MASTER.
CONF:PARA:MODE 0 Set parallel mode to NONE.
Query Syntax: CONFigure:PARAllel:MODE?
Return Parameter: <CRD>, NONE, MASTER, SLAVE [Unit = None]
Query Example: CONF:PARA:MODE?

CONFigure:PARAllel:NUMber

Type: Channel-Specific
Description: Set the parallel device number.
Setting Syntax: CONFigure:PARAllel:NUMber<space><NR1>
Setting Parameter: <NR1>, 2 ~ 20, Unit = None
Setting Example: CONF:PARA:NUM 3 Set parallel devices to 3.
CONF:PARA:NUM 4 Set parallel devices to 4.
Query Syntax: CONFigure:PARAllel:NUMber?[<space><MAX | MIN>]
Return Parameter: <NR1>, 2 ~ 20, [Unit = None]
Query Example: CONF:PARA:NUM?
CONF:PARA:NUM? MAX
CONF:PARA:NUM? MIN

CONFigure:AUTO:ON

Type: Channel-Specific
Description: Set the load module to perform auto load on during power-on.
Setting Syntax: CONFigure:AUTO:ON<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: CONF:AUTO:ON ON Set auto load on state to ON.
CONF:AUTO:ON 0 Set auto load on state to OFF.
Query Syntax: CONFigure:AUTO:ON?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: CONF:AUTO:ON?

CONFigure:ENTer:KEY

Type: Channel-Specific
Description: Set the action type of ENTER key.
Setting Syntax: CONFigure:ENTer:KEY<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, NEXT | 0, FIXED | 1
Setting Example: CONF:ENT:KEY NEXT Set ENTER key function to NEXT.
CONF:ENT:KEY 1 Set ENTER key function to FIXED.

Query Syntax: CONFigure:ENTer:KEY?
Return Parameter: <CRD>, NEXT, FIXED [Unit = None]
Query Example: CONF:ENT:KEY?

CONFigure:SHORt:KEY

Type: Channel-Specific
Description: Set the action enable or disable of SHORT key.
Setting Syntax: CONFigure:SHORt:KEY<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, HOLD | 0, TOGGLE | 1 , DISABLE | 2
Setting Example: CONF:SHOR:KEY DISABLE Set SHORT key function to disable.
CONF:SHOR:KEY 1 Set SHORT key function to enable.
Query Syntax: CONFigure:SHORt:KEY?
Return Parameter: <CRD>, HOLD, TOGGLE, DISABLE [Unit = None]
Query Example: CONF:SHOR:KEY?

CONFigure:SOUNd

Type: Channel-Specific
Description: Set the buzzer on/off in Load.
Setting Syntax: CONFigure:SOUNd<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: CONF:SOUN OFF Set buzzer to OFF.
CONF:SOUN 1 Set buzzer to ON.
Query Syntax: CONFigure:SOUNd?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: CONF:SOUN?

CONFigure:DIO:IN1

Type: Frame-Specific
Description: Set the DI1 type the pin No.11 in System I/O Port.
Setting Syntax: CONFigure:DIO:IN1<space><NR1>
Setting Parameter: <NR1>, 0 ~ 2
0: NONE
1: EXTERNAL LOAD ON/OFF
2: REMOTE INHIBIT
Setting Example: CONF:DIO:IN1 2 Set DI1 to REMOTE INHIBIT.
CONF:DIO:IN1 0 Set DI1 to NONE.
Query Syntax: CONFigure:DIO:IN1?
Return Parameter: <NR1>, 0 ~ 2 [Unit = None]
Query Example: CONF:DIO:IN1?

CONFigure:DIO:IN2

Type: Frame-Specific
Description: Set the DI2 type the pin No.12 in System I/O Port.
Setting Syntax: CONFigure:DIO:IN2<space><NR1>
Setting Parameter: <NR1>, 0 ~ 2
0: NONE
1: EXTERNAL LOAD ON/OFF
2: REMOTE INHIBIT
Setting Example: CONF:DIO:IN2 2 Set DI2 to REMOTE INHIBIT.
CONF:DIO:IN2 0 Set DI2 to NONE.
Query Syntax: CONFigure:DIO:IN2?
Return Parameter: <NR1>, 0 ~ 2 [Unit = None]

Query Example: CONF:DIO:IN2?

CONFigure:DIO:OUT1

Type: Frame-Specific
Description: Set the DO1 type the pin No.8 in System I/O Port.
Setting Syntax: CONFigure:DIO:OUT1<space><NR1>
Setting Parameter: <NR1>, 0 ~ 7
0: NONE
1: OCP TEST PASS-H
2: OCP TEST FAIL-L
3: GONG TOTAL PASS-H
4: GONG TOTAL FAIL-L
5: OTP OVP OCP OPP REV-H
6: BUS CTRL. ACT-H
7: BUS CTRL. ACT-L
Setting Example: CONF:DIO:OUT1 2 Set DO1 to OCP TEST FAIL-L.
CONF:DIO:OUT1 0 Set DO1 to NONE.
Query Syntax: CONFigure:DIO:OUT1?
Return Parameter: <NR1>, 0 ~ 7 [Unit = None]
Query Example: CONF:DIO:OUT1?

CONFigure:DIO:OUT2

Type: Frame-Specific
Description: Set the DO2 type the pin No.9 in System I/O Port.
Setting Syntax: CONFigure:DIO:OUT2<space><NR1>
Setting Parameter: <NR1>, 0 ~ 7
0: NONE
1: OCP TEST PASS-H
2: OCP TEST FAIL-L
3: GONG TOTAL PASS-H
4: GONG TOTAL FAIL-L
5: OTP OVP OCP OPP REV-H
6: BUS CTRL. ACT-H
7: BUS CTRL. ACT-L
Setting Example: CONF:DIO:OUT2 1 Set DO2 to OCP TEST PASS-H.
CONF:DIO:OUT2 0 Set DO2 to NONE.
Query Syntax: CONFigure:DIO:OUT2?
Return Parameter: <NR1>, 0 ~ 7 [Unit = None]
Query Example: CONF:DIO:OUT2?

DIO:OUT1

Type: Frame-Specific
Description: It sets the system I/O port pin 8 DO1 status when the BUS CTRL. mode is selected for DO1.
Setting Syntax: DIO:OUT1<space><NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: DIO:OUT1 ON Set DO1 to act.
DIO:OUT1 0 Set DO1 not to act.
Query Syntax: DIO:OUT1?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: DIO:OUT1?

DIO:OUT2

Type: Frame-Specific
Description: It sets the system I/O port pin 9 DO2 status when the BUS CTRL. mode is selected for DO2.
Setting Syntax: DIO:OUT2<space><NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: DIO:OUT2 ON Set DO2 to act.
DIO:OUT2 0 Set DO2 not to act.
Query Syntax: DIO:OUT2?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: DIO:OUT2?

CONFigure[:PROTection]:OCP

Description: Set the action enable or disable of user's define OCP function.
Setting Syntax: CONFigure[:PROTection]:OCP<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, DISABLE | 0, ENABLE | 1
Setting Example: CONF:OCP DISABLE Set user's define OCP function to DISABLE.
CONF:OCP 1 Set user's define OCP function to ENABLE.
Query Syntax: CONFigure[:PROTection]:OCP?
Return Parameter: <CRD>, DISABLE, ENABLE [Unit = None]
Query Example: CONF:OCP?

CONFigure[:PROTection]:OCP:POINt

Description: Set the current limit for user's define OCP function.
Setting Syntax: CONFigure[:PROTection]:OCP:POINt<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CONF:OCP:POIN 3 Set the current limit to 3A.
CONF:OCP:POIN MAX Set the current limit to the maximum value.
CONF:OCP:POIN MIN Set the current limit to the minimum value.
Query Syntax: CONFigure[:PROTection]:OCP:POINt?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: CONF:OCP:POIN?
CONF:OCP:POIN? MAX
CONF:OCP:POIN? MIN

CONFigure[:PROTection]:OCP:DELay

Description: Set the delay time for user's define OCP function.
Setting Syntax: CONFigure[:PROTection]:OCP:DELay<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 1ms ~ 61s, Resolution = 1ms, Unit = Second
Setting Example: CONF:OCP:DEL 0.02 Set delay time = 20ms
CONF:OCP:DEL 20ms Set delay time = 20ms
CONF:OCP:DEL MAX Set delay time = max. value.
CONF:OCP:DEL MIN Set delay time = min. value.
Query Syntax: CONFigure[:PROTection]:OCP:DELay?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: CONF:OCP:DEL?
CONF:OCP:DEL? MAX
CONF:OCP:DEL? MIN

CONFigure[:PROTection]:OPP

Description: Set the action enable or disable of user's define OPP function.
Setting Syntax: CONFigure[:PROTection]:OPP<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, DISABLE | 0, ENABLE | 1
Setting Example: CONF:OPP DISABLE Set user's define OPP function to DISABLE.
CONF:OPP 1 Set user's define OPP function to ENABLE.
Query Syntax: CONFigure[:PROTection]:OPP?
Return Parameter: <CRD>, DISABLE, ENABLE [Unit = None]
Query Example: CONF:OPP?

CONFigure[:PROTection]:OPP:POINt

Description: Set the current limit for user's define OPP function.
Setting Syntax: CONFigure[:PROTection]:OPP:POINt<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CONF:OPP:POIN 300 Set the current limit to 300W.
CONF:OPP:POIN MAX Set the current limit to the maximum value.
CONF:OPP:POIN MIN Set the current limit to the minimum value.
Query Syntax: CONFigure[:PROTection]:OPP:POINt?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: CONF:OPP:POIN?
CONF:OPP:POIN? MAX
CONF:OPP:POIN? MIN

CONFigure[:PROTection]:OPP:DELay

Description: Set the delay time for user's define OPP function.
Setting Syntax: CONFigure[:PROTection]:OPP:DELay<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 1ms ~ 61s, Resolution = 1ms, Unit = Second
Setting Example: CONF:OPP:DEL 0.02 Set delay time = 20ms
CONF:OPP:DEL 20ms Set delay time = 20ms
CONF:OPP:DEL MAX Set delay time = max. value.
CONF:OPP:DEL MIN Set delay time = min. value.
Query Syntax: CONFigure[:PROTection]:OPP:DELay?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: CONF:OPP:DEL?
CONF:OPP:DEL? MAX
CONF:OPP:DEL? MIN

4.3.2.4 COMMUNICATE Subsystem

COMMunicate:ADDRess:GPIB

Type: Frame-Specific
Description: It sets the GPIB address.
Setting Syntax: COMMunicate:ADDRess:GPIB<space><NR1>
Setting Parameter: <NR1>, 1 ~ 30, Unit = None
Setting Example: COMM:ADDR:GPIB 7 Set GPIB address to 7.
COMM:ADDR:GPIB 11 Set GPIB address to 11.
Query Syntax: COMMunicate:ADDRess:GPIB?[<space><MAX | MIN>]
Return Parameter: <NR1>, 1 ~ 30, [Unit = None]
Query Example: COMM:ADDR:GPIB?
COMM:ADDR:GPIB? MAX

COMM:ADDR:GPIB? MIN

COMMunicate:ADDRess:SBUS

Type: Frame-Specific
Description: It sets the System Bus address.
Setting Syntax: COMMunicate:ADDRess:SBUS<space><NR1>
Setting Parameter: <NR1>, 1 ~ 20, Unit = None
Setting Example: COMM:ADDR:SBUS 7 Set System Bus address to 7.
COMM:ADDR:SBUS 11 Set System Bus address to 11.
Query Syntax: COMMunicate:ADDRess:SBUS?[<space><MAX | MIN>]
Return Parameter: <NR1>, 1 ~ 20, [Unit = None]
Query Example: COMM:ADDR:SBUS?
COMM:ADDR:SBUS? MAX
COMM:ADDR:SBUS? MIN

COMMunicate:TERMinator:SBUS

Type: Frame-Specific
Description: It sets the System Bus terminator's state.
Setting Syntax: COMMunicate:TERMinator:SBUS<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1, Unit = None
Setting Example: COMM:TERM:SBUS 0 Set System Bus terminator to OFF.
COMM:TERM:SBUS ON Set System Bus terminator to ON.
Query Syntax: COMMunicate:TERMinator:SBUS?
Return Parameter: <CRD>, OFF, ON, [Unit = None]
Query Example: COMM:TERM:SBUS?

4.3.2.5 CURRENT Subsystem

CURRent:STATic:L1

Type: Channel-Specific
Description: Set the static load current for constant current static mode.
Setting Syntax: CURRent:STATic:L1<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CURR:STAT:L1 20 Set the static load parameter L1 = 20A.
CURR:STAT:L1 10A Set the static load parameter L1 = 10A.
CURR:STAT:L1 MAX Set the static load parameter L1 = maximum value.
CURR:STAT:L1 MIN Set the static load parameter L1 = minimum value.
Query Syntax: CURRent:STATic:L1?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: CURR:STAT:L1?
CURR:STAT:L1? MAX
CURR:STAT:L1? MIN

CURRent:STATic:L2

Type: Channel-Specific
Description: Set the static load current for constant current static mode.
Setting Syntax: CURRent:STATic:L2<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CURR:STAT:L2 20 Set the static load parameter L2 = 20A.
CURR:STAT:L2 10A Set the static load parameter L2 = 10A.

	CURR:STAT:L2 MAX	Set the static load parameter L2 = maximum value.
	CURR:STAT:L2 MIN	Set the static load parameter L2 = minimum value.

Query Syntax: CURRent:STATic:L2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: CURR:STAT:L2?
CURR:STAT:L2? MAX
CURR:STAT:L2? MIN

CURRent:STATic:RISE

Type: Channel-Specific
Description: Set the rising slew rate of current for constant current static mode.
Setting Syntax: CURRent:STATic:RISE<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.

Setting Example:	CURR:STAT:RISE 2.5	Set rising slew rate to 2.5A/μs.
	CURR:STAT:RISE 1A/μs	Set rising slew rate to 1A/μs.
	CURR:STAT:RISE MAX	Set rising slew rate to the maximum value of static load.
	CURR:STAT:RISE MIN	Set rising slew rate to the minimum value of static load.

Query Syntax: CURRent:STATic:RISE?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example: CURR:STAT:RISE?
CURR:STAT:RISE? MAX
CURR:STAT:RISE? MIN

CURRent:STATic:FALL

Type: Channel-Specific
Description: Set the falling slew rate of current for constant current static mode.
Setting Syntax: CURRent:STATic:FALL<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.

Setting Example:	CURR:STAT:FALL 2.5	Set falling slew rate to 2.5A/μs.
	CURR:STAT:FALL 1A/μs	Set falling slew rate to 1A/μs.
	CURR:STAT:FALL MAX	Set falling slew rate to the maximum value of static load.
	CURR:STAT:FALL MIN	Set falling slew rate to the minimum value of static load.

Query Syntax: CURRent:STATic:FALL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example: CURR:STAT:FALL?
CURR:STAT:FALL? MAX
CURR:STAT:FALL? MIN

CURRent:STATic:VRNG

Type: Channel-Specific
Description: Set the voltage measurement range in CC mode.
Setting Syntax: CURRent:STATic:VRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2

Setting Example:	CURR:STAT:VRNG HIGH	Set voltage range to High.
	CURR:STAT:VRNG M	Set voltage range to Middle.
	CURR:STAT:VRNG 0	Set voltage range to Low.

Query Syntax: CURRent:STATic:VRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]

Query Example: CURR:STAT:VRNG?

CURRent:DYNamic:L1

Type: Channel-Specific
Description: Set the load current during T1 period for constant current dynamic mode.
Setting Syntax: CURRent:DYNamic:L1<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:
CURR:DYN:L1 20 Set the dynamic load parameter L1 = 20A.
CURR:DYN:L1 10A Set the dynamic load parameter L1 = 10A.
CURR:DYN:L1 MAX Set the dynamic load parameter L1 = maximum value.
CURR:DYN:L1 MIN Set the dynamic load parameter L1 = minimum value.
Query Syntax: CURRent:DYNamic:L1?[<space><MAX | MIN>]
Return Parameter: <NR2>,[Unit = Ampere]
Query Example:
CURR:DYN:L1?
CURR:DYN:L1? MAX
CURR:DYN:L1? MIN

CURRent:DYNamic:L2

Type: Channel-Specific
Description: Set the load current during T2 period for constant current dynamic mode.
Setting Syntax: CURRent:DYNamic:L2<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:
CURR:DYN:L2 20 Set the dynamic load parameter L2 = 20A.
CURR:DYN:L2 10A Set the dynamic load parameter L2 = 10A.
CURR:DYN:L2 MAX Set the dynamic load parameter L2 = maximum value.
CURR:DYN:L2 MIN Set the dynamic load parameter L2 = minimum value.
Query Syntax: CURRent:DYNamic:L2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example:
CURR:DYN:L2?
CURR:DYN:L2? MAX
CURR:DYN:L2? MIN

CURRent:DYNamic:T1

Type: Channel-Specific
Description: Set duration parameter T1 for constant current dynamic mode.
Setting Syntax: CURRent:DYNamic:T1<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 20μs ~ 99.999ms, Resolution = 1μs, Unit = Second
Setting Example:
CURR:DYN:T1 10ms Set the dynamic duration T1 = 10ms.
CURR:DYN:T1 90ms Set the dynamic duration T1 = 90ms.
CURR:DYN:T1 MAX Set the dynamic duration T1 as maximum value.
CURR:DYN:T1 MIN Set the dynamic duration T1 as minimum value.
Query Syntax: CURRent:DYNamic:T1?[<space><MAX | MIN>]

Return Parameter: <NR2>, [Unit = Second]
Query Example: CURR:DYN:T1?
CURR:DYN:T1? MAX
CURR:DYN:T1? MIN

CURRent:DYNamic:T2

Type: Channel-Specific
Description: Set duration parameter T2 for constant current dynamic mode.
Setting Syntax: CURRent:DYNamic:T2<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 20μs ~ 99.999ms, Resolution = 1μs, Unit = Second
Setting Example: CURR:DYN:T2 10ms Set the dynamic duration T2 = 10ms.
CURR:DYN:T2 90ms Set the dynamic duration T2 = 90ms.
CURR:DYN:T2 MAX Set the dynamic duration T2 as maximum value.
CURR:DYN:T2 MIN Set the dynamic duration T2 as minimum value.
Query Syntax: CURRent:DYNamic:T2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: CURR:DYN:T2?
CURR:DYN:T2? MAX
CURR:DYN:T2? MIN

CURRent:DYNamic:REPeat

Type: Channel-Specific
Description: Set the repeat count for constant current dynamic mode.
Setting Syntax: CURRent:DYNamic:REPeat<space><NRf+>
Setting Parameter: <NRf+>, 0 ~ 65535, Resolution = 1, Unit = None
Setting Example: CURR:DYN:REP 500 Set repeat count = 500
CURR:DYN:REP MAX Set repeat count = maximum value.
CURR:DYN:REP MIN Set repeat count = minimum value.
Query Syntax: CURRent:DYNamic:REPeat?[<space><MAX | MIN>]
Return Parameter: <NR1>, [Unit = None]
Query Example: CURR:DYN:REP?
CURR:DYN:REP? MAX
CURR:DYN:REP? MIN

CURRent:DYNamic:RISE

Type: Channel-Specific
Description: Set the rising slew rate of current for constant current dynamic mode.
Setting Syntax: CURRent:DYNamic:RISE<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CURR:DYN:RISE 2.5 Set rising slew rate to 2.5A/μs.
CURR:DYN:RISE 1A/μs Set rising slew rate to 1A/μs.
CURR:DYN:RISE MAX Set rising slew rate to the maximum value of dynamic load.
CURR:DYN:RISE MIN Set rising slew rate to the minimum value of dynamic load.
Query Syntax: CURRent:DYNamic:RISE?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example: CURR:DYN:RISE?
CURR:DYN:RISE? MAX
CURR:DYN:RISE? MIN

CURRent:DYNamic:FALL

Type: Channel-Specific
Description: Set the falling slew rate of current for constant current dynamic mode.
Setting Syntax: CURRent:DYNamic:FALL<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:
CURR:DYN:FALL 2.5 Set falling slew rate to 2.5A/μs.
CURR:DYN:FALL 1A/μs Set falling slew rate to 1A/μs.
CURR:DYN:FALL MAX Set falling slew rate to the maximum value of dynamic load.
CURR:DYN:FALL MIN Set falling slew rate to the minimum value of dynamic load.
Query Syntax: CURRent:DYNamic:FALL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example:
CURR:DYN:FALL?
CURR:DYN:FALL? MAX
CURR:DYN:FALL? MIN

CURRent:DYNamic:VRNG

Type: Channel-Specific
Description: Set the voltage measurement range in CCD mode.
Setting Syntax: CURRent:DYNamic:VRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example:
CURR:DYN:VRNG HIGH Set voltage range to High.
CURR:DYN:VRNG M Set voltage range to Middle.
CURR:DYN:VRNG 0 Set voltage range to Low.
Query Syntax: CURRent: DYNamic: VRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: CURR:DYN:VRNG?

4.3.2.6 RESISTANCE Subsystem

RESistance:STATic:L1

Type: Channel-Specific
Description: Set static resistance level for constant resistance mode.
Setting Syntax: RESistance:STATic:L1<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:
RES:STAT:L1 20 Set constant resistance = 20Ω for Load L1.
RES:STAT:L1 10 OHM Set constant resistance = 10Ω for Load L1.
RES:STAT:L1 MAX Set constant resistance = maximum value for Load L1.
RES:STAT:L1 MIN Set constant resistance = minimum value for Load L1.
Query Syntax: RESistance:STATic:L1?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ohm]
Query Example:
RES:STAT:L1?
RES:STAT:L1? MAX
RES:STAT:L1? MIN

RESistance:STATic:L2

Type: Channel-Specific
Description: Set static resistance level for constant resistance mode.
Setting Syntax: RESistance:STATic:L2<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

RES:STAT:L2 20	Set constant resistance = 20Ω for Load L2.
RES:STAT:L2 10 OHM	Set constant resistance = 10Ω for Load L2.
RES:STAT:L2 MAX	Set constant resistance = maximum value for Load L2.
RES:STAT:L2 MIN	Set constant resistance = minimum value for Load L2.

Query Syntax: RESistance:STATic:L2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ohm]
Query Example:
RES:STAT:L2?
RES:STAT:L2? MAX
RES:STAT:L2? MIN

RESistance:STATic:RISE

Type: Channel-Specific
Description: Set the rising slew rate of current for constant resistance mode.
Setting Syntax: RESistance:STATic:RISE<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

RES:STAT:RISE 2.5	Set rising slew rate to 2.5A/μs.
RES:STAT:RISE 1A/μs	Set rising slew rate to 1A/μs.
RES:STAT:RISE MAX	Set rising slew rate to the maximum value of static load.
RES:STAT:RISE MIN	Set rising slew rate to the minimum value of static load.

Query Syntax: RESistance:STATic:RISE?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example:
RES:STAT:RISE?
RES:STAT:RISE? MAX
RES:STAT:RISE? MIN

RESistance:STATic:FALL

Type: Channel-Specific
Description: Set the falling slew rate of current for constant resistance mode.
Setting Syntax: RESistance:STATic:FALL<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

RES:STAT:FALL 2.5	Set falling slew rate to 2.5A/μs.
RES:STAT:FALL 1A/μs	Set falling slew rate to 1A/μs.
RES:STAT:FALL MAX	Set falling slew rate to the maximum value of static load.
RES:STAT:FALL MIN	Set falling slew rate to the minimum value of static load.

Query Syntax: RESistance:STATic:FALL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example:
RES:STAT:FALL?
RES:STAT:FALL? MAX
RES:STAT:FALL? MIN

RESistance:STATic:IRNG

Type: Channel-Specific
Description: Set the current measurement range in CR mode.
Setting Syntax: RESistance:STATic:IRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example: RES:STAT:IRNG HIGH — Set current range to High.
RES:STAT:IRNG M — Set current range to Middle.
RES:STAT:IRNG 0 — Set current range to Low.
Query Syntax: RESistance:STATic:IRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: RES:STAT:IRNG?

RESistance:DYNamic:L1

Type: Channel-Specific
Description: Set the load resistance during T1 period for constant resistance dynamic mode.
Setting Syntax: RESistance:DYNamic:L1<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: RES:DYN:L1 20 — Set the dynamic load parameter L1 = 20Ω.
RES:DYN:L1 10 OHM — Set the dynamic load parameter L1 = 10Ω.
RES:DYN:L1 MAX — Set the dynamic load parameter L1 = maximum value.
RES:DYN:L1 MIN — Set the dynamic load parameter L1 = minimum value.
Query Syntax: RESistance:DYNamic:L1?[<space><MAX | MIN>]
Return Parameter: <NR2>,[Unit = Ohm]
Query Example: RES:DYN:L1?
RES:DYN:L1? MAX
RES:DYN:L1? MIN

RESistance:DYNamic:L2

Type: Channel-Specific
Description: Set the load resistance during T2 period for constant resistance dynamic mode.
Setting Syntax: RESistance:DYNamic:L2<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: RES:DYN:L2 20 — Set the dynamic load parameter L2 = 20Ω.
RES:DYN:L2 10 OHM — Set the dynamic load parameter L2 = 10Ω.
RES:DYN:L2 MAX — Set the dynamic load parameter L2 = maximum value.
RES:DYN:L2 MIN — Set the dynamic load parameter L2 = minimum value.
Query Syntax: RESistance:DYNamic:L2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ohm]
Query Example: RES:DYN:L2?
RES:DYN:L2? MAX
RES:DYN:L2? MIN

RESistance:DYNamic:T1

Type: Channel-Specific
Description: Set duration parameter T1 for constant resistance dynamic mode.
Setting Syntax: RESistance:DYNamic:T1<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 20μs ~ 99.999ms, Resolution = 1μs, Unit = Second
Setting Example:
RES:DYN:T1 10ms — Set the dynamic duration T1 = 10ms.
RES:DYN:T1 90ms — Set the dynamic duration T1 = 90ms.
RES:DYN:T1 MAX — Set the dynamic duration T1 as maximum value.
RES:DYN:T1 MIN — Set the dynamic duration T1 as minimum value.
Query Syntax: RESistance:DYNamic:T1?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example:
RES:DYN:T1?
RES:DYN:T1? MAX
RES:DYN:T1? MIN

RESistance:DYNamic:T2

Type: Channel-Specific
Description: Set duration parameter T2 for constant resistance dynamic mode.
Setting Syntax: RESistance:DYNamic:T2<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 20μs ~ 99.999ms, Resolution = 1μs, Unit = Second
Setting Example:
RES:DYN:T2 10ms — Set the dynamic duration T2 = 10ms.
RES:DYN:T2 90ms — Set the dynamic duration T2 = 90ms.
RES:DYN:T2 MAX — Set the dynamic duration T2 as maximum value.
RES:DYN:T2 MIN — Set the dynamic duration T2 as minimum value.
Query Syntax: RESistance:DYNamic:T2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example:
RES:DYN:T2?
RES:DYN:T2? MAX
RES:DYN:T2? MIN

RESistance:DYNamic:REPeat

Type: Channel-Specific
Description: Set the repeat count for constant resistance dynamic mode.
Setting Syntax: RESistance:DYNamic:REPeat<space><NRf+>
Setting Parameter: <NRf+>, 0 ~ 65535, Resolution = 1, Unit = None
Setting Example:
RES:DYN:REP 500 — Set repeat count = 500
RES:DYN:REP MAX — Set repeat count = maximum value.
RES:DYN:REP MIN — Set repeat count = minimum value.
Query Syntax: RESistance:DYNamic:REPeat?[<space><MAX | MIN>]
Return Parameter: <NR1>, [Unit = None]
Query Example:
RES:DYN:REP?
RES:DYN:REP? MAX
RES:DYN:REP? MIN

RESistance:DYNamic:RISE

Type: Channel-Specific
Description: Set the rising slew rate of current for constant resistance dynamic mode.
Setting Syntax: RESistance:DYNamic:RISE<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.

Setting Example:	RES:DYN:RISE 2.5	Set rising slew rate to 2.5A/μs.
	RES:DYN:RISE 1A/μs	Set rising slew rate to 1A/μs.
	RES:DYN:RISE MAX	Set rising slew rate to the maximum value of dynamic load.
	RES:DYN:RISE MIN	Set rising slew rate to the minimum value of dynamic load.
Query Syntax:	RESistance:DYNamic:RISE?[<space><MAX | MIN>]	
Return Parameter:	<NR2>, [Unit = A/μs]	
Query Example:	RES:DYN:RISE?	
	RES:DYN:RISE? MAX	
	RES:DYN:RISE? MIN	

RESistance:DYNamic:FALL

Type:	Channel-Specific	
Description:	Set the falling slew rate of current for constant resistance dynamic mode.	
Setting Syntax:	RESistance:DYNamic:FALL<space><NRf+>[suffix]	
Setting Parameter:	Refer to respective specification for valid value range.	
Setting Example:	RES:DYN:FALL 2.5	Set falling slew rate to 2.5A/μs.
	RES:DYN:FALL 1A/μs	Set falling slew rate to 1A/μs.
	RES:DYN:FALL MAX	Set falling slew rate to the maximum value of dynamic load.
	RES:DYN:FALL MIN	Set falling slew rate to the minimum value of dynamic load.
Query Syntax:	RESistance:DYNamic:FALL?[<space><MAX | MIN>]	
Return Parameter:	<NR2>, [Unit = A/μs]	
Query Example:	RES:DYN:FALL?	
	RES:DYN:FALL? MAX	
	RES:DYN:FALL? MIN	

RESistance:DYNamic:IRNG

Type:	Channel-Specific	
Description:	Set the current measurement range in constant resistance dynamic mode.	
Setting Syntax:	RESistance:DYNamic:IRNG<space><CRD | NR1>	
Setting Parameter:	<CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2	
Setting Example:	RES:DYN:IRNG HIGH	Set current range to High.
	RES:DYN:IRNG M	Set current range to Middle.
	RES:DYN:IRNG 0	Set current range to Low.
Query Syntax:	RESistance:DYNamic:IRNG?	
Return Parameter:	<CRD>, LOW, MIDDLE, HIGH	[Unit = None]
Query Example:	RES:DYN:IRNG?	

4.3.2.7 VOLTAGE Subsystem

VOLTage:STATic:L1

Type:	Channel-Specific	
Description:	Set the static load voltage in constant voltage mode.	
Setting Syntax:	VOLTage:STATic:L1<space><NRf+>[suffix]	
Setting Parameter:	Refer to respective specification for valid value range.	
Setting Example:	VOLT:STAT:L1 8	Set voltage of load L1 as 8V.
	VOLT:STAT:L1 24V	Set voltage of load L1 as 24V.

	VOLT:STAT:L1 MAX	Set voltage of load L1 as the maximum value.
	VOLT:STAT:L1 MIN	Set voltage of load L1 as the minimum value.

Query Syntax: VOLTage:STATic:L1?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: VOLT:STAT:L1?
VOLT:STAT:L1? MAX
VOLT:STAT:L1? MIN

VOLTage:STATic:L2

Type: Channel-Specific
Description: Set the static load voltage in constant voltage mode.
Setting Syntax: VOLTage:STATic:L2<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

VOLT:STAT:L2 8	Set voltage of load L2 as 8V.
VOLT:STAT:L2 24V	Set voltage of load L2 as 24V.
VOLT:STAT:L2 MAX	Set voltage of load L2 as the maximum value.
VOLT:STAT:L2 MIN	Set voltage of load L2 as the minimum value.

Query Syntax: VOLTage:STATic:L2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: VOLT:STAT:L2?
VOLT:STAT:L2? MAX
VOLT:STAT:L2? MIN

VOLTage:STAT:ILIMit

Type: Channel-Specific
Description: Set the current limit for constant voltage mode.
Setting Syntax: VOLTage:STATic:ILIMit<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

VOLT:STAT:ILIM 3	Set the current limit to 3A in constant voltage mode.
VOLT:STAT:ILIM MAX	Set the current limit to the maximum value in constant voltage mode.
VOLT:STAT:ILIM MIN	Set the current limit to the minimum value in constant voltage mode.

Query Syntax: VOLTage:STATic:ILIMit?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: VOLT:STAT:ILIM?
VOLT:STAT:ILIM? MAX
VOLT:STAT:ILIM? MIN

VOLTage:STATic:RESponse

Type: Channel-Specific
Description: Set the response speed in constant voltage mode.
Setting Syntax: VOLTage:STATic:RESponose<space><NRf>
Setting Parameter: <NRf>, SLOW | 0, NORMAL | 1, FAST | 2
Example: VOLT:STAT:RES FAST
VOLT:STAT:RES SLOW

Query Syntax: VOLTage:STATic:RESponse?
Return Parameter: <CRD>, SLOW, NORMAL, FAST
Query Example: VOLT:STAT:RES?

VOLTage:STATic:IRNG

Type: Channel-Specific
Description: Set the current measurement range in constant voltage mode.
Setting Syntax: VOLTage:STATic:IRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example: VOLT:STAT:IRNG HIGH Set current range to High.
VOLT:STAT:IRNG M Set current range to Middle.
VOLT:STAT:IRNG 0 Set current range to Low.
Query Syntax: VOLTage: STATic: IRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: VOLT:STAT:IRNG?

4.3.2.8 POWER Subsystem

POWer:STATic:L1

Type: Channel-Specific
Description: Set the static load power for constant power mode.
Setting Syntax: POWer:STATic:L1<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: POW:STAT:L1 20 Set the load parameter L1 = 20W.
POW:STAT:L1 10W Set the load parameter L1 = 10W.
POW:STAT:L1 MAX Set the load parameter L1 = max. value.
POW:STAT:L1 MIN Set the load parameter L1 = min. value.
Query Syntax: POWer:STATic:L1?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: POW:STAT:L1?
POW:STAT:L1? MAX
POW:STAT:L1? MIN

POWer:STATic:L2

Type: Channel-Specific
Description: Set the static load power for constant power mode.
Setting Syntax: POWer:STATic:L2<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: POW:STAT:L2 20 Set the load parameter L2 = 20W.
POW:STAT:L2 10W Set the load parameter L2 = 10W.
POW:STAT:L2 MAX Set the load parameter L2 = max. value.
POW:STAT:L2 MIN Set the load parameter L2 = min. value.
Query Syntax: POWer:STATic:L2?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: POW:STAT:L2?
POW:STAT:L2? MAX
POW:STAT:L2? MIN

POWer:STATic:RISE

Type: Channel-Specific
Description: Set the rising slew rate of current for constant power mode.
Setting Syntax: POWer:STATic:RISE<space><NRf+>[suffix]

Setting Parameter: Refer to respective specification for valid value range.
Setting Example: POW:STAT:RISE 2.5 Set rising slew rate to 2.5A/μs.
POW:STAT:RISE 1A/μs Set rising slew rate to 1A/μs .
POW:STAT:RISE MAX Set rising slew rate to the max. value of load.
POW:STAT:RISE MIN Set rising slew rate to the min. value of load.
Query Syntax: POWer:STATic:RISE?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example: POW:STAT:RISE?
POW:STAT:RISE? MAX
POW:STAT:RISE? MIN

POWer:STATic:FALL

Type: Channel-Specific
Description: Set the falling slew rate of current for constant power mode.
Setting Syntax: POWer:STATic:FALL<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: POW:STAT:FALL 2.5 Set falling slew rate to 2.5A/μs.
POW:STAT:FALL 1A/μs Set falling slew rate to 1A/μs.
POW:STAT:FALL MAX Set falling slew rate to the max. value.
POW:STAT:FALL MIN Set falling slew rate to the min.value.
Query Syntax: POWer:STATic:FALL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example: POW:STAT:FALL?
POW:STAT:FALL? MAX
POW:STAT:FALL? MIN

POWer:STATic:VRNG

Type: Channel-Specific
Description: Set the voltage measurement range in constant power mode.
Setting Syntax: POWer:STATic:VRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example: POW:STAT:VRNG HIGH Set voltage range to High.
POW:STAT:VRNG M Set voltage range to Middle.
POW:STAT:VRNG 0 Set voltage range to Low.
Query Syntax: POWer: STATic: VRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: POW:STAT:VRNG?

4.3.2.9 ADVANCE Subsystem

[ADVance:]BATTery:MODE

Type: Channel-Specific
Description: Set run mode in battery discharge mode.
Setting Syntax: [ADVance:]BATTery:MODE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, CC | 0, CR | 1, CP | 2
Setting Example: BATT:MODE CC Set run mode = CC
BATT:MODE 2 Set run mode = CP
Query Syntax: [ADVance:]BATTery:MODE?
Return Parameter: <CRD>, CC, CR, CP [Unit = None]
Query Example: BATT:MODE?

[ADVance:]BATTery:VALue

Type: Channel-Specific
Description: Set load value according to the run mode in battery discharge mode.
Setting Syntax: [ADVance:]BATTery:VALue<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

When BATT:MODE set to CC mode, then

BATT:VAL 0.5	Set current = 0.5A
BATT:VAL 500mA	Set current = 0.5A
BATT:VAL MAX	Set current = max. value.
BATT:VAL MIN	Set current = mini. value.

When BATT:MODE set to CR mode, then

BATT:VAL 0.5	Set resistance = 0.5Ω.
BATT:VAL 500mΩ	Set resistance = 0.5Ω.
BATT:VAL MAX	Set resistance = max. value.
BATT:VAL MIN	Set resistance = min. value.

When BATT:MODE set to CP mode, then

BATT:VAL 0.5	Set power = 0.5W.
BATT:VAL 500mW	Set power = 0.5W.
BATT:VAL MAX	Set power = max. value.
BATT:VAL MIN	Set power = min. value.

Query Syntax: [ADVance:]BATTery:VALue?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere | Ohm | Watt]
Query Example: BATT:VAL?
BATT:VAL? MAX
BATT:VAL? MIN

[ADVance:]BATTery:RISE

Type: Channel-Specific
Description: Set rising slew rate of current in battery discharge mode.
Setting Syntax: [ADVance:]BATTery:RISE<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

BATT:RISE 0.1	Set slew rate = 0.1A/μs
BATT:RISE 100mA/μs	Set slew rate = 0.1A/μs
BATT:RISE MAX	Set slew rate = max. value.
BATT:RISE MIN	Set slew rate = min. value.

Query Syntax: [ADVance:]BATTery:RISE?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/uS]
Query Example: BATT:RISE?
BATT:RISE? MAX
BATT:RISE? MIN

[ADVance:]BATTery:FALL

Type: Channel-Specific
Description: Set falling slew rate of current in battery discharge mode.
Setting Syntax: [ADVance:]BATTery:FALL<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example:

BATT:FALL 0.1	Set slew rate = 0.1A/μs
BATT:FALL 100mA/μs	Set slew rate = 0.1A/μs
BATT:FALL MAX	Set slew rate = max. value.
BATT:FALL MIN	Set slew rate = min. value.

Query Syntax: [ADVance:]BATTery:FALL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/uS]

Query Example: BATT:FALL?
BATT:FALL? MAX
BATT:FALL? MIN

[ADVance:]BATTery:ENDVoltage

Type: Channel-Specific
Description: Set end voltage for battery discharge mode.
Setting Syntax: [ADVance:]BATTery:ENDVoltage<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: BATT:ENDV 0.5 Set end voltage = 0.5V
BATT:ENDV 500mV Set end voltage = 0.5V
BATT:ENDV MAX Set end voltage = max. value.
BATT:ENDV MIN Set end voltage = min. value.
Query Syntax: [ADVance:]BATTery:ENDVoltage?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: BATT:ENDV?
BATT:ENDV? MAX
BATT:ENDV? MIN

[ADVance:]BATTery:TOUT

Type: Channel-Specific
Description: Set timeout for battery discharge mode.
Setting Syntax: [ADVance:]BATTery:TOUT<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 0s~100000s, Resolution = 1s, Unit = Second
Setting Example: BATT:TOUT 100 Set timeout = 100s
BATT:TOUT MAX Set timeout = max. value.
BATT:TOUT MIN Set timeout = min. value.
Query Syntax: [ADVance:]BATTery:TOUT?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: BATT:TOUT?
BATT:TOUT? MAX
BATT:TOUT? MIN

[ADVance:]SINE:IAC

Type: Channel-Specific
Description: Set AC current for sine wave dynamic mode.
Setting Syntax: [ADVance:]SINE:IAC<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SINE:IAC 0.5 Set AC current = 0.5A.
SINE:IAC 500mA Set AC current = 0.5A.
SINE:IAC MAX Set AC current = max. value.
SINE:IAC MIN Set AC current = min. value.
Query Syntax: [ADVance]:SINE:IAC?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: SINE:IAC?
SINE:IAC? MAX
SINE:IAC? MIN

[ADVance:]SINE:IDC

Type: Channel-Specific
Description: Set DC current for sine wave dynamic mode.
Setting Syntax: [ADVance:]SINE:IDC<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SINE:IDC 0.5 Set DC current = 0.5A.

	SINE:IDC 500mA	Set DC current = 0.5A.
	SINE:IDC MAX	Set DC current = max. value.
	SINE:IDC MIN	Set DC current = min. value.
Query Syntax:	[ADVance:]SINE:IDC?[<space><MAX | MIN>]	
Return Parameter:	<NR2>, [Unit = Ampere]	
Query Example:	SINE:IDC?	
	SINE:IDC? MAX	
	SINE:IDC? MIN	

[ADVance:]SINE:FREQuency

Type:	Channel-Specific	
Description:	Set frequency for sine wave dynamic mode.	
Setting Syntax:	[ADVance:]SINE:FREQuency<space><NRf+>[suffix]	
Setting Parameter:	<NRf+>, 0.01Hz ~ 20000.00Hz, Resolution = 0.01Hz, Unit = Hertz	
Setting Example:	SINE:FREQ 1000	Set frequency = 1kHz.
	SINE:FREQ 1kHz	Set frequency = 1kHz.
	SINE:FREQ MAX	Set frequency = max. value.
	SINE:FREQ MIN	Set frequency = min. value.
Query Syntax:	[ADVance:]SINE:FREQuency?[<space><MAX | MIN>]	
Return Parameter:	<NR2>, [Unit = Hertz]	
Query Example:	SINE:FREQ?	
	SINE:FREQ? MAX	
	SINE:FREQ? MIN	

[ADVance:]OCP:STARt

Type:	Channel-Specific	
Description:	Set start current for OCP test mode.	
Setting Syntax:	[ADVance:]OCP:STARt<space><NRf+>[suffix]	
Setting Parameter:	Refer to respective specification for valid value range.	
Setting Example:	OCP:STAR 0.5	Set start current = 0.5A.
	OCP:STAR 500mA	Set start current = 0.5A.
	OCP:STAR MAX	Set start current = max. value.
	OCP:STAR MIN	Set start current = min. value.
Query Syntax:	[ADVance:]OCP:STARt?[<space><MAX | MIN>]	
Return Parameter:	<NR2>, [Unit = Ampere]	
Query Example:	OCP:STAR?	
	OCP:STAR? MAX	
	OCP:STAR? MIN	

[ADVance:]OCP:END

Type:	Channel-Specific	
Description:	Set end current for OCP test mode.	
Setting Syntax:	[ADVance:]OCP:END<space><NRf+>[suffix]	
Setting Parameter:	Refer to respective specification for valid value range.	
Setting Example:	OCP:END 0.5	Set end current = 0.5A.
	OCP:END 500mA	Set end current = 0.5A.
	OCP:END MAX	Set end current = max. value.
	OCP:END MIN	Set end current = min. value.
Query Syntax:	[ADVance:]OCP:END?[<space><MAX | MIN>]	
Return Parameter:	<NR2>, [Unit = Ampere]	
Query Example:	OCP:END?	
	OCP:END? MAX	
	OCP:END? MIN	

[ADVance:]OCP:STEP

Type: Channel-Specific
Description: Set step count for OCP test mode.
Setting Syntax: [ADVance:]OCP:STEP<space><NRf+>
Setting Parameter: <NRf+>, 1 ~ 1000, Resolution = 1, Unit = None
Setting Example: OCP:STEP 500 Set step count = 500.
OCP:STEP MAX Set step count = max. value.
OCP:STEP MIN Set step count = min. value.
Query Syntax: [ADVance:]OCP:STEP?[<space><MAX | MIN>]
Return Parameter: <NR1>, [Unit = None]
Query Example: OCP:STEP?
OCP:STEP? MAX
OCP:STEP? MIN

[ADVance:]OCP:DWELl

Type: Channel-Specific
Description: Set dwell time for OCP test mode.
Setting Syntax: [ADVance:]OCP:DWELl<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 10µs ~ 1s Resolution = 10µs, Unit = Second
Setting Example: OCP:DWEL 0.5 Set off time = 0.5s.
OCP:DWEL 500ms Set off time = 0.5s.
OCP:DWEL MAX Set off time = max. value.
OCP:DWEL MIN Set off time = min. value.
Query Syntax: [ADVance:]OCP:DWELl?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: OCP:DWEL?
OCP:DWEL? MAX
OCP:DWEL? MIN

[ADVance:]OCP:TRIGger:VOLTage

Type: Channel-Specific
Description: Set trigger voltage for OCP test mode.
Setting Syntax: [ADVance:]OCP:TRIGger:VOLTage<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OCP:TRIG:VOLT 0.5 Set trigger voltage = 0.5V.
OCP:TRIG:VOLT 500mV Set trigger voltage = 0.5V.
OCP:TRIG:VOLT MAX Set trigger voltage = max. value.
OCP:TRIG:VOLT MIN Set trigger voltage = min. value.
Query Syntax: [ADVance:]OCP:TRIGger:VOLTage?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: OCP:TRIG:VOLT?
OCP:TRIG:VOLT? MAX
OCP:TRIG:VOLT? MIN

[ADVance:]OCP:SPECification:H

Type: Channel-Specific
Description: Set high level current of specification for OCP test mode.
Setting Syntax: [ADVance:]OCP:SPECification:H<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OCP:SPEC:H 0.5 Set high level current = 0.5A.
OCP:SPEC:H 500mA Set high level current = 0.5A.
OCP:SPEC:H MAX Set high level current = max. value.

OCP:SPEC:H MIN Set high level current = min. value.
Query Syntax: [ADVance:]OCP:SPECification:H?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: OCP:SPEC:H?
OCP:SPEC:H? MAX
OCP:SPEC:H? MIN

[ADVance:]OCP:SPECification:L

Type: Channel-Specific
Description: Set low level current of specification for OCP test mode.
Setting Syntax: [ADVance:]OCP:SPECification:L<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OCP:SPEC:L 0.5 Set low level current = 0.5A.
OCP:SPEC:L 500mA Set low level current = 0.5A.
OCP:SPEC:L MAX Set low level current = max. value.
OCP:SPEC:L MIN Set low level current = min. value.
Query Syntax: [ADVance:]OCP:SPECification:L?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: OCP:SPEC:L?
OCP:SPEC:L? MAX
OCP:SPEC:L? MIN

[ADVance:]OCP: LATCh

Type: Channel-Specific
Description: Set load latch function for OCP test mode.
Setting Syntax: [ADVance:]OCP:LATCh<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: OCP:LATC OFF Set latch = OFF
OCP:LATC 1 Set latch = ON
Query Syntax: [ADVance:]OCP:LATCh?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: OCP:LATC?

[ADVance:]OCP:RESult?

Type: Channel-Specific
Description: Returns the result of OCP test function.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: [ADVance:]OCP:RESult?
Return Parameter: <arg1>,<arg2>,<arg3>
<arg1>: Pass/Fail. <NR1>, 0: PASS 1: FAIL [Unit = None]
<arg2>: OCP current. <NR2>, [Unit = Ampere]
<arg3>: Maximum power. <NR2>, [Unit = Watt]
When the returns are
-1,-1,-1 denotes OCP test is stop.
-2,-2,-2 denotes OCP test is ready to execute what wait for Von or other condition.
-3,-3,-3 denotes OCP test is execute.
Query Example: OCP:RES?

[ADVance:]OPP:STARt

Type: Channel-Specific
Description: Set start power for OPP test mode.

Setting Syntax: [ADVance:]OPP:STARt<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OPP:STAR 100 Set start power = 100W.
OPP:STAR 500mw Set start power = 0.5W.
OPP:STAR MAX Set start power = max. value.
OPP:STAR MIN Set start power = min. value.
Query Syntax: [ADVance:]OPP:STARt?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: OPP:STAR?
OPP:STAR? MAX
OPP:STAR? MIN

[ADVance:]OPP:END

Type: Channel-Specific
Description: Set end power for OPP test mode.
Setting Syntax: [ADVance:]OPP:END<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OPP:END 100 Set end power = 100W.
OPP:END 500mW Set end power = 0.5W.
OPP:END MAX Set end power = max. value.
OPP:END MIN Set end power = min. value.
Query Syntax: [ADVance:]OPP:END?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: OPP:END?
OPP:END? MAX
OPP:END? MIN

[ADVance:]OPP:STEP

Type: Channel-Specific
Description: Set step count for OPP test mode.
Setting Syntax: [ADVance:]OPP:STEP<space><NRf+>
Setting Parameter: <NRf+>, 1 ~ 1000, Resolution = 1, Unit = None
Setting Example: OPP:STEP 500 Set step count = 500.
OPP:STEP MAX Set step count = max. value.
OPP:STEP MIN Set step count = min. value.
Query Syntax: [ADVance:]OPP:STEP?[<space><MAX | MIN>]
Return Parameter: <NR1>, [Unit = None]
Query Example: OPP:STEP?
OPP:STEP? MAX
OPP:STEP? MIN

[ADVance:]OPP:DWELl

Type: Channel-Specific
Description: Set the step dwell time for OPP test mode.
Setting Syntax: [ADVance:]OPP:DWELl<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 10μs ~ 1s Resolution = 10μs, Unit = Second
Setting Example: OPP:DWEL 0.5 Set off time = 0.5s.
OPP:DWEL 500ms Set off time = 0.5s.
OPP:DWEL MAX Set off time = max. value.
OPP:DWEL MIN Set off time = min. value.
Query Syntax: [ADVance:]OPP:DWELl?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: OPP:DWEL?
OPP:DWEL? MAX

OPP:DWEL? MIN

[ADVance:]OPP:TRIGger:VOLTage

Type: Channel-Specific
Description: Set trigger voltage for OPP test mode.
Setting Syntax: [ADVance:]OPP:TRIGger:VOLTage<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OPP:TRIG:VOLT 0.5 Set trigger voltage = 0.5V.
OPP:TRIG:VOLT 500mV Set trigger voltage = 0.5V.
OPP:TRIG:VOLT MAX Set trigger voltage = max. value.
OPP:TRIG:VOLT MIN Set trigger voltage = min. value.
Query Syntax: [ADVance:]OPP:TRIGger:VOLTage?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: OPP:TRIG:VOLT?
OPP:TRIG:VOLT? MAX
OPP:TRIG:VOLT? MIN

[ADVance:]OPP:SPECification:H

Type: Channel-Specific
Description: Set high level power of specification for OPP test mode.
Setting Syntax: [ADVance:]OPP:SPECification:H<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OPP:SPEC:H 0.5 Set high level power = 0.5W.
OPP:SPEC:H 500mW Set high level power = 0.5W.
OPP:SPEC:H MAX Set high level power = max. value.
OPP:SPEC:H MIN Set high level power = min. value.
Query Syntax: [ADVance:]OPP:SPECification:H?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: OPP:SPEC:H?
OPP:SPEC:H? MAX
OPP:SPEC:H? MIN

[ADVance:]OPP:SPECification:L

Type: Channel-Specific
Description: Set low level power of specification for OPP test mode.
Setting Syntax: [ADVance:]OPP:SPECification:L<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: OPP:SPEC:L 0.5 Set low level power = 0.5W.
OPP:SPEC:L 500mW Set low level power = 0.5W.
OPP:SPEC:L MAX Set low level power = max. value.
OPP:SPEC:L MIN Set low level power = min. value.
Query Syntax: [ADVance:]OPP:SPECification:L?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: OPP:SPEC:L?
OPP:SPEC:L? MAX
OPP:SPEC:L? MIN

[ADVance:]OPP: LATCh

Type: Channel-Specific
Description: Set load latch function in OPP test mode.
Setting Syntax: [ADVance:]OPP:LATCh<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: OPP:LATC OFF Set latch = OFF

OPP:LATC 1 Set latch = ON
Query Syntax: [ADVance:]OPP:LATCh?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: OPP:LATC?

[ADVance:]OPP:RESult?

Type: Channel-Specific
Description: Returns the result of OPP test function.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: [ADVance:]OPP:RESult?
Return Parameter: <arg1>,<arg2>,<arg3>
<arg1>: Pass/Fail. <NR1>, 0: PASS 1: FAIL [Unit = None]
<arg2>: OPP power. <NR2>, [Unit = Watt]
<arg3>: Maximum power. <NR2>, [Unit = Watt]
When the returns are
-1,-1,-1 denotes OPP test is stop.
-2,-2,-2 denotes OPP test is ready to execute what wait for Von or other condition.
-3,-3,-3 denotes OPP test is execute.
Query Example: OPP:RES?

[ADVance:]CURRent:SWEep:IMAXimum

Type: Channel-Specific
Description: Set the maximum current for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:IMAXimum<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CURR:SWE:IMAX 20 Set max current = 20A.
CURR:SWE:IMAX 10A Set max current = 10A.
CURR:SWE:IMAX MAX Set max current = max. value.
CURR:SWE:IMAX MIN Set max current = min. value.
Query Syntax: [ADVance:]CURRent:SWEep:IMAXimum?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: CURR:SWE:IMAX?
CURR:SWE:IMAX? MAX
CURR:SWE:IMAX? MIN

[ADVance:]CURRent:SWEep:IMINimum

Type: Channel-Specific
Description: Set the minimum current for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:IMINimum<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CURR:SWE:IMIN 20 Set min current = 20A.
CURR:SWE:IMIN 10A Set min current = 10A.
CURR:SWE:IMIN MAX Set min current = max. value.
CURR:SWE:IMAX MIN Set min current = min. value.
Query Syntax: [ADVance:]CURRent:SWEep:IMINimum?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: CURR:SWE:IMIN?
CURR:SWE:IMIN? MAX
CURR:SWE:IMIN? MIN

[ADVance:]CURRent:SWEep:FSTArt

Type: Channel-Specific
Description: Set the start of frequency for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:FSTArt<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 0.01Hz ~ 50kHz, Resolution = 0.01Hz, Unit = Hertz
Setting Example: CURR:SWE:FSTA 1000 Set frequency = 1kHz
CURR:SWE:FSTA 1kHz Set frequency = 1kHz
CURR:SWE:FSTA MAX Set frequency = maxi. value.
CURR:SWE:FSTA MIN Set frequency = min. value.
Query Syntax: [ADVance:]CURRent:SWEep:FSTA?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Hertz]
Query Example: CURR:SWE:FSTA?
CURR:SWE:FSTA? MAX
CURR:SWE:FSTA? MIN

[ADVance:]CURRent:SWEep:FEND

Type: Channel-Specific
Description: Set the end of frequency for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:FEND<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 0.01Hz ~ 50kHz, Resolution = 0.01Hz, Unit = Hertz
Setting Example: CURR:SWE:FEND 1000 Set frequency = 1kHz
CURR:SWE:FEND 1kHz Set frequency = 1kHz
CURR:SWE:FEND MAX Set frequency = max. value.
CURR:SWE:FEND MIN Set frequency = min. value.
Query Syntax: [ADVance:]CURRent:SWEep:FEND?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Hertz]
Query Example: CURR:SWE:FEND?
CURR:SWE:FEND? MAX
CURR:SWE:FEND? MIN

[ADVance:]CURRent:SWEep:FSTEp

Type: Channel-Specific
Description: Set the step of frequency for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:FSTEp<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 0.01Hz ~ 50kHz, Resolution = 0.01Hz, Unit = Hertz
Setting Example: CURR:SWE:FSTE 1000 Set frequency = 1kHz
CURR:SWE:FSTE 1kHz Set frequency = 1kHz
CURR:SWE:FSTE MAX Set frequency = max. value.
CURR:SWE:FSTE MIN Set frequency = min. value.
Query Syntax: [ADVance:]CURRent:SWEep:FSTE?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Hertz]
Query Example: CURR:SWE:FSTE?
CURR:SWE:FSTE? MAX
CURR:SWE:FSTE? MIN

[ADVance:]CURRent:SWEep:DWELl

Type: Channel-Specific
Description: Set the dwell time for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:DWELl<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 1ms ~ 100s, Resolution = 1ms, Unit = Second

Setting Example: CURR:SWE:DWEL 50 Set dwell time = 50s
CURR:SWE:DWEL 500ms Set dwell time = 0.5s
CURR:SWE:DWEL MAX Set dwell time = max. value.
CURR:SWE:DWEL MIN Set dwell time = min. value.
Query Syntax: [ADVance:]CURRent:SWEep:DWELl?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: CURR:SWE:DWEL?
CURR:SWE:DWEL? MAX
CURR:SWE:DWEL? MIN

[ADVance:]CURRent:SWEep:DUTY

Type: Channel-Specific
Description: Set the duty cycle for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:DUTY<space><NRf+>
Setting Parameter: <NRf+>, 1% ~ 99%, Resolution = 1%
Setting Example: CURR:SWE:DUTY 50 Set duty cycle = 50%
CURR:SWE:DUTY MAX Set duty cycle = max. value.
CURR:SWE:DUTY MIN Set duty cycle = min. value.
Query Syntax: [ADVance:]CURRent:SWEep:DUTY?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = None]
Query Example: CURR:SWE:DUTY?
CURR:SWE:DUTY? MAX
CURR:SWE:DUTY? MIN

[ADVance:]CURRent:SWEep:RISE

Type: Channel-Specific
Description: Set the rising slew rate of current for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:RISE<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CURR:SWE:RISE 2.5 Set rising slew rate to 2.5A/μs.
CURR:SWE:RISE 1A/μsSet rising slew rate to 1A/μs.
CURR:SWE:RISE MAX Set rising slew rate to the max. value of static load.
CURR:SWE:RISE MIN Set rising slew rate to the min. value of static load.
Query Syntax: [ADVance:]CURRent:SWEep:RISE?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example: CURR:SWE:RISE?
CURR:SWE:RISE? MAX
CURR:SWE:RISE? MIN

[ADVance:]CURRent:SWEep:FALL

Type: Channel-Specific
Description: Set the falling slew rate of current for constant current frequency sweep mode.
Setting Syntax: [ADVance:]CURRent:SWEep:FALL<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CURR:SWE:FALL 2.5 Set falling slew rate to 2.5A/μs.
CURR:SWE:FALL 1A/μs Set falling slew rate to 1A/μs.
CURR:SWE:FALL MAX Set falling slew rate to the max. value of static load.
CURR:SWE:FALL MIN Set falling slew rate to the min. value of static load.

Query Syntax: [ADVance:]CURRent:SWEep:FALL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = A/μs]
Query Example: CURR:SWE:FALL?
CURR:SWE:FALL? MAX
CURR:SWE:FALL? MIN

[ADVance:]IMPedance:STATic:CL

Type: Channel-Specific
Description: Set the equivalent parallel load capacitance for constant impedance mode.
Setting Syntax: [ADVance:]IMPedance:STATic:CL<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 30μF ~ 50,000μF, Resolution = 1uF, Unit = Farad
Setting Example: IMP:STAT:CL 0.02 Set capacitance = 20mF.
IMP:STAT:CL 100μF Set capacitance = 100μF.
IMP:STAT:CL MAX Set capacitance = max. value.
IMP:STAT:CL MIN Set capacitance = min. value.
Query Syntax: [ADVance:]IMPedance:STATic:CL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Farad]
Query Example: IMP:STAT:CL?
IMP:STAT:CL? MAX
IMP:STAT:CL? MIN

[ADVance:]IMPedance:STATic:LS

Type: Channel-Specific
Description: Set the equivalent series inductance for constant impedance mode.
Setting Syntax: [ADVance:]IMPedance:STATic:LS<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 0 ~ 20.0μH, Resolution = 0.1μH, Unit = Henry
Setting Example: IMP:STAT:LS 0.00002 Set inductance = 20μH.
IMP:STAT:LS 1μH Set inductance = 1μH.
IMP:STAT:LS MAX Set inductance = max. value.
IMP:STAT:LS MIN Set inductance = mini. value.
Query Syntax: [ADVance:]IMPedance:STATic:LS?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Henry]
Query Example: IMP:STAT:LS?
IMP:STAT:LS? MAX
IMP:STAT:LS? MIN

[ADVance:]IMPedance:STATic:RS

Type: Channel-Specific
Description: Set the equivalent series resistance for constant impedance mode.
Setting Syntax: [ADVance:]IMPedance:STATic:RS<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 0.03Ω ~ 20.00Ω, Resolution = 0.01Ω, Unit = Ohm
Setting Example: IMP:STAT:RS 20 Set resistance = 20Ω.
IMP:STAT:RS 10 OHM Set resistance = 10Ω.
IMP:STAT:RS MAX Set resistance = max. value.
IMP:STAT:RS MIN Set resistance = min. value.
Query Syntax: [ADVance:]IMPedance:STATic:RS?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ohm]
Query Example: IMP:STAT:RS?
IMP:STAT:RS? MAX
IMP:STAT:RS? MIN

[ADVance:]IMPedance:STATic:RL

Type: Channel-Specific
Description: Set the equivalent parallel load resistance for constant impedance mode.
Setting Syntax: [ADVance:]IMPedance:STATic:RL<space><NRf+>[suffix]
Setting Parameter: For valid value range refer to respective specification.
Setting Example: IMP:STAT:RL 20 Set resistance = 20Ω.
IMP:STAT:RL 10 OHM Set resistance = 10Ω.
IMP:STAT:RL MAX Set resistance = max. value.
IMP:STAT:RL MIN Set resistance = min. value.
Query Syntax: [ADVance:]IMPedance:STATic:RL?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ohm]
Query Example: IMP:STAT:RL?
IMP:STAT:RL? MAX
IMP:STAT:RL? MIN

[ADVance:]USER:WAVeform:NSELect

Type: Channel-Specific
Description: Set the active waveform to run for user-define waveform function.
Setting Syntax: [ADVance:]USER:WAVeform:NSELect<space><NRf+>
Setting Parameter: <NRf+>, 1 ~ 10, Resolution = 1, Unit = None
Setting Example: USER:WAV:NSEL 5 Set active waveform = 5
USER:WAV:NSEL MAX Set active waveform = max. value.
ADV:USER:WAV:NSEL MIN Set active waveform = min. value.
Query Syntax: [ADVance:]USER:WAVeform:NSELect?[<space><MAX | MIN>]
Return Parameter: <NR1>, [Unit = None]
Query Example: USER:WAV:NSEL?
USER:WAV:NSEL? MAX
USER:WAV:NSEL? MIN

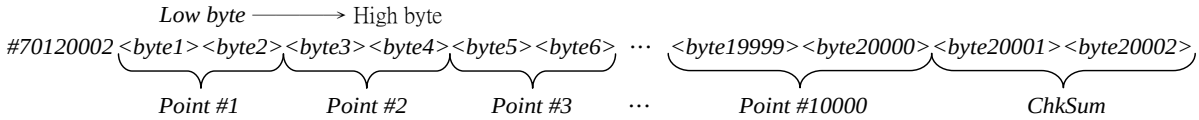
[ADVance:]USER:WAVeform:DATA

Type: Channel-Specific
Description: Set the user-define waveform parameters. (Note: All setting parameters in this command can't use suffix.)
Setting Syntax:
[ADVance:]USER:WAVeform:DATA<space><Arg1>,<Arg2>,<Arg3>,<Arg4>,<Arg5>
Setting Parameter:
Selects a waveform to be configured:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.
Set the **interval** of waveform:
Arg2: <NRf>, 0.00001s ~ 20s, Resolution = 0.00001s, Unit = Second
Set the **repeat** time of waveform:
Arg3: <NR1>, 0 ~ 100000, Resolution = 1, Unit = None.
Set the **chain** parameter of waveform:
Arg4: <NR1>, 0 ~ 10, Resolution = 1, Unit = None.
Set the **interpolation** function of waveform:
Arg5: <NRf>, NO | 0, YES | 1, Unit = None.
Setting Example: USER:WAV:DATA 1,0.001,1,0,YES
Query Syntax:
[ADVance:]USER:WAVeform:DATA?<space><NR1>[<space><MAX | MIN>]
Return Parameter: <aard>
Query Example: USER:WAV:DATA? 1
USER:WAV:DATA? 1 MAX

USER:WAV:DATA? 1 MIN
Return Example: 1,0.001,1,0,YES

[ADVance:]USER:WAVeform:DATA:POINt

Type: Channel-Specific
Description: This command sets the user-define waveform data with binary format. The waveform is consist of number points correspond to sampling points that user specified in format of 16bits unsigned integral.



Setting Syntax: [ADVance:]USER:WAVeform:DATA:POINt<space><DLABRD>
Setting Parameter: <DLABRD>
The <DLABRD> is formatted as:
#<x><ww><yy...y><byte1><byte2><byte3><byte4>…<byteN><Chksum Low byte><Chksum High byte>

Where,
<x> is the number of characters in <ww><yy…y>.
<ww> is the waveform number.
<yy…y> is the number of bytes to transfer.
<ChkSum> is the two's complement of summary of <yy…y>.

For example, if <yy…y> = 20002 and <ww> = 01, then <x> = 7 and <byte1><byte2><byte3>…<byte20000><Chksum Low byte><Chksum High byte>

Setting Example:ADV:USER:WAV:DATA:POIN "#70120002xxxxxxxxxxxxxx…….xxxcc"
Query Syntax: [ADVance:]USER:WAVeform:DATA:POINt?<space><NR1>
Return Parameter: <NR1>, 0 ~ 120000
Query Example: USER:WAV:DATA:POIN?

[ADVance:]USER:WAVeform:DATA:STATus?

Type: Frame-Specific
Description: This command returns the status of waveform data download.
Setting Syntax: None
Setting Parameter: None
Query Syntax: [ADVance:]USER:WAVeform:DATA:STATus?
Return Parameter: <NR1>
0: Idle
1: Wait Processing
2: Finish
3: Data Format Error
4: Data Length Error
5: Over limit of waveform data
6: ChkSum Error
Query Example: USER:WAV: DATA:STAT?

[ADVance:]USER:WAVeform:EXEcute:STATus?

Type: Channel-Specific
Description: This command returns the status of waveform data download.
Setting Syntax: None
Setting Parameter: None
Query Syntax: [ADVance:]USER:WAVeform:EXEcute:STATus?
Return Parameter: <NR1>,
0: Idle
1: Running
2: Finish
3: Stop
Query Example: USER:WAV:EXE:STAT?
Return Example: 1

[ADVance:]USER:WAVeform:REMain?[<space><NR1>]

Type: Channel-Specific
Description: This command returns the remains waveform data of unused.
Setting Syntax: None
Setting Parameter: None
Query Syntax: [ADVance:]USER:WAVeform:REMain?[<space><NR1>]
Query Parameters: <NR1>, 1 ~ 10, Resolution = 1, Unit = None, 1~10:Waveform 1~10
Return Parameter: <NR1>, 0 ~ 120000
Query Example: ADV:USER:WAV:REM? Return total remain points.
ADV:USER:WAV:REM? 1 Return waveform #1 remain points.

[ADVance:]USER:WAVeform:CLEar?

Type: Channel-Specific
Description: Clear the waveform specified.
Setting Syntax: [ADVance:]USER:WAVeform:CLEar?<space><NR1>
Setting Parameter: <NR1>, 1 ~ 10, Resolution = 1, Unit = None, 1~10:Waveform 1~10
Setting Example: ADV:USER:WAV:CLE? 3
Query Syntax: None
Return Parameter: <NR1>, 0:ok 1:error
Query Example: None

[ADVance:]CVCC:VSET

Type: Channel-Specific
Description: Set the contant voltage in CV+CC mode.
Setting Syntax: [ADVance:]CVCC:VSET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CVCC:VSET 8 Set VSET as 8V.
CVCC:VSET 24V Set VSET as 24V.
CVCC:VSET MAX Set VSET as the maximum value.
CVCC:VSET MIN Set VSET as the minimum value.
Query Syntax: [ADVance:]CVCC:VSET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: CVCC:VSET?
CVCC:VSET? MAX
CVCC:VSET? MIN

[ADVance:]CVCC:RESponse

Type: Channel-Specific
Description: Set the response speed in CV+CC mode.
Setting Syntax: [ADVance:]CVCC:RESponse<space><NRf>
Setting Parameter: <NRf>, SLOW(0), NORMAL(1), FAST(2)

Example: CVCC:RES FAST
CVCC:RES SLOW
Query Syntax: [ADVance:]CVCC:RESponse?
Return Parameter: <CRD>, SLOW(0), NORMAL(1), FAST(2)
Query Example: CVCC:RES?

[ADVance:]CVCC:ISET

Type: Channel-Specific
Description: Set the constant current in CV+CC mode.
Setting Syntax: [ADVance:]CVCC:ISET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CVCC:ISET 20 Set the ISET = 20A.
CVCC:ISET 10A Set the ISET = 10A.
CVCC:ISET MAX Set the ISET = maximum value.
CVCC:ISET MIN Set the ISET = minimum value.
Query Syntax: [ADVance:]CVCC:ISET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: CVCC:ISET?
CVCC:ISET? MAX
CVCC:ISET? MIN

[ADVance:]CRCC:RSET

Type: Channel-Specific
Description: Set constant resistance in CR+CC mode.
Setting Syntax: [ADVance:]CRCC:RSET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CRCC:RSET 20 Set the RSET = 20Ω.
CRCC:RSET 10 OHM Set the RSET = 10Ω.
CRCC:RSET MAX Set the RSET = maximum value.
CRCC:RSET MIN Set the RSET = minimum value.
Query Syntax: [ADVance:]CRCC:RSET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = OHM]
Query Example: CRCC:RSET?
CRCC:RSET? MAX
CRCC:RSET? MIN

[ADVance:]CRCC:ISET

Type: Channel-Specific
Description: Set the constant current in CR+CC mode.
Setting Syntax: [ADVance:]CRCC:ISET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CRCC:ISET 20 Set the ISET = 20A.
CRCC:ISET 10A Set the ISET = 10A.
CRCC:ISET MAX Set the ISET = maximum value.
CRCC:ISET MIN Set the ISET = minimum value.
Query Syntax: [ADVance:]CRCC:ISET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: CRCC:ISET?
CRCC:ISET? MAX
CRCC:ISET? MIN

[ADVance:]CVCR:VSET

Type: Channel-Specific
Description: Set the constant voltage in CV+CR mode.

Setting Syntax: [ADVance:]CVCR:VSET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CVCR:VSET 8 Set VSET as 8V.
CVCR:VSET 24V Set VSET as 24V.
CVCR:VSET MAX Set VSET as the maximum value.
CVCR:VSET MIN Set VSET as the minimum value.
Query Syntax: [ADVance:]CVCR:VSET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: CVCR:VSET?
CVCR:VSET? MAX
CVCR:VSET? MIN

[ADVance:]CVCR:RSET

Type: Channel-Specific
Description: Set constant resistance in CV+CR mode.
Setting Syntax: [ADVance:]CVCR:RSET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CVCR:RSET 20 Set the RSET = 20Ω.
CVCR:RSET 10 OHM Set the RSET = 10Ω.
CVCR:RSET MAX Set the RSET = maximum value.
CVCR:RSET MIN Set the RSET = minimum value.
Query Syntax: [ADVance:]CVCR:RSET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = OHM]
Query Example: CVCR:RSET?
CVCR:RSET? MAX
CVCR:RSET? MIN

[ADVance:]AUTO:VSET

Type: Channel-Specific
Description: Set the constant voltage in AUTO mode.
Setting Syntax: [ADVance:]AUTO:VSET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: AUTO:VSET 8 Set VSET as 8V.
AUTO:VSET 24V Set VSET as 24V.
AUTO:VSET MAX Set VSET as the maximum value.
AUTO:VSET MIN Set VSET as the minimum value.
Query Syntax: [ADVance:]AUTO:VSET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: AUTO:VSET?
AUTO:VSET? MAX
AUTO:VSET? MIN

[ADVance:]AUTO:RSET

Type: Channel-Specific
Description: Set constant resistance in AUTO mode.
Setting Syntax: [ADVance:]AUTO:RSET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: AUTO:RSET 20 Set the RSET = 20Ω.
AUTO:RSET 10 OHM Set the RSET = 10Ω.
AUTO:RSET MAX Set the RSET = maximum value.
AUTO:RSET MIN Set the RSET = minimum value.
Query Syntax: [ADVance:]AUTO:RSET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = OHM]
Query Example: AUTO:RSET?

AUTO:RSET? MAX
AUTO:RSET? MIN

[ADVance:]AUTO:ISET

Type: Channel-Specific
Description: Set the constant current in AUTO mode.
Setting Syntax: [ADVance:]AUTO:ISET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: AUTO:ISET 20 Set the ISET = 20A.
AUTO:ISET 10A Set the ISET = 10A.
AUTO:ISET MAX Set the ISET = maximum value.
AUTO:ISET MIN Set the ISET = minimum value.
Query Syntax: [ADVance:]AUTO:ISET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: AUTO:ISET?
AUTO:ISET? MAX
AUTO:ISET? MIN

[ADVance:]AUTO:PSET

Type: Channel-Specific
Description: Set the constant power in AUTO mode.
Setting Syntax: [ADVance:]AUTO:PSET<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: AUTO:PSET 20 Set the PSET = 20W.
AUTO:PSET 10W Set the PSET = 10W.
AUTO:PSET MAX Set the PSET = maximum value.
AUTO:PSET MIN Set the PSET = minimum value.
Query Syntax: [ADVance:]AUTO:PSET?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: AUTO:PSET?
AUTO:PSET? MAX
AUTO:PSET? MIN

[ADVance:]EXTernal:WAVeform:MODE

Type: Channel-Specific
Description: Set run mode in external waveform mode.
Setting Syntax: [ADVance:]EXTernal:WAVeform:MODE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, CC | 0, CR |1, CV | 2
Setting Example: BATT:MODE CC Set run mode = CC
BATT:MODE 2 Set run mode = CV
Query Syntax: [ADVance:]EXTernal:WAVeform:MODE?
Return Parameter: <CRD>, CC, CR, CV [Unit = None]
Query Example: EXT:WAV:MODE?

[ADVance:]EXTernal:WAVeform:CC:VRNG

Type: Channel-Specific
Description: Set the voltage measurement range in external waveform when the mode is set to CC mode.
Setting Syntax: [ADVance:]EXTernal:WAVeform:CC:VRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example: EXT:WAV:CC:VRNG HIGH Set voltage range to High.
EXT:WAV:CC:VRNG M Set voltage range to Middle.
EXT:WAV:CC:VRNG 0 Set voltage range to Low.
Query Syntax: EXTernal:WAVeform:CC:VRNG?

Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: EXT:WAV:CC:VRNG?

[ADVance:]EXTernal:WAVeform:CR:IRNG

Type: Channel-Specific
Description: Set the current measurement range in external waveform when the mode is set to CR mode.
Setting Syntax: [ADVance:]EXTernal:WAVeform:CR:IRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example: EXT:WAV:CR:IRNG HIGH Set current range to High.
EXT:WAV:CR:IRNG M Set current range to Middle.
EXT:WAV:CR:IRNG 0 Set current range to Low.
Query Syntax: EXTernal:WAVeform:CR:IRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: EXT:WAV:CR:IRNG?

[ADVance:] EXTernal:WAVeform:CV:IRNG

Type: Channel-Specific
Description: Set the current measurement range in external waveform when the mode is set to CV mode.
Setting Syntax: [ADVance:]EXTernal:WAVeform:CV:IRNG<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOW | L | 0, MIDDLE | M | 1, HIGH | H | 2
Setting Example: EXT:WAV:CV:IRNG HIGH Set current range to High.
EXT:WAV:CV:IRNG M Set current range to Middle.
EXT:WAV:CV:IRNG 0 Set current range to Low.
Query Syntax: EXTernal:WAVeform:CV:IRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: EXT:WAV:CV:IRNG?

4.3.2.10 DIGITIZING Subsystem

DIGitizing:ABORt

Type: Channel-Specific
Description: Abort the digitizing function.
Setting Syntax: DIGitizing:ABORt
Setting Parameter: None
Setting Example: DIG:ABOR Abort digitizing function.
Query Syntax: None
Return Parameter: None
Query Example: None

DIGitizing:INITiate

Type: Channel-Specific
Description: Start the digitizing function to wait for trigger signal.
Setting Syntax: DIGitizing:INITiate
Setting Parameter: None
Setting Example: DIG:INIT Initial digitizing function.
Query Syntax: None
Return Parameter: None
Query Example: None

DIGitizing:SAMPling:POINt

Type: Channel-Specific
Description: Set the sampling points for digitizing function.
Setting Syntax: DIGitizing:SAMPling:POINt<space><NRf+>
Setting Parameter: <NRf+>, 1 ~ 15,000, Resolution = 1, Unit = None
Setting Example: DIG:SAMP:POIN 500 Set sampling points = 500
DIG:SAMP:POIN MAX Set sampling points = max. value.
DIG:SAMP:POIN MIN Set sampling points = min. value.
Query Syntax: DIGitizing:SAMPling:POINt?[<space><MAX | MIN>]
Return Parameter: <NR1>, [Unit = None]
Query Example: DIG:SAMP:POIN?
DIG:SAMP:POIN? MAX
DIG:SAMP:POIN? MIN

DIGitizing:SAMPling:TIME

Type: Channel-Specific
Description: Set the sampling time for digitizing function.
Setting Syntax: DIGitizing:SAMPling:TIME<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 2µs ~ 40ms, Resolution = 2µs, Unit = Second
Setting Example: DIG:SAMP:TIME 0.02 Set sampling time = 20ms
DIG:SAMP:TIME 20ms Set sampling time = 20ms
DIG:SAMP:TIME MAX Set sampling time = max. value.
DIG:SAMP:TIME MIN Set sampling time = min. value.
Query Syntax: DIGitizing:SAMPling:TIME?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: DIG:SAMP:TIME?
DIG:SAMP:TIME? MAX
DIG:SAMP:TIME? MIN

DIGitizing:TRIGger[:STATe]

Type: Channel-Specific
Description: Set the software trigger for digitizing function.
Setting Syntax: DIGitizing:TRIGger[:STATe]<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1 [Unit = None]
Setting Example: DIG:TRIG ON Set trigger state to ON.
DIG:TRIG 0 Set trigger state to OFF.
Query Syntax: DIGitizing:TRIGger[:STATe]?
Return Parameter: <CRD>, IDLE, PRE_TRIG, WAIT_TRIG, POST_TRIG
Query Example: DIG:TRIG?

DIGitizing:TRIGger:POINt

Type: Channel-Specific
Description: Set the trigger points for digitizing function.
Setting Syntax: DIGitizing:TRIGger:POINt<space><NRf+>
Setting Parameter: <NRf+>, 1 ~ 15,000, Resolution = 1, Unit = None
Setting Example: DIG:TRIG:POIN 500 Set trigger points = 500
DIG:TRIG:POIN MAX Set trigger points = maximum value.
DIG:TRIG:POIN MIN Set trigger points = minimum value.
Query Syntax: DIGitizing:TRIGger:POINt?[<space><MAX | MIN>]
Return Parameter: <NR1>, [Unit = None]
Query Example: DIG:TRIG:POIN?
DIG:TRIG:POIN? MAX
DIG:TRIG:POIN? MIN

DIGitizing:TRIGger:SOURce

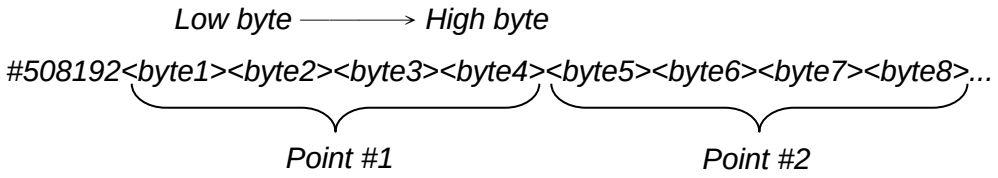
Type: Channel-Specific
Description: Set the trigger source for digitizing function.
Setting Syntax: DIGitizing:TRIGger:SOURce<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOADON | 0, LOADOFF | 1, TTL | 2, BUS | 3, MANUAL | 4 [Unit = None]
Setting Example: DIG:TRIG:SOUR TTL Set trigger source to TTL.
DIG:TRIG:SOUR 3 Set trigger source to BUS.
Query Syntax: DIGitizing:TRIGger:SOURce?
Return Parameter: <CRD>, LOADON, LOADOFF, TTL, BUS, MANUAL
Query Example: DIG:TRIG:SOUR?

DIGitizing:WAVeform:CAPture?

Type: Channel-Specific
Description: Start waveform data transmit from Module to Frame.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: DIGitizing:WAVeform:CAPture?
Return Parameter: <CRD>, WAIT, OK, ERROR [Unit = None]
Query Example: DIG:WAV:CAP?

DIGitizing:WAVeform:DATA?

Type: Channel-Specific
Description: This query returns voltage or current waveform data from the DC Electronic Load in binary format. The waveform either voltage or current are consist of number points correspond to sampling points that user specified in format of 32bits float point.



Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: DIGitizing:WAVeform:DATA?<space><V | I>
Return Parameter: <DLABRD>, [Unit = None]
Query Example: DIG:WAV:DATA? V
DIG:WAV:DATA? I

4.3.2.11 TIMING Subsystem

TIMing[:STATe]

Type: Channel-Specific
Description: Set the action enable or disable of TIMING function.
Setting Syntax: TIMing[:STATe]<space><CRD | NR1>

Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: TIM OFF — Disable the TIMING function.
TIM 1 — Enable the TIMING function.
Query Syntax: TIMing[:STATe]?
Return Parameter: <CRD>, OFF, ON [Unit = None]
Query Example: TIM?

TIMing:TRIGger:MODE

Type: Channel-Specific
Description: Set the trigger mode for starting measurement in TIMING function.
Setting Syntax: TIMing:TRIGger:MODE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, RISE | 0, FALL | 1
Setting Example: TIM:TRIG:MODE RISE — Set trigger mode to rising trigger.
TIM:TRIG:MODE 1 — Set trigger mode to falling trigger.
Query Syntax: TIMing:TRIGger:MODE?
Return Parameter: <CRD>, RISE, FALL [Unit = None]
Query Example: TIM:TRIG:MODE?

TIMing:TRIGger:VSTArt

Type: Channel-Specific
Description: Set the voltage condition at the start of measurement in Timing function.
Setting Syntax: TIMing:TRIGger:VSTArt<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: TIM:TRIG:VSTA 8 — Set the voltage of start as 8V.
TIM:TRIG:VSTA 24V — Set the voltage of start as 24V.
TIM:TRIG:VSTA MAX — Set the voltage of start as the maximum value.
TIM:TRIG:VSTA MIN — Set the voltage of start as the minimum value.
Query Syntax: TIMing:TRIGger:VSTArt?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: TIM:TRIG:VSTA?
TIM:TRIG:VSTA? MAX
TIM:TRIG:VSTA? MIN

TIMing:TRIGger:VEND

Type: Channel-Specific
Description: Set the voltage condition at the end of measurement in Timing function.
Setting Syntax: TIMing:TRIGger:VEND<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: TIM:TRIG:VEND 8 — Set the voltage of end as 8V.
TIM:TRIG:VEND 24V — Set the voltage of end as 24V.
TIM:TRIG:VEND MAX — Set the voltage of end as the maximum value.
TIM:TRIG:VEND MIN — Set the voltage of end as the minimum value.
Query Syntax: TIMing:TRIGger:VEND?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: TIM:TRIG:VEND?
TIM:TRIG:VEND? MAX
TIM:TRIG:VEND? MIN

TIMing:TOUT

Type: Channel-Specific
Description: Set the measurement timeout in TIMING function.
Setting Syntax: TIMing:TOUT<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 0s ~ 100000s, Resolution = 1s, Unit = Second
Setting Example: TIM:TOUT 10 Set timeout as 10s
TIM:TOUT MAX Set timeout as max. value.
TIM:TOUT MIN Set timeout as min. value.
Query Syntax: TIMing:TOUT?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]
Query Example: TIM:TOUT?
TIM:TOUT? MAX
TIM:TOUT? MIN

TIMing:RESult?

Type: Channel-Specific
Description: Return the result of Timing function.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: TIMing:RESult?
Return Parameter: <NR2>, [Unit = Second]
When the returns are
-1 denotes timing measurement is stop.
-2 denotes timing measurement function is executing and is waiting for the start trigger condition.
-3 denotes timing measurement function is executing and is waiting for the end trigger condition.
Query Example: TIM:RES?

4.3.2.12 SPECIFICATION Subsystem

SPECification[:PASS]?

Type: All Channels
Description: Request GO-NG result reference to all channels specifications.
Query Syntax: SPECification[:PASS]?
Query Example: SPEC? Return all channels GO-NG results.
Return Parameter: <CRD>, IDLE, GO, NG

SPECification[:PASS]:CURRent?

Type: Channel-Specific
Description: Request GO-NG result reference to current specification.
Query Syntax: SPECification[:PASS]:CURRent?
Query Example: SPEC:CURR?
Return Parameter: <CRD>, IDLE, GO, NG

SPECification[:PASS]:POWer?

Type: Channel-Specific
Description: Request GO-NG result reference to power specification.
Query Syntax: SPECification[:PASS]:POWer?
Query Example: SPEC:POW?
Return Parameter: <CRD>, IDLE, GO, NG

SPECification[:PASS]:VOLTage?

Type: Channel-Specific
Description: Request GO-NG result reference to voltage specification.
Query Syntax: SPECification[:PASS]:VOLTage?
Query Example: SPEC:VOLT?
Return Parameter: <CRD>, IDLE, GO, NG

SPECification:CURRent:C

Type: Channel-Specific
Description: Set the center-level current specification. The -1 means don't care.
Setting Syntax: SPECification:CURRent:C<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SPEC:CURR:C 10
SPEC:CURR:C 10mA
Query Syntax: SPECification:CURRent:C?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: SPEC:CURR:C?
SPEC:CURR:C? MAX
SPEC:CURR:C? MIN

SPECification:CURRent:H

Type: Channel-Specific
Description: Set the high-level current specification. The -1 mean don't care.
Setting Syntax: SPECification:CURRent:H<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SPEC:CURR:H 10
SPEC:CURR:H 10mA
Query Syntax: SPECification:CURRent:H?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: SPEC:CURR:H?
SPEC:CURR:H? MAX
SPEC:CURR:H? MIN

SPECification:CURRent:L

Type: Channel-Specific
Description: Set the low-level current specification. The -1 mean don't care.
Setting Syntax: SPECification:CURRent:L<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SPEC:CURR:L 10
SPEC:CURR:L 10mA
Query Syntax: SPECification:CURRent:H?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: SPEC:CURR:L?
SPEC:CURR:L? MAX
SPEC:CURR:L? MIN

SPECification:POWer:C

Type: Channel-Specific
Description: Set the center-level power specification. The -1 mean don't care.
Setting Syntax: SPECification:POWer:C<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SPEC:POW:C 10
SPEC:POW:C 10mW

Query Syntax: SPECification:POWer:C?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: SPEC:POW:C?
SPEC:POW:C? MAX
SPEC:POW:C? MIN

SPECification:POWer:H

Type: Channel-Specific
Description: Set the high-level power specification. The -1 mean don't care.
Setting Syntax: SPECification:POWer:H<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SPEC:POW:H 10
SPEC:CURR:H 10mW
Query Syntax: SPECification:POWer:H?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: SPEC:POW:H?
SPEC:POW:H? MAX
SPEC:POW:H? MIN

SPECification:POWer:L

Type: Channel-Specific
Description: Set the low-level power specification. The -1 mean don't care.
Setting Syntax: SPECification:POWer:L<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: SPEC:POW:L 10
SPEC:POW:L 10mW
Query Syntax: SPECification:POWer:H?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Watt]
Query Example: SPEC:POW:L?
SPEC:POW:L? MAX
SPEC:POW:L? MIN

SPECification:TEST

Type: All Channels
Description: Start or close the all channel specification test.
Setting Syntax: SPECification:TEST<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: SPEC:TEST ON
SPEC:TEST 0
Query Syntax: SPECification:TEST?
Query Example: SPEC:TEST?
Return Parameter: <CRD>, OFF, ON

SPECification:UNIT

Type: Channel-Specific
Description: Set the specific entry mode.
Setting Syntax: SPECification:UNIT<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, VALUE | 1, PERCENT | 0
Setting Example: SPEC:UNIT VALUE
SPEC: UNIT 0
Query Syntax: SPECification:UNIT?
Return Parameter: <CRD>, VALUE, PERCENT
Query Example: SPEC:UNIT?

SPECification:VOLTage:C

Type:	Channel-Specific
Description:	Set the center-level voltage specification. The -1 mean don't care.
Setting Syntax:	SPECification:VOLTage:C<space><NRf+>[suffix]
Parameters:	Refer to respective specification for valid value range.
Setting Example:	SPEC:VOLT:C 20
	SPEC:VOLT:C 20mV
Query Syntax:	SPECification:VOLTage:C?[<space><MAX | MIN>]
Return Parameter:	<NR2>, [Unit = Volt]
Query Example:	SPEC:VOLT:C?
	SPEC:VOLT:C? MAX
	SPEC:VOLT:C? MIN

SPECification:VOLTage:H

Type:	Channel-Specific
Description:	Set the high-level voltage specification. The -1 mean don't care.
Setting Syntax:	SPECification:VOLTage:H<space><NRf+>[suffix]
Parameters:	Refer to respective specification for valid value range.
Setting Example:	SPEC:VOLT:H 20
	SPEC:VOLT:H 20mV
Query Syntax:	SPECification:VOLTage:H?[<space><MAX | MIN>]
Return Parameter:	<NR2>, [Unit = Volt]
Query Example:	SPEC:VOLT:H?
	SPEC:VOLT:H? MAX
	SPEC:VOLT:H? MIN

SPECification:VOLTage:L

Type:	Channel-Specific
Description:	Set the low-level voltage specification. The -1 mean don't care.
Setting Syntax:	SPECification:VOLTage:L<space><NRf+>[suffix]
Parameters:	Refer to respective specification for valid value range.
Setting Example:	SPEC:VOLT:L 20
	SPEC:VOLT:L 20mV
Query Syntax:	SPECification:VOLTage:L?[<space><MAX | MIN>]
Return Parameter:	<NR2>, [Unit = Volt]
Query Example:	SPEC:VOLT:L?
	SPEC:VOLT:L? MAX
	SPEC:VOLT:L? MIN

4.3.2.13 FETCH Subsystem

FETCh:AH?

Type:	Channel-Specific
Description:	Returns the ampere-hour measurement.
Query Syntax:	FETCh:AH?
Return Parameter:	<NR2>, [Unit = Ampere-hour]
Query Example:	FETC:AH?
Return Example:	3.15

FETCh:CURRent?

Type:	Channel-Specific
Description:	Returns the current measurement.

Query Syntax: FETCh:CURRent?
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: FETC:CURR?
Return Example: 3.15

FETCh:CURRent:PEAK+?

Type: Channel-Specific
Description: Returns the maximum peak current measurement.
Query Syntax: FETCh:CURRent:PEAK+?
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: FETC:CURR:PEAK+?
Return Example: 3.15

FETCh:FREQuency?

Type: Channel-Specific
Description: Returns the execution frequency in frequency sweep mode or sine wave dynamic mode.
Query Syntax: FETCh:FREQuency?
Return Parameter: <NR2>, [Unit = Hertz]
Query Example: FETC:FREQ?
Return Example: 100.0

FETCh:POWer?

Type: Channel-Specific
Description: Returns the power measurement.
Query Syntax: FETCh:POWer?
Return Parameter: <NR2>, [Unit = Watt]
Query Example: FETC:POW?
Return Example: 3.15

FETCh:STATus?

Type: Channel-Independent
Description: Returns real time status of the load module.

Bit Position	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Condition		MAX_ LIM	RMT _INH	VCC	FAN	SYNC	OTP	OPP3	OPP2	OPP1	OCP3	OCP2	OCP1	REV	OV2	OV1
Bit Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Query Syntax: FETCh:STATus?
Return Parameter: <NR1>, [Unit = None]
Query Example: FETC:STAT?
Return Example: 4

FETCh:TIME?

Type: Channel-Specific
Description: Returns the time measurement.
Query Syntax: FETCh:TIME?
Return Parameter: <NR2>, [Unit = Second]
Query Example: FETC:TIME?
Return Example: 0.045

FETCh:WH?

Type: Channel-Specific

Description: Returns the watt-hour measurement.
Query Syntax: FETCh:WH?
Return Parameter: <NR2>, [Unit = Watt-hour]
Query Example: FETC:WH?
Return Example: 20.045

FETCh:VOLTage?
Type: Channel-Specific
Description: Returns the voltage measurement.
Query Syntax: FETCh:VOLTage?
Return Parameter: <NR2>, [Unit = Volt]
Query Example: FETC:VOLT?
Return Example: 8.12

FETCh:VOLTage:MAX?
Type: Channel-Specific
Description: Returns the maximum voltage measurement.
Query Syntax: FETCh:VOLTage:MAX?
Return Parameter: <NR2>, [Unit = Volt]
Query Example: FETC:VOLT:MAX?
Return Example: 8.12

FETCh:VOLTage:MIN?
Type: Channel-Specific
Description: Returns the minimum voltage measurement..
Query Syntax: FETCh:VOLTage:MIN?
Return Parameter: <NR2>, [Unit = Volt]
Query Example: FETC:VOLT:MIN?
Return Example: 8.12

FETCh:VOLTage:PEAK+?
Type: Channel-Specific
Description: Returns the maximum peak voltage measurement.
Query Syntax: FETCh:VOLTage:PEAK+?
Return Parameter: <NR2>, [Unit = Volt]
Query Example: FETC:VOLT:PEAK+?
Return Example: 8.12

FETCh:VOLTage:PEAK+:FREQuency?
Type: Channel-Specific
Description: Returns the frequency measurement at maximum peak voltage.
Query Syntax: FETCh:VOLTage:PEAK+:FREQuency?
Return Parameter: <NR2>, [Unit = Hertz]
Query Example: FETC:VOLT:PEAK+:FREQ?
Return Example: 8.12

FETCh:VOLTage:PEAK-?
Type: Channel-Specific
Description: Returns the minimum peak voltage measurement.
Query Syntax: FETCh:VOLTage:PEAK-?
Return Parameter: <NR2>, [Unit = Voltage]
Query Example: FETC:VOLT:PEAK-?
Return Example: 8.12

FETCh:VOLTage:PEAK-:FREQuency?

Type: Channel-Specific
Description: Returns the frequency measurement at minimum peak voltage.
Query Syntax: FETCh:VOLTage:PEAK-:FREQuency?
Return Parameter: <NR2>, [Unit = Hertz]
Query Example: FETC:VOLT:PEAK-:FREQ?
Return Example: 8.12

4.3.2.14 MEASURE Subsystem

MEASure:CURRent?

Type: Channel-Specific
Description: Returns the real time current measurement.
Query Syntax: MEASure:CURRent?
Return Parameter: <NR2>, [Unit = Ampere]
Query Example: MEAS:CURR?
Return Example: 3.15

MEASure:INPut

Type: Channel-Specific
Description: Selects the input port of electronic load to measure voltage.
Setting Syntax: MEASure:INPut<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, LOAD | 0, UUT | 1
Setting Example: MEAS:INP LOAD
MEAS:INP 1
Query Syntax: MEASure:INPut?
Return Parameter: <CRD>, LOAD, UUT
Query Example: MEAS:INP?

MEASure:POWer?

Type: Channel-Specific
Description: Returns the real time power measurement.
Query Syntax: MEASure:POWer?
Return Parameter: <NR2>, [Unit = Watt]
Query Example: MEAS:POW?
Return Example: 3.15

MEASure:VOLTage?

Type: Channel-Specific
Description: Returns the real time voltage measurement.
Query Syntax: MEASure:VOLTage?
Return Parameter: <NR2>, [Unit = Volt]
Query Example: MEAS:VOLT?
Return Example: 8.12

4.3.2.15 PROGRAM Subsystem

PROGram:DATA

Type: Channel-Specific
Description: Set the program parameters. (**Note:** All setting parameters in this command can't use suffix.)

Setting Syntax: PROGram:DATA<space><Arg1>,<Arg2>,<Arg3>,<Arg4>,<Arg5>
Setting Parameter:
Selects a program to be set:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.
Set the type of program:
Arg2: <NRf>, LIST | 0, STEP | 1, Unit = None.
Set the chain parameter in program:
Arg3: <NR1>, 0 ~ 10, Resolution = 1, Unit = None.
Set the repeat count of program:
Arg4: <NR1>, 0 ~ 4,000, Resolution = 1, Unit = None.
Set the sequence number in program:
Arg5: <NR1>, 0 ~ 255, Resolution = 1, Unit = None.
Setting Example: PROG:DATA 1,STEP,2,0,5
Query Syntax: PROGram:DATA?<space><NR1>[<space><MAX | MIN>]
Return Parameter: <aard>
Query Example: PROG:DATA? 1
PROG:DATA? 1 MAX
PROG:DATA? 1 MIN
Return Example: 1,LIST,3,1,5

PROGram:DATA:LIST

Type: Channel-Specific
Description: Set the list parameters in program. (**Note:** All setting parameters in this command can't use suffix.)
Setting Syntax: PROGram:DATA:LIST<space><Arg1>,<Arg2>,<Arg3>,<Arg4>,<Arg5>,<Arg6>,<Arg7>,<Arg8>,<Arg9>,<Arg10>,<Arg11>,<Arg12>,<Arg13>,<Arg14>,<Arg15>,<Arg16>
Setting Parameter:
Selects a program to be set:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.
Selects a sequence to be set:
Arg2: <NR1>, 1 ~ N, Resolution = 1, Unit = None.
Set the trigger mode of sequence:
Arg3: <NRf>, SKIP | 0, AUTO | 1, MANUAL | 2, EXTERNAL | 3, Unit = None.
Set the run mode of sequence:
Arg4: <NRf>, CC | 0, CR | 1, CV | 2, CP | 3, Unit = None.
Set the mode's range of sequence:
Arg5: <NRf>, LOW | 0, MIDDLE | 1, HIGH | 2, Unit = None.
Set the load value according to run mode in sequence:
Arg6: <NRf>, Refer to respective specification for valid value range.
Set the rising slew rate in sequence:
Arg7: <NRf>, Refer to respective specification for valid value range.
Set the falling slew rate in sequence:
Arg8: <NRf>, Refer to respective specification for valid value range.
Set the dwell time of sequence:
Arg9: <NRf>, 0.1ms ~ 30s, Resolution = 0.0001s, Unit = Second.
Set the high-level of voltage specific in sequence:
Arg10: <NRf>, Refer to respective specification for valid value

range.
Set the low-level of voltage specific in sequence:
Arg11: <NRf>, Refer to respective specification for valid value range.
Set the high-level of current specific in sequence:
Arg12: <NRf>, Refer to respective specification for valid value range.
Set the low-level of current specific in sequence:
Arg13: <NRf>, Refer to respective specification for valid value range.
Set the high-level of power specific in sequence:
Arg14: <NRf>, Refer to respective specification for valid value range.
Set the low-level of power specific in sequence:
Arg15: <NRf>, Refer to respective specification for valid value range.
Set the delay time of Pass/Fail in sequence:
Arg16: <NRf>, 0s ~ 30s, Resolution = 0.0001s, Unit = Second.

Setting Example: PROG:DATA:LIST 1,1,AUTO,CC,2,3.5,0.5,0.5,2,-1,-1,-1,-1,-1,-1,1

Query Syntax 1: PROGram:DATA:LIST?<space><Arg1>,<Arg2>[<space><MAX | MIN>]
Selects a program:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.
Selects a sequence:
Arg2: <NR1>, 1 ~ N, Resolution = 1, Unit = None.

Query Syntax 2: PROGram:DATA:LIST?<space><Arg1>,<Arg2>,<Arg3>,<Arg4><space><MAX | MIN>
Selects a program:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.
Selects a sequence:
Arg2: <NR1>, 1 ~ N, Resolution = 1, Unit = None.
Selects a run mode:
Arg3: <NRf>, CC | 0, CR | 1, CV | 2, CP | 3, Unit = None.
Selects the mode's range:
Arg4: <NRf>, LOW | 0, MIDDLE | 1, HIGH | 2, Unit = None.

Return Parameter: <aard>

Query Example: PROG:DATA:LIST? 2,1
PROG:DATA:LIST? 2,1 MAX
PROG:DATA:LIST? 2,1 MIN
PROG:DATA:LIST? 2,1,1,0 MAX
PROG:DATA:LIST? 2,1,1,0 MIN

Return Example: 2,1,AUTO,CC,HIGH,3.5,0.5,0.5,2,-1,-1,-1,-1,-1,-1,1

PROGram:DATA:STEP

Type: Channel-Specific

Description: Set the step parameters in program. (**Note:** All setting parameters in this command can't use suffix.)

Setting Syntax: PROGram:DATA:STEP<space><Arg1>,<Arg2>,<Arg3>,<Arg4>,<Arg5>,<Arg6>,<Arg7>,<Arg8>,<Arg9>,<Arg10>,<Arg11>,<Arg12>,<Arg13>,<Arg14>,<Arg15>,<Arg16>

Setting Parameter:
Selects a program to be set:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.
Set the trigger mode of sequence:

Arg2: <NRf>, SKIP | 0, AUTO | 1, MANUAL | 2, EXTERNAL | 3, Unit = None.
Set the run mode of sequence:
Arg3: CC | 0, CR | 1, CV | 2, CP | 3, Unit = None.
Set the mode's range of sequence:
Arg4: <NRf>, LOW | 0, MIDDLE | 1, HIGH | 2, Unit = None.
Set the start value according to run mode in sequence:
Arg5: <NRf>, Refer to respective specification for valid value range.
Set the end value according to run mode in sequence:
Arg6: <NRf>, Refer to respective specification for valid value range.
Set the rising slew rate in sequence:
Arg7: <NRf>, Refer to respective specification for valid value range.
Set the falling slew rate in sequence:
Arg8: <NRf>, Refer to respective specification for valid value range.
Set the dwell time of sequence:
Arg9: <NRf>, 0.1ms ~ 30s, Resolution = 0.0001s, Unit = Second.
Set the high-level of voltage specific in sequence:
Arg10: <NRf>, Refer to respective specification for valid value range.
Set the low-level of voltage specific in sequence:
Arg11: <NRf>, Refer to respective specification for valid value range.
Set the high-level of current specific in sequence:
Arg12: <NRf>, Refer to respective specification for valid value range.
Set the low-level of current specific in sequence:
Arg13: <NRf>, Refer to respective specification for valid value range.
Set the high-level of power specific in sequence:
Arg14: <NRf>, Refer to respective specification for valid value range.
Set the low-level of power specific in sequence:
Arg15: <NRf>, Refer to respective specification for valid value range.
Set the delay time of Pass/Fail in sequence:
Arg16: <NRf>, 0s ~ 30s, Resolution = 0.0001s, Unit = Second.

Setting Example: PROG:DATA:STEP ,AUTO,CC,2,3.5,20.0,0.5,0.5,2,-1,-1,-1,-1,-1,1

Query Syntax 1: PROGram:DATA:STEP?<space><Arg1>[<space><MAX | MIN>]
Selects a program:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.

Query Syntax 2: PROGram:DATA:STEP?<space><Arg1>,<Arg2>, <Arg3><space><MAX | MIN>
Selects a program:
Arg1: <NR1>, 1 ~ 10, Resolution = 1, Unit = None.
Selects a run mode:
Arg2: <NRf>, CC | 0, CR | 1, CV | 2, CP | 3, Unit = None.
Selects the mode's range:
Arg3: <NRf>, LOW | 0, MIDDLE | 1, HIGH | 2, Unit = None.

Return Parameter: <aard>
Query Example: PROG:DATA:STEP? 1
PROG:DATA:STEP? 1 MAX
PROG:DATA:STEP? 1 MIN
PROG:DATA:STEP? 1,0,2 MAX
PROG:DATA:STEP? 1,0,2 MIN
Return Example: 1,AUTO,CC,HIGH,3.5,20.0,0.5,0.5,2,-1,-1,-1,-1,-1,-1,1

PROGram:NSELect

Type: Channel-Specific
Description: Selects the program number which to be executed.
Setting Syntax: PROGram:NSELect<space><NRf+>
Setting Parameter: <NR1>, 1 ~ 10, Resolution = 1, Unit = None
Setting Example: PROG:NSEL 10
PROG:NSEL MAX
PROG:NSEL MIN
Query Syntax: PROGram:NSELect?[<space><MAX | MIN>]
Return Parameter: <NR1>
Query Example: PROG:NSEL?
PROG:NSEL? MAX
PROG:NSEL? MIN

PROGram:SAVe

Type: Channel-Specific
Description: Save the program settings.
Syntax: PROGram:SAVe
Parameters: NONE
Example: PROG:SAV

PROGram:STATe?

Type: Channel-Specific
Description: This command returns the information of program running.
Setting Syntax: None
Setting Parameter: None
Query Syntax: PROGram:STATe?
Return Parameter: <aard>, x1,x2,x3,x4 which
x1 : program number.
x2 : sequence number.
x3 : load mode, 0:CCL, 1:CCM, 2:CCH, 3:CRL, 4:CRM, 4:CRH, 5:CVL, 6:CVM, 7:CVH, 8:CPL, 9:CPM, 10:CPH
x4 : execution state, 0:Idle, 1:running, 2:Wait manual trigger, 3:Wait external trigger
Query Example: PROG:STAT?
Return Example: 1,2,1,1

PROGram:SEQuence:CLEar

Type: Channel-Specific
Description: Clear all sequence in program file what specified.
Setting Syntax: PROGram:SEQuence:CLEar<space><NR1>
Setting Parameter: <NR1>, 1 ~ 10, Resolution = 1, Unit = None
Setting Example: PROG:SEQ:CLE 3
Query Syntax: None
Return Parameter: None
Query Example: None

PROGram:SEQuence:FAIL?

Type: Channel-Specific
Description: This command returns the fail of sequence in specification.
Setting Syntax: None
Setting Parameter: None
Query Syntax: PROGram:SEQuence:FAIL?
Return Parameter: <aard>, xx-xxx,xx-xxx,xx-xxx…etc, which front of "-" is the program number and rear of "-" is the sequence number.
Query Example: PROG:SEQ:FAIL?
Return Example: 1-2,5-13,10-8

PROGram:SEQuence:REMain

Type: Channel-Specific
Description: This command returns the remains sequence of unused.
Setting Syntax: None
Setting Parameter: None
Query Syntax: PROGram:SEQuence:REMain?
Return Parameter: <NR1>
Query Example: PROG:SEQ:REM?

4.3.2.16 SYNCHRONOUS Subsystem

SYNChronous:RUN

Type: All Channels
Description: Set all electronic loads to "ON" in sync. dynamic run.
Setting Syntax: SYNChronous:RUN<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, ON | 1
Setting Example: SYNC: RUN ON Set the load to "ON" on sync. parallel.
SYNC: RUN OFF Set the load to "OFF" on sync. parallel.

SYNChronous:TYPE

Type: All Channels
Description: Set the specified 63200A to master or slave for sync. dynamic run.
Setting Syntax: SYNChronous:TYPE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, NONE | 0, MASTER | 1, SLAVE | 2
Setting Example: SYNC:TYPE MASTER Set the 63200A to master for sync. dynamic.
SYNC:TYPE SLAVE Set the 63200A to slave for sync. dynamic.
SYNC:TYPE NONE Disables the 63200A to sync.

4.3.2.17 STATUS Subsystem

STATus:CHANnel:CONDition?

Type: Channel-Specific
Description: Returns the real time channel status.
Query Syntax: STATus:CHANnel:CONDition?
Return Parameter: <NR1>

Bit Configuration of Channel Status Register

Bit Position	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Condition		MAX_ LIM	RMT _INH	VCC	FAN	SYNC	OTP	OPP3	OPP2	OPP1	OCP3	OCP2	OCP1	REV	OV2	OV1
Bit Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Query Example: STAT:CHAN:COND? Return the status of the electronic load.
Return Example: 2048

STATus:CHANnel:ENABle

Type: Channel-Specific
Description: Mask to select which bit in the Event register is allowed to be summed into the corresponding channel bit for the Channel Summary Event register.
Setting Syntax: STATus:CHANnel:ENABle<space><NR1>
Setting Parameter: <NR1>, 0 ~ 2^{31}-1, Unit = None
Setting Example: STAT:CHAN:ENABl 24
Query Syntax: STATus:CHANnel:ENABle?
Return Parameter: <NR1>
Query Example: STAT:CHAN:ENAB? Return the contents of the Status Channel Enable register.
Return Example: 24

STATus:CHANnel:EVENt?

Type: Channel-Specific
Description: Record all channel events that have occurred since last time the register was read, and reset the Channel Event register.
Query Syntax: STATus:CHANnel:EVENt?
Return Parameter: <NR1>
Query Example: STAT:CHAN:EVEN? Read and reset the Channel Event register.
Return Example: 24

STATus:CHANnel:PTRansition

Type: Channel-Specific
Description: Programmable filters that determine 0-to-1 transition in the Condition register will set the corresponding bit of the Event register.
Setting Syntax: STATus:CHANnel:PTRansition<space><NR1>
Setting Parameter: <NR1>, 0 ~ 2^{31}-1, Unit = None
Setting Example: STAT:CHAN:PTR 4 Set over current bit 2 from 0-to-1.
Query Syntax: STATus:CHANnel:PTRansition?
Return Parameter: <NR1>
Query Example: STAT:CHAN:PTR?
Return Example: 4

STATus:CHANnel:NTRansition

Type: Channel-Specific
Description: Programmable filters that determine 1-to-0 transition in the Condition register will set the corresponding bit of the Event register.
Setting Syntax: STATus:CHANnel:NTRansition<space><NR1>
Setting Parameter: <NR1>, 0 ~2^{31}-1, Unit = None
Setting Example: STAT:CHAN:NTR 4 Set over current bit 2 from 1-to-0.
Query Syntax: STATus:CHANnel:NTRansition?
Return Parameter: <NR1>

Query Example: STAT:CHAN:NTR?
Return Example: 4

STATus:CSUMmary:ENABle

Type: Channel-Specific
Description: Mask to select which bit in the Channel Event register is allowed to be summed into the CSUM (Channel Summary) bit for the Status Byte register.
Setting Syntax: STATus:CSUMmary:ENABle<space><NR1>
Setting Parameter: <NR1>, 0 ~ 1023, Unit = None

Bit Configuration of Channel Summary Register

Bit Position	9	8	7	6	5	4	3	2	1	0
Channel	10	9	8	7	6	5	4	3	2	1
Bit Weight	512	256	128	64	32	16	8	4	2	1

Setting Example: STAT:CSUM:ENAB 3
Query Syntax: STATus:CSUMmary:ENABle?
Return Parameter: <NR1>
Query Example: STAT:CSUM:ENAB? Return the setting of Channel Summary Enable register.
Return Example: 3

STATus:CSUMmary:EVENt?

Type: Channel-Specific
Description: Indicate all channels of which an enabled STAT:CHAN Event has occurred since last time the register was read.
Query Syntax: STATus:CSUMmary:EVENt?
Return Parameter: <NR1>
Query Example: STAT:CSUM:EVEN? Return the value of the Channel Summary Event register.
Return Example: 3

STATus:QUEStionable:CONDition?

Type: Channel-Specific
Description: Real-time ("live") recording of Questionable data
Query Syntax: STATus:QUEStionable:CONDition?
Return Parameter: <NR1>
Query Example: STAT:QUES:COND? Return the channel status.
Return Example: 6

STATus:QUEStionable:ENABle

Type: Channel-Specific
Description: Mask to select which bit on the Event register is allowed to be summed into the QUES bit for the Status Byte register.
Setting Syntax: STATus:QUEStionable:ENABle<space><NR1>
Setting Parameter:

Bit Configuration of Questionable Status Register

Bit Position	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Condition		MAX_ LIM	RMT _INH	VCC	FAN	SYNC	OTP	OPP3	OPP2	OPP1	OCP3	OCP2	OCP1	REV	OV2	OV1
Bit Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Setting Example: STAT:QUES:ENAB 24

Query Syntax: STATus:QUEStionable:ENABle?
Return Parameter: <NR1>, 0 ~ 2^{31}-1, Unit = None
Query Example: STAT:QUES:ENAB Return the setting of the Status Questionable Enable register.
Return Example: 24

STATus:QUEStionable:EVENt?

Type: Channel-Specific
Description: Record all Questionable conditions that have occurred since last time the register was read.
Query Syntax: STATus:QUEStionable:EVENt?
Return Parameter: <NR1>
Query Example: STAT:QUES:EVEN? Return the contents of the Questionable Event register.
Return Example: 24

STATus:QUEStionable:PTRansition

Type: Channel-Specific
Description: Programmable filters determine 0-to-1 transition in the Condition register will set the corresponding bit of the Event register.
Setting Syntax: STATus:QUEStionable:PTRansition<space><NR1>
Setting Parameter: <NR1>, 0 ~ 2^{31}-1, Unit = None
Setting Example: STAT:QUES:PTR 4 Set over current bit 2 as 0-to-1.
Query Syntax: STATus:QUEStionable:PTRansition?
Return Parameter: <NR1>
Query Example: STAT:QUES:PTR?
Return Example: 4

STATus:QUEStionable:NTRansition

Type: Channel-Specific
Description: Programmable filters determine 1-to-0 transition in the Condition register will set the corresponding bit of the Event register.
Setting Syntax: STATus:QUEStionable:NTRansition<space><NR1>
Setting Parameter: <NR1>, 0 ~ 2^{31}-1, Unit = None
Setting Example: STAT:QUES:NTR 4 Set over current bit 2 as 1-to-0.
Query Syntax: STATus:QUEStionable:NTRansition?
Return Parameter: <NR1>
Query Example: STAT:QUES:NTR?
Return Example: 4

4.3.2.18 SYSTEM Subsystem

SYSTem:ERRor?

Type: All Channels
Description: This command queries the error string of the command parser.
Setting Syntax: None
Setting Parameter: None
Query Syntax: SYSTem:ERRor?.
Return Parameter: <ACCRD>, 0,"No Error",
1,Data Format Error",
2,Data Range Error",
3,Command Error",

4,Execution Error",
5,Too Many Errors"

Query Example: SYST:ERR?

SYSTem:REMote

Type: All Channels
Description: This command can only be used under control of USB and Ethernet. If SYST:REM is programmed, the 63200A will be set in the REMOTE state, and the front panel of frame will be disabled except the <LOCAL>key pressed.
Setting Syntax: SYSTem:REMote
Setting Parameter: None
Setting Example: SYST:REM

SYSTem:LOCal

Type: All Channels
Description: This command can only be used under control of USB and Ethernet. If SYST:LOC is programmed, the 63200A will be set in the LOCAL state, and the front panel will work.
Setting Syntax: SYSTem:LOCal
Setting Parameter: None
Setting Example: SYST:LOC

5. Status Reporting

5.1 Introduction

This chapter explains the status data structure of Chroma 63200A Series Electronic Load as shown in Figure 5-1. The standard registers, such as the Event Status register group, the Output Queue, the Status Byte and Service Request Enable, perform the standard GPIB functions and are defined in IEEE-488.2 Standard Digital Interface for Programmable Instrumentation. Other status register groups implement the specific status reporting requirements for the electronic load. The Channel Status and Channel Summary groups are used by multiple channel electronic loads to enable the status information that will be kept at its own Status register for each channel.

5.2 Register Information in Common

■ ***Condition register***

The condition register represents the present status of electronic load signals. Reading the condition register does not change the state of its bits. Only changes in electronic load conditions affect the contents of this register.

■ ***PTR/NTR Filter, Event register***

The Event register captures changes in conditions corresponding to condition bits in a condition register, or to a specific condition in the electronic load. An event becomes true when the associated condition makes one of the following electronic load-defined transitions:

Positive TRansition (0 - to - 1)
Negative TRansition (1 - to - 0)
Positive or Negative TRansition (0-to-1 or 1-to-0)

The PTR/NTR filters determine what type of condition transitions set the bits in the Event register. Channel Status, Questionable Status allow transitions to be programmed. Other register groups, i.e. Channel Summary, Standard Event Status register group use an implied Rise (0-to-1) condition transition to set bits in the Event register. Reading an Event register clears it (all bits set to zero).

■ ***Enable register***

The Enable register can be programmed to enable the bit that the corresponding Event register is logically ORed into the Channel Summary.

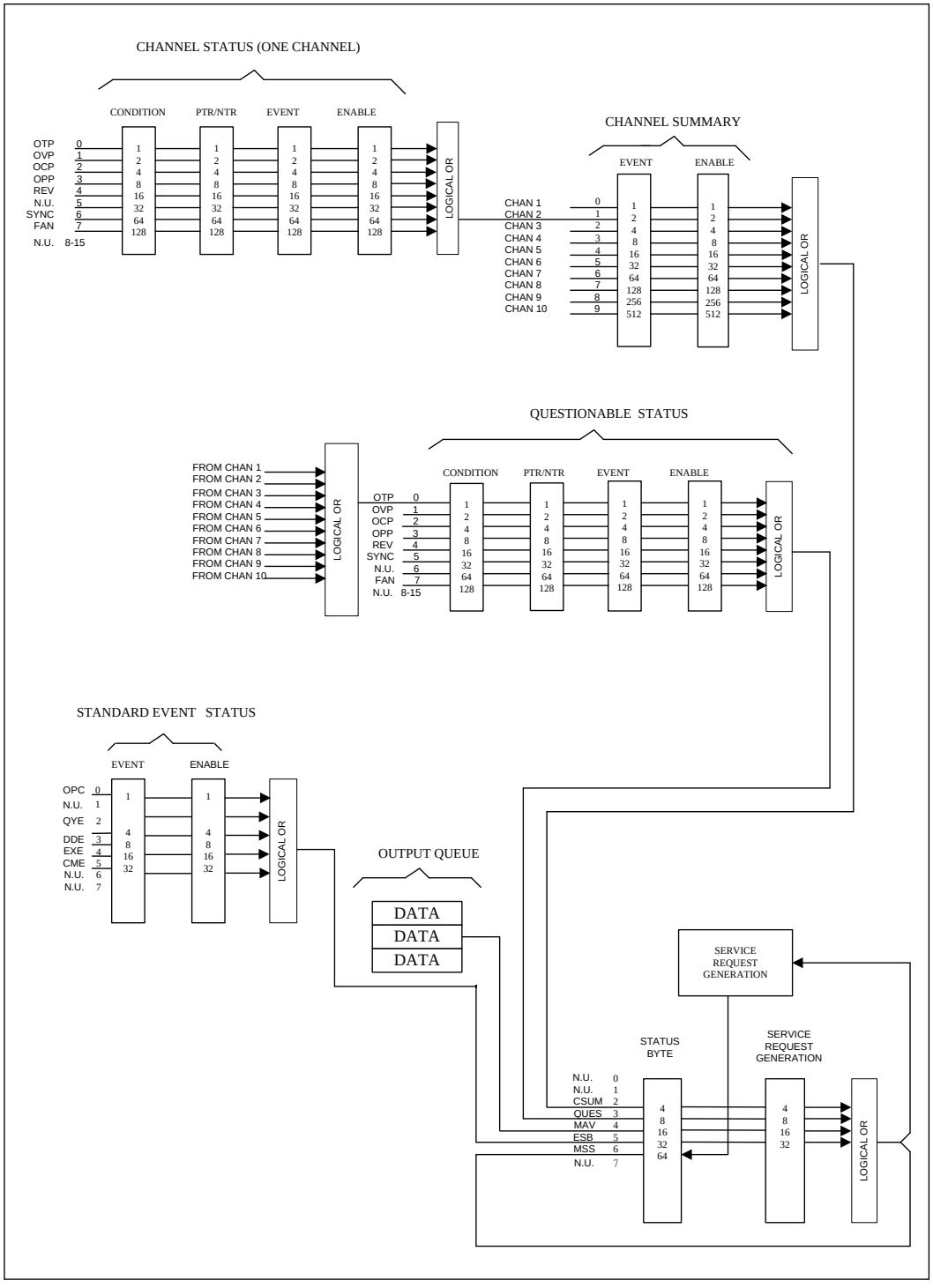


Figure 5-1 Status Registers of Electronic Load

5.2.1 Channel Status

- The Channel Status register informs you one or more channel status conditions, which indicate certain errors or faults have occurred to a specific channel. Table 5-1 explains the channel status conditions that are applied to the electronic load.
- When the bits of the Channel Status Condition register are set, the corresponding condition is true.
- Program the PTR/NTR filter to select the way of condition transition in the Channel Status Condition register that will be set in the Event registers.
- Reading the Channel Status Event register resets itself to zero.
- The Channel Status Enable register can be programmed to specify the channel status event bit that is logically ORed to become the corresponding channel bit in Channel Summary Event register.

Table 5-1 Bit Description of Channel Status

Mnemonic	Bit	Value	Meaning
OV1	0	1	*Over voltage*. When an over voltage condition has occurred on a channel, Bit 0 is set and remains set until the over voltage condition is removed and LOAD:PROT:CLE is programmed.
OV2	1	2	*Over voltage*. When an over peak voltage condition has occurred on a channel, Bit 1 is set and remains set until the over voltage condition is removed and LOAD:PROT:CLE is programmed.
REV	2	4	*Reverse voltage on input*. When a channel has a reverse voltage applied to it, Bit 2 is set. It remains set until the reverse voltage is removed and LOAD:PROT:CLE is programmed.
OCP1	3	8	*Over current*. When an over current condition has occurred on a channel, Bit 3 is set and remains set until the over current condition is removed and LOAD:PROT:CLE is programmed.
OCP2	4	16	*Over current*. When an over peak current condition has occurred on a channel, Bit 4 is set and remains set until the over current condition is removed and LOAD:PROT:CLE is programmed. *Over current*.
OCP3	5	32	User-defined over current protection (see 3.7.9). When an over current condition has occurred on a channel, Bit 5 is set and remains set until the over current condition is removed and LOAD:PROT:CLE is programmed.
OPP1	6	64	*Over power*. When an overpower condition has occurred on a channel, Bit 6 is set and remains set until the over power condition is removed and LOAD:PROT:CLE is programmed.
OPP2	7	128	Over temperature on power. An over temperature on power condition has occurred on a channel, Bit 7 is set and remains set until the over power condition is removed and LOAD:PROT:CLE is programmed.
OPP3	8	256	User-defined over power protection (see 3.7.9). When an over power condition has occurred on a channel, Bit 8 is set and remains set until the over current condition is removed and LOAD:PROT:CLE is programmed.
OTP	9	512	*Over temperature*. When over temperature condition has

			occurred on a channel, Bit 9 is set and the channel is turned off. It remains set until the channel has cooled down below the over temperature trip point and LOAD:PROT:CLE is programmed. ◦
SYNC	10	1024	*Synchronize timeout*. When a synchronize timeout condition has occurred on a channel, Bit 10 is set and remains set until the synchronize timeout condition is removed and LOAD:PROT:CLE is programmed.
FAN	11	2048	*FAN fail*. When a FAN failure condition has occurred on a channel, Bit 11 is set and remains set until the fan failure condition is removed and LOAD:PROT:CLE is programmed.
VCC	12	4096	Internal system power error. When an internal system power error has occurred on a channel, Bit 12 is set and remains set until the fan failure condition is removed and LOAD:PROT:CLE is programmed.
RMT_INH	13	8192	*Remote inhibit*. When a Remote inhibit condition has occurred on a master frame, Bit 13 is set and remains set until the remote inhibit condition is removed and LOAD:PROT:CLE is programmed.
MAX_LIM	14	16384	*Maximum sine wave current limit*. When this condition has occurred on a channel, Bit 14 is set and remains set until the condition is removed and LOAD:PROT:CLE is programmed.

5.2.2 Channel Summary

- The Channel Summary registers summarize the channel status conditions up to 10 channels.
- When an enabled bit in the Channel Status Event register is set, it causes the corresponding channel bit in the Channel Summary Event register to be set.
- Reading the Event register will reset it to zero.
- The Channel Summary Enable register can be programmed to specify the channel summary event bit from the existing channels that is logically ORed to become Bit 2 (CSUM bit) in the Status Byte register.

5.2.3 Questionable Status

- The Questionable Status registers inform you one or more questionable status conditions, which indicate certain errors or faults, have occurred to at least one channel. Table 5-2 lists the questionable status conditions that are applied to the electronic load. These conditions are same as the channel status conditions. Refer to Table 5-1 for a complete description.
- When a corresponding bit of Questionable Status Condition register is set, it indicates the condition is true.
- Program the PTR/NTR filter to select the way of condition transition in the Questionable Status Condition register that will be set in the Event registers.
- Reading the Questionable Status Event register will reset it to zero.
- The Questionable status Enable register can be programmed to specify the questionable status event bit that is logically ORed to become Bit 3 (QUES bit) in the Status Byte register.

Table 5-2 Bit Description of Questionable Status

Mnemonic	Bit	Value	Meaning
OV1	0	1	Over voltage.
OV2	1	2	Over peak voltage.
REV	2	4	Reverse voltage on input
OCP1	3	8	Current error (over current).
OCP2	4	16	Current error (over peak current).
OCP3	5	32	User-defined over current protection (see 3.7.9).
OPP1	6	64	Power Error (over power).
OPP2	7	128	Power Error (over power).
OPP3	8	256	User-defined over power protection (see 3.7.9).
OTP	9	512	Temperature error (over temperature).
SYNC	10	1024	Synchronize timeout.
FAN	11	2048	Fan fail.
VCC	12	4096	Internal system power error.
RMT_INH	13	8192	Remote inhibit.
MAX_LIM	14	16384	Maximum sine wave current limit.

5.2.4 Output Queue

- The Output Queue stores output messages until they are read from the electronic load.
- The Output Queue stores messages sequentially on a FIFO (First-In, First-Out) basis.
- It sets to 4 (MAV bit) in the Status Byte register when there are data in the queue.

5.2.5 Standard Event Status

- All programming errors that have occurred will set one or more error bits in the Standard Event Status register. Table 5-3 describes the standard events that apply to the electronic load.
- Reading the Standard Event Status register will reset it to zero.
- The Standard Event Enable register can be programmed to specify the standard event bit that is logically ORed to become Bit 5 (ESB bit) in the Status Byte register.

Table 5-3 Bit Description of Standard Event Status

Mnemonic	Bit	Value	Meaning
OPC	0	1	*Operation Complete.* This event bit generated is responding to the *OPC command. It indicates that the device has completed all of the selected pending operations.
QYE	2	4	*Query Error*. The output queue was read when no data were present or the data in the queue were lost.
DDE	3	8	*Device Dependent Error*. Memory was lost, or self-test failed.
EXE	4	16	*Execution Error*. A command parameter was out of the legal range or inconsistent with the electronic load's operation, or the command could not be executed due to some operating conditions.
CME	5	32	*Command Error*. A syntax or semantic error has occurred, or the electronic load has received a <GET> message from program.

5.2.6 Status Byte Register

- The Status Byte register summarizes all of the status events for all status registers. Table 5-4 describes the status events that are applied to the electronic load.
- The Status Byte register can be read with a serial of pull or *STB? query.
- The RQS bit is the only bit that is automatically cleared after a serial of pull.
- When the Status Byte register is read with a *STB? query, Bit 6 of the Status Byte register will contain the MSS bit. The MSS bit indicates that the load has at least one reason for requesting service. *STB? does not affect the status byte.
- The Status Byte register is cleared by *CLS command.

Table 5-4 Bit Description of Status Byte

Mnemonic	Bit	Value	Meaning
CSUM	2	4	*Channel Summary*. It indicates if an enabled channel event has occurred. It is affected by Channel Condition, Channel Event and Channel Summary Event registers.
QUES	3	8	*Questionable*. It indicates if an enabled questionable event has occurred.
MAV	4	16	*Message Available.* It indicates if the Output Queue contains data.
ESB	5	32	*Event Status Bit*. It indicates if an enabled standard event has occurred.
RQS/MSS	6	64	*Request Service/Master Summary Status*. During a serial of pull, RQS is returned and cleared. For a *STB? query, MSS is returned without being cleared.

5.2.7 Service Request Enable Register

- The Service Request Enable register can be programmed to specify the bit in the Status Byte register that will generate the service requests.

6. Verification

6.1 Introduction

This chapter contains test procedures for checking the operation and specification of Chroma 63200A Series. The tests are performed using the 63200A Series models and some required equipment. The required test equipment is listed in Table 6-1. Please refer the Performance Tests section for equipment connecting and test procedure. The user can use verification tables included at Verification Test Records section for checking the specification. The performance tests confirm Chroma 63200A Series meet the published specifications. For the detailed information of operation and programming, please refer to the *Chapter 3 and Chapter 4.*

If any of the 63200A Series models requires service, refer to the list of Chroma Sales and Support Offices at the web site http://www.chromaate.com/english/contact/default.asp.

6.2 Equipment Required

The following table lists the equipment or its equivalent required for verification.

Table 6-1 Equipment Suggested for Verification

Equipment	Characteristics	Recommended Model
Voltmeter	5 1/2 digits or more	Agilent 34401A, Agilent 3458A
Current Transducer	2000A	DC-CT(ITZ-2000-SBPR)
DC Source	600V/25A, 40V/375A 100V/100A	Chroma 62150H-600-25*2 units Chroma 62150H-40-375*6 units Chroma 62050P-100-100*6 units
Mainframe		Chroma 63200A

Connection

Connect the Load, DC Source, DMM and Current Shunt as shown in Figure 6-1. Use DMM (I) to measure the voltage that passes through the shunt resistor measurement port, and get the Load current.

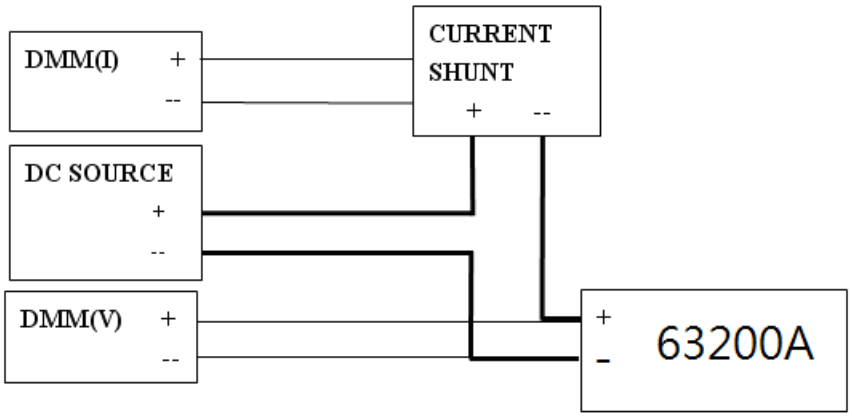


Figure 6-1

6.3 Performance Tests

6.3.1 CC Mode Verification

This test verifies if the current programming and readings are within specifications when operating in CC mode. For each DMM reading, the front panel display of current should be identical.

The reading of the Load in amps = Shunt current ± inaccuracy.

DMM (V): means DMM dc voltage of voltage measurement
DMM (I): means DMM dc voltage of current shunt measurement
DMM (DC): means DMM in dc voltage measurement
Shunt current (DMM Ai): means DMM (I) voltage/shunt resistor

Checking High Current Range

A. Connect the Load, DC Source, DMM and Current Shunt as shown in Figure 6-1. Use DMM (I) to measure the voltage that passes through the shunt resistor measurement port, and get the load current.

B. Select the right range for the current shunt resistor. Press MODE to select **CC** and press RANGE to H range.

C. Press EDIT to enter into CC Mode for setting. Use push button rotary and ◀ or ▶ to program the current listed in Table 6-2.

D. Turn on the DC source and set output voltage to 5V. Set current limit of DC source larger than the set current in Table 6-2. Press LOAD to enable the load and wait for 30 seconds. Then record the shunt current and the front panel displayed readings. The current of load can be recorded from current shunt = DMM (I) voltage/current shunt resistor.

Table 6-2

Model	CCH	Shunt Current		Front Panel Display Reading
	Current Setting	Maximum	Minimum	
63202A-150-200	200A	200.2A	199.8A	DMM Ai ±0.16A
	2A	2.101A	1.899A	DMM Ai ±0.081A
63202A-600-140	140A	140.1A	139.9A	DMM Ai ±0.11A
	1.4A	1.471A	1.329A	DMM Ai ±0.057A
63202A-1200-80	80A	80.1A	79.9A	DMM Ai ±0.06A
	0.8A	0.84A	0.76A	DMM Ai ±0.032A
63203A-150-300	300A	300.3A	299.7A	DMM Ai ±0.24A
	3A	3.152A	2.849A	DMM Ai ±0.121A
63203A-600-210	210A	210.2A	209.8A	DMM Ai ±0.17A
	2.1A	2.206A	1.994A	DMM Ai ±0.085A
63203A-1200-120	120A	120.1A	119.9A	DMM Ai ±0.12A
	1.2A	1.272A	1.128A	DMM Ai ±0.072A
63204A-150-400	400A	400.4A	399.6A	DMM Ai ±0.32A

	4A	4.202A	3.798A	DMM Ai ±0.162A
63204A-600-280	280A	280.3A	279.7A	DMM Ai ±0.22A
	2.8A	2.941A	2.659A	DMM Ai ±0.113A
63204A-1200-160	160A	160.2A	159.8A	DMM Ai ±0.16A
	1.6A	1.697A	1.503A	DMM Ai ±0.097A
63205A-150-500	500A	500.5A	499.5A	DMM Ai ±0.4A
	5A	5.253A	4.748A	DMM Ai ±0.202A
63205A-600-350	350A	350.4A	349.7A	DMM Ai ±0.28A
	3.5A	3.677A	3.323A	DMM Ai ±0.141A
63205A-1200-200	200A	200.2A	199.8A	DMM Ai ±0.2A
	2A	2.121A	1.879A	DMM Ai ±0.121A
63206A-150-600	600A	600.6A	599.4A	DMM Ai ±0.48A
	6A	6.303A	5.697A	DMM Ai ±0.242A
63206A-600-420	420A	420.4A	419.6A	DMM Ai ±0.34A
	4.2A	4.412A	3.988A	DMM Ai ±0.17A
63206A-1200-240	240A	240.2A	239.8A	DMM Ai ±0.24A
	2.4A	2.545A	2.255A	DMM Ai ±0.145A
63208A-150-800	800A	800.8A	799.2A	DMM Ai ±0.64A
	8A	8.404A	7.596A	DMM Ai ±0.323A
63208A-600-560	560A	560.56A	559.44A	DMM Ai ±0.448A
	5.6A	5.883A	5.317A	DMM Ai ±0.226A
63208A-1200-320	320A	320.32A	319.68A	DMM Ai ±0.32A
	3.2A	3.393A	3.007A	DMM Ai ±0.193A
63210A-150-1000	1000A	1001A	999A	DMM Ai ±0.8A
	10A	10.505A	9.495A	DMM Ai ±0.404A
63210A-600-700	700A	700.7A	699.3A	DMM Ai ±0.56A
	7A	7.354A	6.647A	DMM Ai ±0.283A
63210A-1200-400	400A	400.4A	399.6A	DMM Ai ±0.4A
	4A	4.242A	3.758A	DMM Ai ±0.242A
63212A-150-1200	1200A	1260.6A	1139.4A	DMM Ai ±0.96A
	12A	12.606A	11.394A	DMM Ai ±0.485A
63212A-600-840	840A	882.42A	797.58A	DMM Ai ±0.672A
	8.4A	8.824A	7.976A	DMM Ai ±0.339A
63212A-1200-480	480A	508.992A	451.008A	DMM Ai ±0.48A
	4.8A	5.09A	4.51A	DMM Ai ±0.29A
63215A-150-1500	1500A	1575.75A	1424.25A	DMM Ai ±1.2A
	15A	15.758A	14.243A	DMM Ai ±0.606A
63215A-600-1050	1050A	1103.025A	996.975A	DMM Ai ±0.84A
	10.5A	11.03A	9.97A	DMM Ai ±0.424A
63215A-1200-600	600A	636.24A	563.76A	DMM Ai ±0.6A
	6A	6.362A	5.638A	DMM Ai ±0.362A
63218A-150-1800	1800A	1890.9A	1709.1A	DMM Ai ±1.44A
	18A	18.909A	17.091A	DMM Ai ±0.727A
63218A-600-1260	1260A	1323.63A	1196.37A	DMM Ai ±1.008A
	12.6A	13.236A	11.964A	DMM Ai ±0.509A
63218A-1200-720	720A	763.488A	676.512A	DMM Ai ±0.72A
	7.2A	7.635A	6.765A	DMM Ai ±0.435A
63220A-150-2000	2000A	2101A	1899A	DMM Ai ±1.6A
	20A	21.01A	18.99A	DMM Ai ±0.808A
63220A-600-1400	1400A	1470.7A	1329.3A	DMM Ai ±1.12A
	14A	14.707A	13.293A	DMM Ai ±0.566A

63220A-1200-800	800A	848.32A	751.68A	DMM Ai ±0.8A
	8A	8.483A	7.517A	DMM Ai ±0.483A
63224A-150-2000	2000A	2002A	1998A	DMM Ai ±1.6A
	20A	21.01A	18.99A	DMM Ai ±0.808A
63224A-600-1680	1680A	1681.7A	1678.3A	DMM Ai ±1.34A
	16.8A	17.648A	15.952A	DMM Ai ±0.679A
63224A-1200-960	960A	961A	959A	DMM Ai ±0.96A
	9.6A	10.18A	9.02A	DMM Ai ±0.58A
A632009	1680A	1681.7A	1678.3A	DMM Ai ±1.34A
	16.8A	17.648A	15.952A	DMM Ai ±0.679A
A632010	960A	961A	959A	DMM Ai ±0.96A
	9.6A	10.18A	9.02A	DMM Ai ±0.58A

Checking Medium Current Range

A. After tested the high current range, press RANGE to M range.

B. Press EDIT to enter into CC Mode for setting. Use push button rotary and ◀ or ▶ to program the current listed in Table 6-3.

C. Turn on the DC source and set output voltage to 5V. Set current limit of DC source larger than the set current in Table 6-3. Press LOAD to enable the load and wait for 30 seconds. Then record the shunt current and the front panel displayed readings. The current of load can be recorded from current shunt = DMM (I) voltage/current shunt resistor.

Table 6-3

Model	CCM	Shunt Current		Front Panel Display Reading
	Current Setting	Maximum	Minimum	
63202A-150-200	100A	100.1A	99.9A	DMM Ai ±0.08A
	1A	1.1A	0.9A	DMM Ai ±0.04A
63202A-600-140	70A	70.1A	69.9A	DMM Ai ±0.06A
	0.7A	0.7A	0.7A	DMM Ai ±0.03A
63202A-1200-80	40A	40A	40A	DMM Ai ±0.03A
	0.4A	0.4A	0.4A	DMM Ai ±0.02A
63203A-150-300	150A	150.2A	149.9A	DMM Ai ±0.12A
	1.5A	1.6A	1.4A	DMM Ai ±0.06A
63203A-600-210	105A	105.1A	104.9A	DMM Ai ±0.08A
	1.05A	1.1A	1A	DMM Ai ±0.04A
63203A-1200-120	60A	60.1A	59.9A	DMM Ai ±0.05A
	0.6A	0.6A	0.6A	DMM Ai ±0.02A
63204A-150-400	200A	200.2A	199.8A	DMM Ai ±0.16A
	2A	2.1A	1.9A	DMM Ai ±0.08A
63204A-600-280	140A	140.1A	139.9A	DMM Ai ±0.11A
	1.4A	1.5A	1.3A	DMM Ai ±0.06A
63204A-1200-160	80A	80.1A	79.9A	DMM Ai ±0.06A
	0.8A	0.8A	0.8A	DMM Ai ±0.03A
63205A-150-500	250A	250.3A	249.8A	DMM Ai ±0.2A
	2.5A	2.6A	2.4A	DMM Ai ±0.1A
63205A-600-350	175A	175.2A	174.8A	DMM Ai ±0.14A

	1.75A	1.8A	1.7A	DMM Ai ±0.07A
63205A-1200-200	100A	100.1A	99.9A	DMM Ai ±0.08A
	1A	1.1A	0.9A	DMM Ai ±0.04A
63206A-150-600	300A	300.3A	299.7A	DMM Ai ±0.24A
	3A	3.2A	2.8A	DMM Ai ±0.12A
63206A-600-420	210A	210.2A	209.8A	DMM Ai ±0.17A
	2.1A	2.2A	2A	DMM Ai ±0.08A
63206A-1200-240	120A	120.1A	119.9A	DMM Ai ±0.1A
	1.2A	1.3A	1.1A	DMM Ai ±0.05A
63208A-150-800	400A	400.4A	399.6A	DMM Ai ±0.32A
	4A	4.2A	3.8A	DMM Ai ±0.16A
63208A-600-560	280A	280.3A	279.7A	DMM Ai ±0.22A
	2.8A	2.9A	2.7A	DMM Ai ±0.11A
63208A-1200-320	160A	160.2A	159.8A	DMM Ai ±0.13A
	1.6A	1.7A	1.5A	DMM Ai ±0.06A
63210A-150-1000	500A	500.5A	499.5A	DMM Ai ±0.4A
	5A	5.3A	4.7A	DMM Ai ±0.2A
63210A-600-700	350A	350.4A	349.7A	DMM Ai ±0.28A
	3.5A	3.7A	3.3A	DMM Ai ±0.14A
63210A-1200-400	200A	200.2A	199.8A	DMM Ai ±0.16A
	2A	2.1A	1.9A	DMM Ai ±0.08A
63212A-150-1200	600A	600.6A	599.4A	DMM Ai ±0.48A
	6A	6.3A	5.7A	DMM Ai ±0.24A
63212A-600-840	420A	420.4A	419.6A	DMM Ai ±0.34A
	4.2A	4.4A	4A	DMM Ai ±0.17A
63212A-1200-480	240A	240.2A	239.8A	DMM Ai ±0.19A
	2.4A	2.5A	2.3A	DMM Ai ±0.1A
63215A-150-1500	750A	750.8A	749.3A	DMM Ai ±0.6A
	7.5A	7.9A	7.1A	DMM Ai ±0.3A
63215A-600-1050	525A	525.5A	524.5A	DMM Ai ±0.42A
	5.25A	5.5A	5A	DMM Ai ±0.21A
63215A-1200-600	300A	300.3A	299.7A	DMM Ai ±0.24A
	3A	3.2A	2.8A	DMM Ai ±0.12A
63218A-150-1800	900A	900.9A	899.1A	DMM Ai ±0.72A
	9A	9.5A	8.5A	DMM Ai ±0.36A
63218A-600-1260	630A	630.6A	629.4A	DMM Ai ±0.5A
	6.3A	6.6A	6A	DMM Ai ±0.25A
63218A-1200-720	360A	360.4A	359.6A	DMM Ai ±0.29A
	3.6A	3.8A	3.4A	DMM Ai ±0.15A
63220A-150-2000	1000A	1001A	999A	DMM Ai ±0.8A
	10A	10.5A	9.5A	DMM Ai ±0.4A
63220A-600-1400	700A	700.7A	699.3A	DMM Ai ±0.56A
	7A	7.4A	6.6A	DMM Ai ±0.28A
63220A-1200-800	400A	400.4A	399.6A	DMM Ai ±0.32A
	4A	4.2A	3.8A	DMM Ai ±0.16A
63224A-150-2000	1000A	1001A	999A	DMM Ai ±0.8A
	10A	10.5A	9.5A	DMM Ai ±0.4A
63224A-600-1680	840A	840.8A	839.2A	DMM Ai ±0.67A
	8.4A	8.8A	8A	DMM Ai ±0.34A
63224A-1200-960	480A	480.5A	479.5A	DMM Ai ±0.38A
	4.8A	5A	4.6A	DMM Ai ±0.19A

A632009	840A	840.8A	839.2A	DMM Ai ±0.67A
	8.4A	8.8A	8A	DMM Ai ±0.34A
A632010	480A	480.5A	479.5A	DMM Ai ±0.38A
	4.8A	5A	4.6A	DMM Ai ±0.19A

Checking Low Current Range

A. After tested the medium current range, press RANGE to L range.

B. Press EDIT to enter into CC Mode for setting. Use push button rotary and ◄ or ► to program the current listed in Table 6-4.

C. Turn on the DC source and set output voltage to 5V. Set current limit of DC source larger than the set current in Table 6-4. Press LOAD to enable the load and wait for 30 seconds. Then record the shunt current and the front panel displayed readings. The current of load can be recorded from current shunt = DMM (I) voltage/current shunt resistor.

Table 6-4

Model	CCL	Shunt Current		Front Panel Display Reading
	Current Setting	Maximum	Minimum	
63202A-150-200	20A	20.02A	19.98A	DMM Ai ±0.02A
	0.2A	0.21A	0.19A	DMM Ai ±0.01A
63202A-600-140	14A	14.014A	13.986A	DMM Ai ±0.01A
	0.14A	0.147A	0.133A	DMM Ai ±0.01A
63202A-1200-80	8A	8.008A	7.992A	DMM Ai ±0.01A
	0.08A	0.084A	0.076A	DMM Ai ±0A
63203A-150-300	30A	30.03A	29.97A	DMM Ai ±0.02A
	0.3A	0.315A	0.285A	DMM Ai ±0.01A
63203A-600-210	21A	21.021A	20.979A	DMM Ai ±0.02A
	0.21A	0.221A	0.199A	DMM Ai ±0.01A
63203A-1200-120	12A	12.012A	11.988A	DMM Ai ±0.01A
	0.12A	0.126A	0.114A	DMM Ai ±0A
63204A-150-400	40A	40.04A	39.96A	DMM Ai ±0.03A
	0.4A	0.42A	0.38A	DMM Ai ±0.02A
63204A-600-280	28A	28.028A	27.972A	DMM Ai ±0.02A
	0.28A	0.294A	0.266A	DMM Ai ±0.01A
63204A-1200-160	16A	16.016A	15.984A	DMM Ai ±0.01A
	0.16A	0.168A	0.152A	DMM Ai ±0.01A
63205A-150-500	50A	50.05A	49.95A	DMM Ai ±0.04A
	0.5A	0.525A	0.475A	DMM Ai ±0.02A
63205A-600-350	35A	35.035A	34.965A	DMM Ai ±0.03A
	0.35A	0.368A	0.332A	DMM Ai ±0.01A
63205A-1200-200	20A	20.02A	19.98A	DMM Ai ±0.02A
	0.2A	0.21A	0.19A	DMM Ai ±0.01A
63206A-150-600	60A	60.06A	59.94A	DMM Ai ±0.05A
	0.6A	0.63A	0.57A	DMM Ai ±0.02A
63206A-600-420	42A	42.042A	41.958A	DMM Ai ±0.03A
	0.42A	0.441A	0.399A	DMM Ai ±0.02A

63206A-1200-240	24A	24.024A	23.976A	DMM Ai ±0.02A
	0.24A	0.252A	0.228A	DMM Ai ±0.01A
63208A-150-800	80A	80.08A	79.92A	DMM Ai ±0.06A
	0.8A	0.84A	0.76A	DMM Ai ±0.03A
63208A-600-560	56A	56.056A	55.944A	DMM Ai ±0.04A
	0.56A	0.588A	0.532A	DMM Ai ±0.02A
63208A-1200-320	32A	32.032A	31.968A	DMM Ai ±0.03A
	0.32A	0.336A	0.304A	DMM Ai ±0.01A
63210A-150-1000	100A	100.1A	99.9A	DMM Ai ±0.08A
	1A	1.051A	0.95A	DMM Ai ±0.04A
63210A-600-700	70A	70.07A	69.93A	DMM Ai ±0.06A
	0.7A	0.735A	0.665A	DMM Ai ±0.03A
63210A-1200-400	40A	40.04A	39.96A	DMM Ai ±0.03A
	0.4A	0.42A	0.38A	DMM Ai ±0.02A
63212A-150-1200	120A	120.12A	119.88A	DMM Ai ±0.1A
	1.2A	1.261A	1.139A	DMM Ai ±0.05A
63212A-600-840	84A	84.084A	83.916A	DMM Ai ±0.07A
	0.84A	0.882A	0.798A	DMM Ai ±0.03A
63212A-1200-480	48A	48.048A	47.952A	DMM Ai ±0.04A
	0.48A	0.504A	0.456A	DMM Ai ±0.02A
63215A-150-1500	150A	150.15A	149.85A	DMM Ai ±0.12A
	1.5A	1.576A	1.424A	DMM Ai ±0.06A
63215A-600-1050	105A	105.105A	104.895A	DMM Ai ±0.08A
	1.05A	1.103A	0.997A	DMM Ai ±0.04A
63215A-1200-600	60A	60.06A	59.94A	DMM Ai ±0.05A
	0.6A	0.63A	0.57A	DMM Ai ±0.02A
63218A-150-1800	180A	180.18A	179.82A	DMM Ai ±0.14A
	1.8A	1.891A	1.709A	DMM Ai ±0.07A
63218A-600-1260	126A	126.126A	125.874A	DMM Ai ±0.1A
	1.26A	1.324A	1.196A	DMM Ai ±0.05A
63218A-1200-720	72A	72.072A	71.928A	DMM Ai ±0.06A
	0.72A	0.756A	0.684A	DMM Ai ±0.03A
63220A-150-2000	200A	200.2A	199.8A	DMM Ai ±0.16A
	2A	2.101A	1.899A	DMM Ai ±0.08A
63220A-600-1400	140A	140.14A	139.86A	DMM Ai ±0.11A
	1.4A	1.471A	1.329A	DMM Ai ±0.06A
63220A-1200-800	80A	80.08A	79.92A	DMM Ai ±0.06A
	0.8A	0.84A	0.76A	DMM Ai ±0.03A
63224A-150-2000	200A	200.2A	199.8A	DMM Ai ±0.16A
	2A	2.101A	1.899A	DMM Ai ±0.08A
63224A-600-1680	168A	168.168A	167.832A	DMM Ai ±0.13A
	1.68A	1.765A	1.595A	DMM Ai ±0.07A
63224A-1200-960	96A	96.096A	95.904A	DMM Ai ±0.08A
	0.96A	1.008A	0.912A	DMM Ai ±0.04A
A632009	168A	168.168A	167.832A	DMM Ai ±0.13A
	1.68A	1.765A	1.595A	DMM Ai ±0.07A
A632010	96A	96.096A	95.904A	DMM Ai ±0.08A
	0.96A	1.008A	0.912A	DMM Ai ±0.04A

6.3.2 CV Mode Verification

This test verifies if the voltage programming and reading value on the front panel display are within specifications when operating in CV mode. For each DMM (V) reading, the front panel display of voltage should be equivalent to:

Load module reading in volts = DMM (V) reading in volts ± inaccuracy.

Checking High Voltage Range

A. Connect the Load, DC source, DMM and Current Shunt as shown Figure 6-1. Use DMM (V) to measure the voltage passing through the Load input terminal.
B. Press MODE till the VFD shows **CV** and press RANGE to H range.
C. The DC Source voltage outputs the voltage/current values listed in Table 6-5.
D. Wait for 30 seconds after the DC Source outputted and to record the voltage measured by DMM (V) and the Load.

Table 6-5

Model	DC Source Output Voltage	Front Panel Display Reading
632xxA-150-xxx	150V	DMM (V)±0.045V
	15V	DMM (V)±0.02475V
632xxA-600-xxx & A632009	600V	DMM (V)±0.18V
	60V	DMM (V)±0.099V
632xxA-1200-xxx & A632010	1200V	DMM (V)±0.36V
	120V	DMM (V)±0.198V

Checking Medium Voltage Range

A. After tested the high voltage range, press RANGE to M range.
B. The DC Source voltage outputs the voltage/current values listed in Table 6-6.
C. Wait for 30 seconds after the DC Source outputted and to record the voltage measured by DMM (V) and the Load.

Table 6-6

Model	DC Source Output Voltage	Front Panel Display Reading
632xxA-150-xxx	80V	DMM (V)±0.024V
	8V	DMM (V)±0.0132V
632xxA-600-xxx & A632009	150V	DMM (V)±0.045V
	15V	DMM (V)±0.02475V
632xxA-1200-xxx & A632010	600V	DMM (V)±0.18V
	60V	DMM (V)±0.099V

Checking Low Voltage Range

A. After tested the medium voltage range, press RANGE to L range.
B. The DC Source voltage outputs the voltage/current values listed in Table 6-7.
C. Wait for 30 seconds after the DC Source outputted and to record the voltage measured by DMM (V) and the Load.

Table 6-7

Model	DC Source Output Voltage	Front Panel Display Reading
632xxA-150-xxx	16V	DMM (V)±0.0048V
	1.6V	DMM (V)±0.00264V
632xxA-600-xxx &	80V	DMM (V)±0.024V

A632009	8V	DMM (V)±0.0132V
632xxA-1200-xxx & A632010	80V	DMM (V)±0.024V
	8V	DMM (V)±0.0132V

Appendix A Precautions for Loading Battery

In regard of the blooming EV, the test application for high power battery has become more and more. However, since it is to test the battery with high power and voltage, it is necessary to pay more attention to the application safety.

According to the RMA data, the damage part is MOSFET mainly for large power, high voltage Electronic Load to be repaired in general and the most possible cause is over voltage between the connection of MOSFET and UUT. It may be just a transient, but it could cause the MOSFET to be damaged by a little energy if it exceeds the maximum voltage.

Common battery application often forms high voltage by paralleling multiple batteries to avoid the transmission lost caused by low voltage high current. As the switch is uses directly to connect the battery and applied object, the study shows it is the main cause of LOAD damage. Figure A-1 shows the wire connection of Electronic Load and Battery. When the switch is shorted same as inputting a pulse signal, the effect caused by the stray element on the circuit (series inductance and parallel capacitance resonance) will generate a transient high voltage to damage the MOSFET and cause short circuit explosion as the simulation shows in Figure A-2. It can be seen that it will generate the Spike exceeding the previous setting when the switch effects and it may beyond the IC maximum withstand voltage.

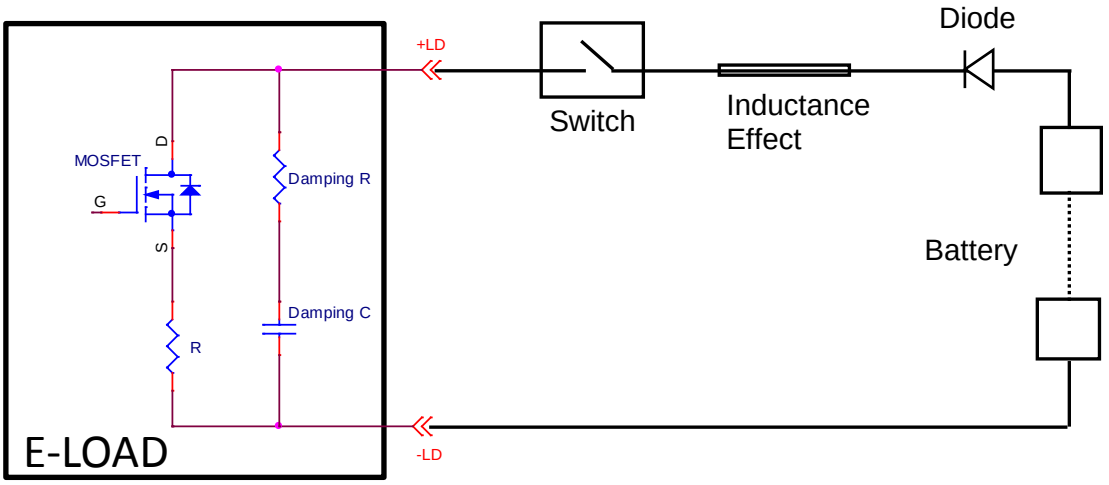


Figure A-1 Wire Connection of Electronic Load and Battery

The figure below shows the simulated circuit diagram of the application that causes damage.

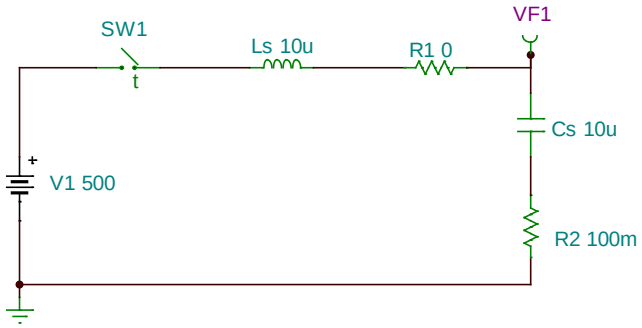


Figure A-2 Simulation Circuit

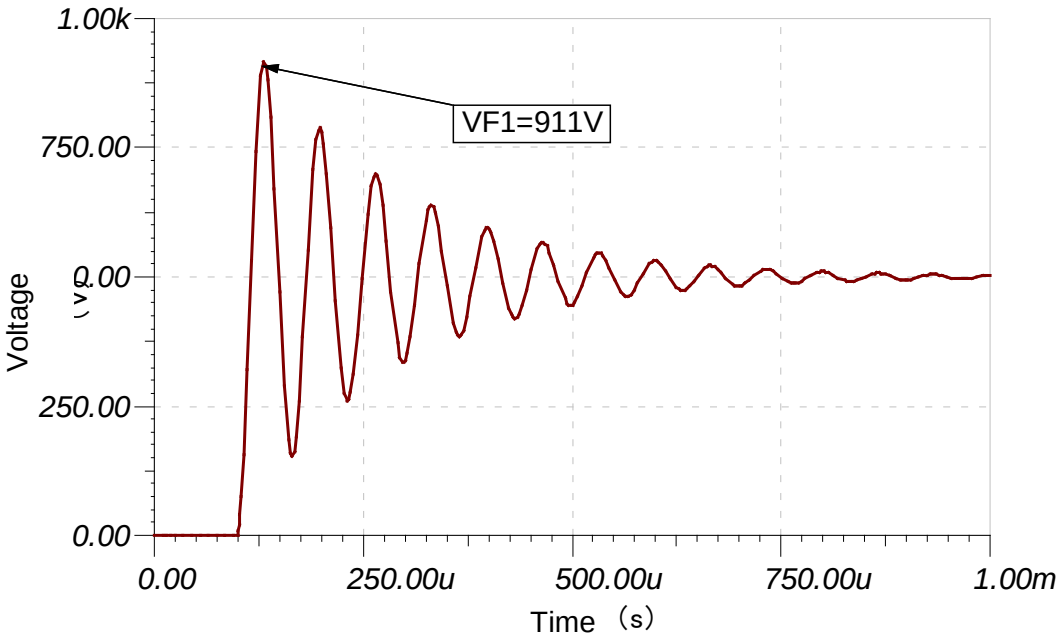


Figure A-3 Simulation of Surge Chart when Switching between Electronic Load and Battery

During the testing procedure if the entire circuit is shorted due to MOSFET breakdown by high voltage and if the energy source is battery or other source that can provide high power, continuous high current will pass through Electronic Load internal due to short circuit. The load and the battery should be disconnected immediately. If unable to do so, the huge energy of battery output may cause the Electronic Load to burnout or even more severe situation. To prevent this from happening, a mechanism of over current protection is required.

For the above situation, it is suggested not to connect the battery and Electronic Load directly using a switch only to avoid damaging the equipment.

A.1 Measures for Improvement

A.1.1 Additional Protection Switch

As the burnout may expand due to the MOSFET damage and continuous energy release from battery that caused by the conditions described previously, it is suggested to connect

the wires as Figure A-4 shows below when doing the battery charge/discharge tests to prevent problems from happening and to ensure the safety of using Electronic Load.

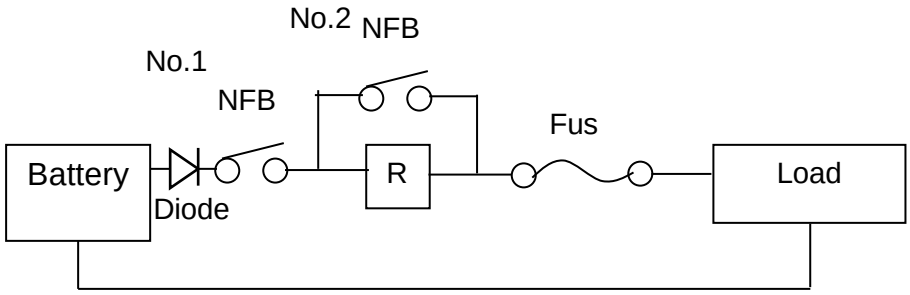


Figure A-4 Wire Connecting Diagram of LOAD and Battery

NFB(No-Fuse Breaker): The capacity (current amount) should be smaller than maximum current to facilitate load and it should be able to cutoff in time when the internal is aging short circuited.

R: It is suggested to install the resistor of 100kΩ or above to avoid giving Electronic Load huge voltage in a sudden.

Fuse: First, calculate the kW for discharge and select a proper fuse.

Note If two or more Electronic Loads are paralleled for discharge test, the front terminal of each Load has to add a fuse for protection.

A.1.2 Operation

Before inputting voltage to Electronic Load, switch to No.1 NFB to make the current go through R resistor to prevent damaging or aging the MOSFET from high voltage sent to Electronic Load internal in a sudden.

Switch to No.2 NFB after 5 seconds and then start battery discharge testing.

To stop discharge test, first press Load OFF on the Electronic Load and then switch No.2 NFB to OFF, and last switch No.1 NFB to OFF. The whole discharge test stops and the battery is cutoff from Electronic Load.

For example:

How to install the wire to discharge 2kW when using 300V (maximum current is 100A) for battery discharge?
(I = P / V = 2000W / 300V = 6.6A)

- When NFB is selected, since the battery maximum current is 100A, the NFB should be smaller than 100A; therefore, it is suggested to use NFB of 20A.
- When R is selected, it is suggested to use the resistor of 1W, 100kΩ
- When Fuse is selected, it has to be larger than loading discharge current. In this case, the discharge current is 6.6A; therefore, it should use fuse of 10A.

Appendix B Parallel Procedure and Example

B.1 Parallel Procedure

1. Parallel procedure

   A. Use the parallel communication cable to connect the System Bus of each unit and then turn on each unit's power.

   B. Set the System Bus address.
   The System Bus address of the unit to be paralleled has to start from 1. The MASTER System Bus address must set to "1" and the SLAVE address must increase in order without jumping number.

   C. Set the TERMINATOR.
   Set the TERMINATOR of the first and last unit to ON and the rest to OFF in the System Bus network.

   D. Set the PARA. MODE of each unit by selecting MASTER or SLAVE set via System Bus address.

   E. Set the PARA. NUM on MASTER unit (the total number of MASTER+SLAVE).

   F. At last, set INITIAL=ON for the MASTER unit to enable the parallel setting. When the parallel connection is done, the MASTER unit will show the system setting range.

2. Power on procedure in parallel state

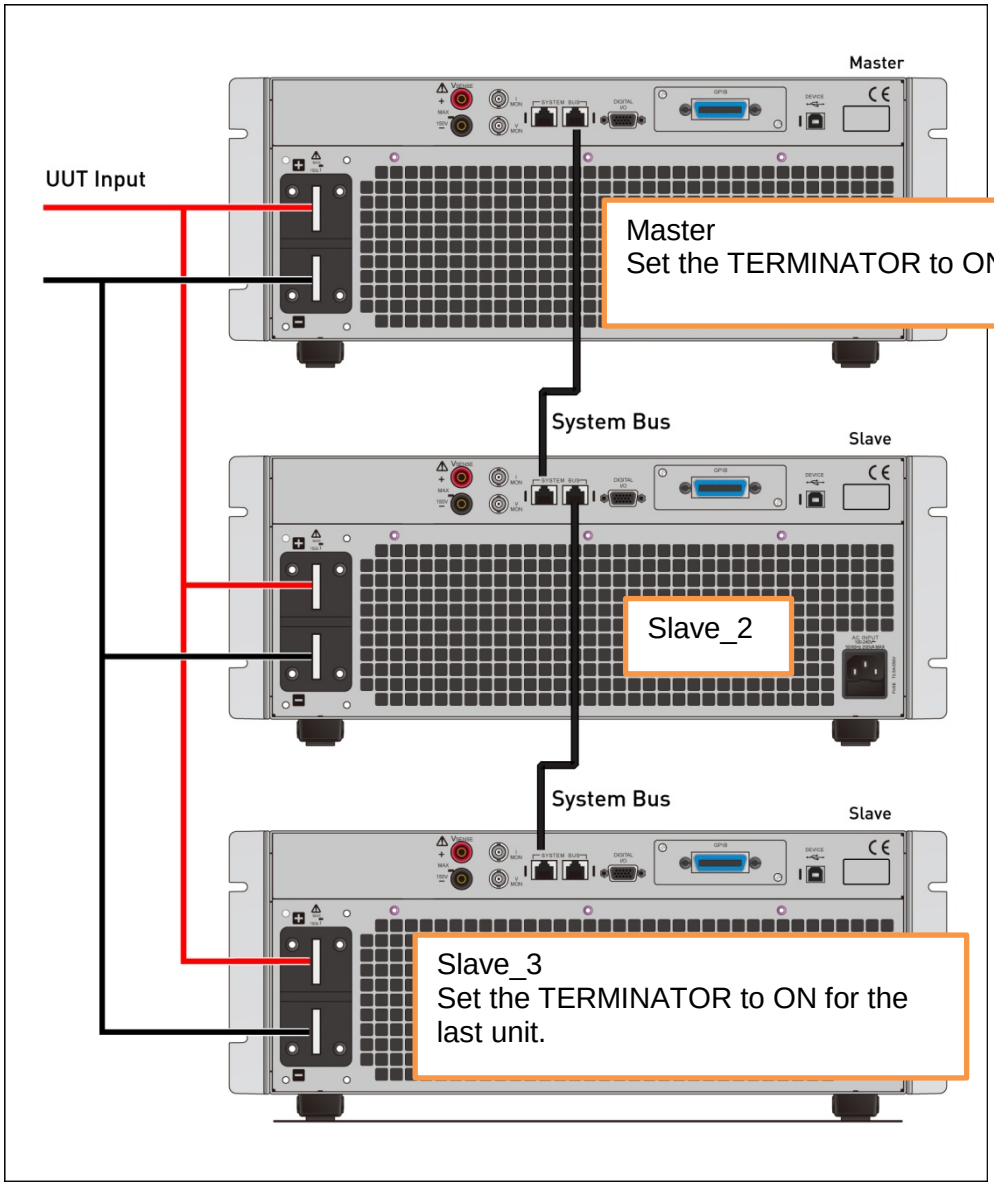
   Turn on the SLAVE power first and then the MASTER power. The MASTER unit will start to parallel automatically after it is turned on, and resume to the state before power off when the connection is done.

3. Disable the parallel

   Set INITIAL=OFF on the MASTER unit to disable the parallel, and then set the PARA. MODE of each unit to NONE.

B.2 Operating Example for Paralleling 3 Units

1. The parallel connection diagram of 63200A is as follows:



2. 63200A parallel operation

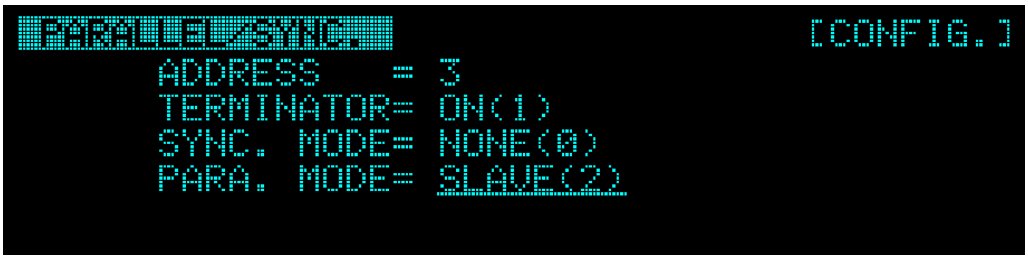
(1) First, press CONFIG on the panel of Slave_3 to enter into next menu:

A. In CONFIG menu, select “3. PARALLEL/ SYNC.” (or press the number key “3”) and press Enter.

B. In PARALLEL/ SYNC. menu

- Set the ADDRESS to 3 by pressing the number key “3” and press Enter.

- Set the TERMINATOR to ON by pressing the number key “1” and press Enter.
- Set the PARA. MODE to SLAVE by pressing the number key “2” and press Enter.



(2) Press CONFIG on the panel of Slave_2 to enter into next menu.

A. In CONFIG menu, select “3. PARALLEL/ SYNC.” (or press the number key “3”) and press Enter.

B. In PARALLEL/ SYNC. menu

- Set the ADDRESS to 2 by pressing the number key “2” and press Enter.
- Set the TERMINATOR to OFF by pressing the number key “0” and press Enter.
- Set the PARA. MODE to SLAVE by pressing the number key “2” and press Enter.

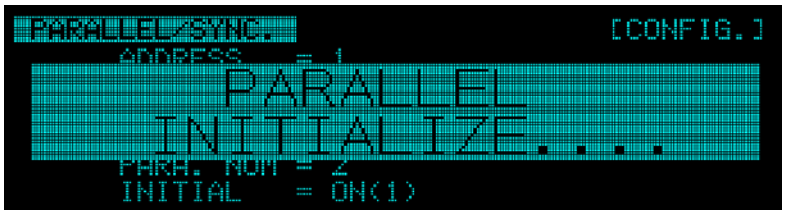
(3) Press CONFIG on the panel of Master to enter into next menu.

A. In CONFIG menu, select “3. PARALLEL/ SYNC.” (or press the number key “3”) and press Enter.

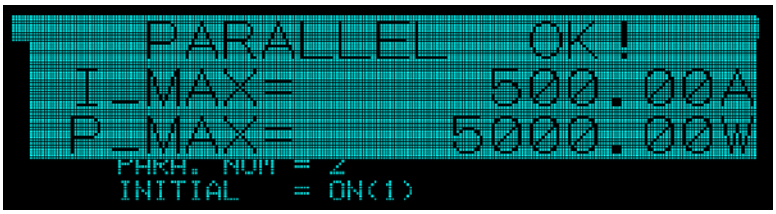
B. In PARALLEL/ SYNC. menu

- Set the ADDRESS to 1 by pressing the number key “1” and press Enter.
- Set the TERMINATOR to ON by pressing the number key “1” and press Enter.
- Set the PARA. MODE to MASTER by pressing the number key “1” and press Enter.
- Set the PARA. NUM to 3 by pressing the number key “3” and press Enter.
- Set INITIAL to ON by pressing the number key “1” and press Enter.

(4) The parallel initialization of 63200A is shown as below:



(5) The figure below shows the parallel connection is done successfully.



(6) A connection error as shown below will appear on the MASTER screen if the connection fails.

When the connection fails, check if the connecting cables and parameters are connected and set correctly, and then press Enter to reconnect.

Appendix C Using UDW Mode

1. Download the Translator tool.

   Contact the Chroma Global Sales Agency listed in the following URL to get the tool.

   http://www.chromaate.com/english/contact/default.asp

2. Before uing the Translator tool, it needs to install the LabVIEW Runtime Engine first. The mapped OS version is shown in the figure below.

3. Uncompress the Translator tool.

4. Edit the Excel file and save it.

   There is no restriction for Excel file naming; however, the tab naming must be started

with UDW.

WAVE: WAVE 1 maps to Waveform 1; WAVE 2 maps to Waveform 2. 10 waveforms are available for setting.
INTERV: Set the interval for update.
REPEAT: Set the number of time to repeat.
INTERP: Set the open linear interpolation.
CHAIN: Set to link other memory. If REPEAT is set to 0, only the current WAVE will be executed.

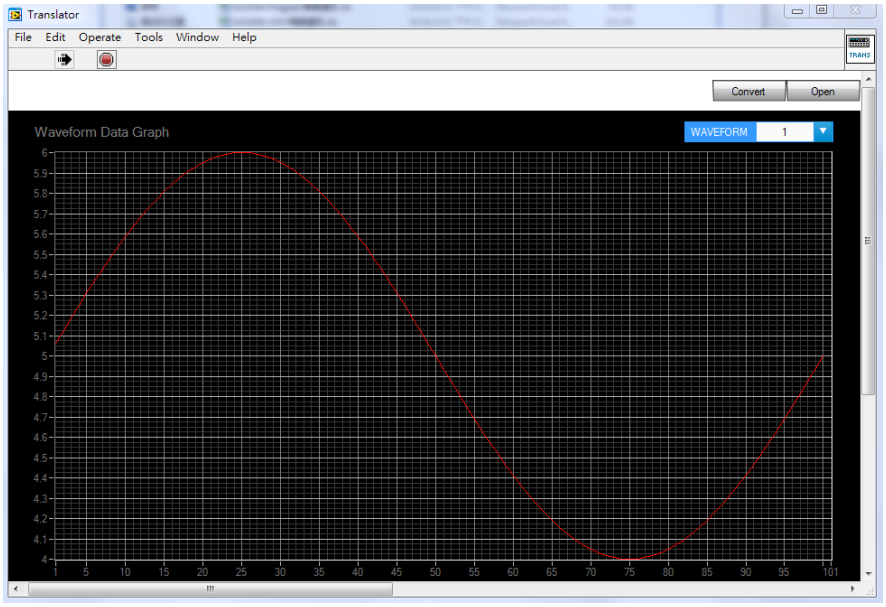
If Start is set to 11, the current is compiled from A11. When Length is set to 100, the current is compiled from A11~A110 boxed in red forl 100 compling points.

	A	B	C	D	E
1	Waveform:	1			
2	Interval:	0.01	msec	Resolution: 0.01msec	
3	Repeat:	1			
4	Interpolation:	NO			
5	Chain:	1			
6					
7	Start	11			
8	Length	100			
9					
10	Waveform Data	Unit: Amp.			
11	5.06				
12	5.13				
13	5.20				
14	5.27				
15	5.34				
16	5.41				
17	5.48				
18	5.55				
19	5.62				
20	5.69				
21	5.76				
22	5.83				
23	5.90				
24	5.97				
25	6.04				
26	6.11				
27	6.18				
28	6.25				
29	6.32				
30	6.39				
31	6.46				
32	6.53				

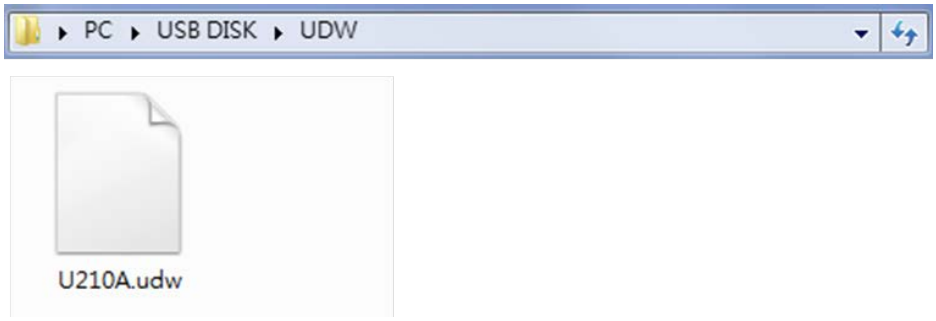
UDW1 UDW2 UDW3 UDW4 UDW5 UDW6 UDW7 UDW8 UDW9 UDW10

5. Execute the Translator.

Open a user defined waveform Excel file.

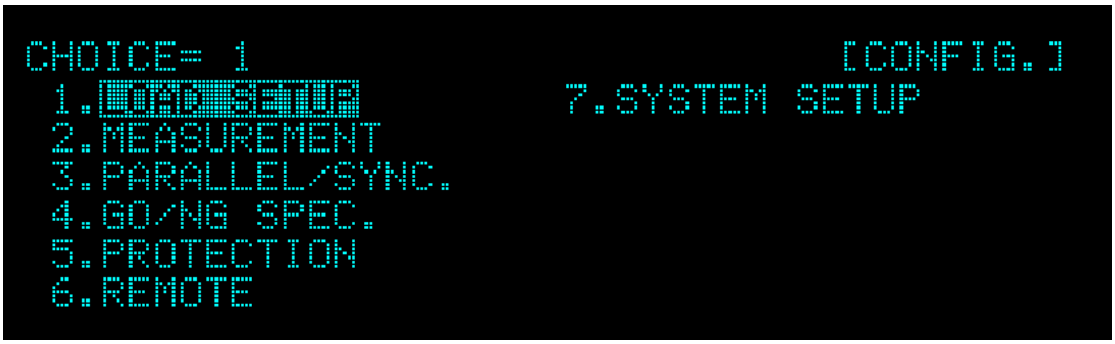


Click Convert to export the udw file. The naming of an udw file must be 8 (or less) English letters or digits. Add a folder named “UDW” in the flash drive and save the file in it.



6. Insert the flash drive to Electronic Load.

Press CONFIG→SYSTEM SETUP.



Press FRONT USB SETUP→IMPORT FILE→UDW FILE→ select the desired udw file →ENTER, and the setting is done for testing.

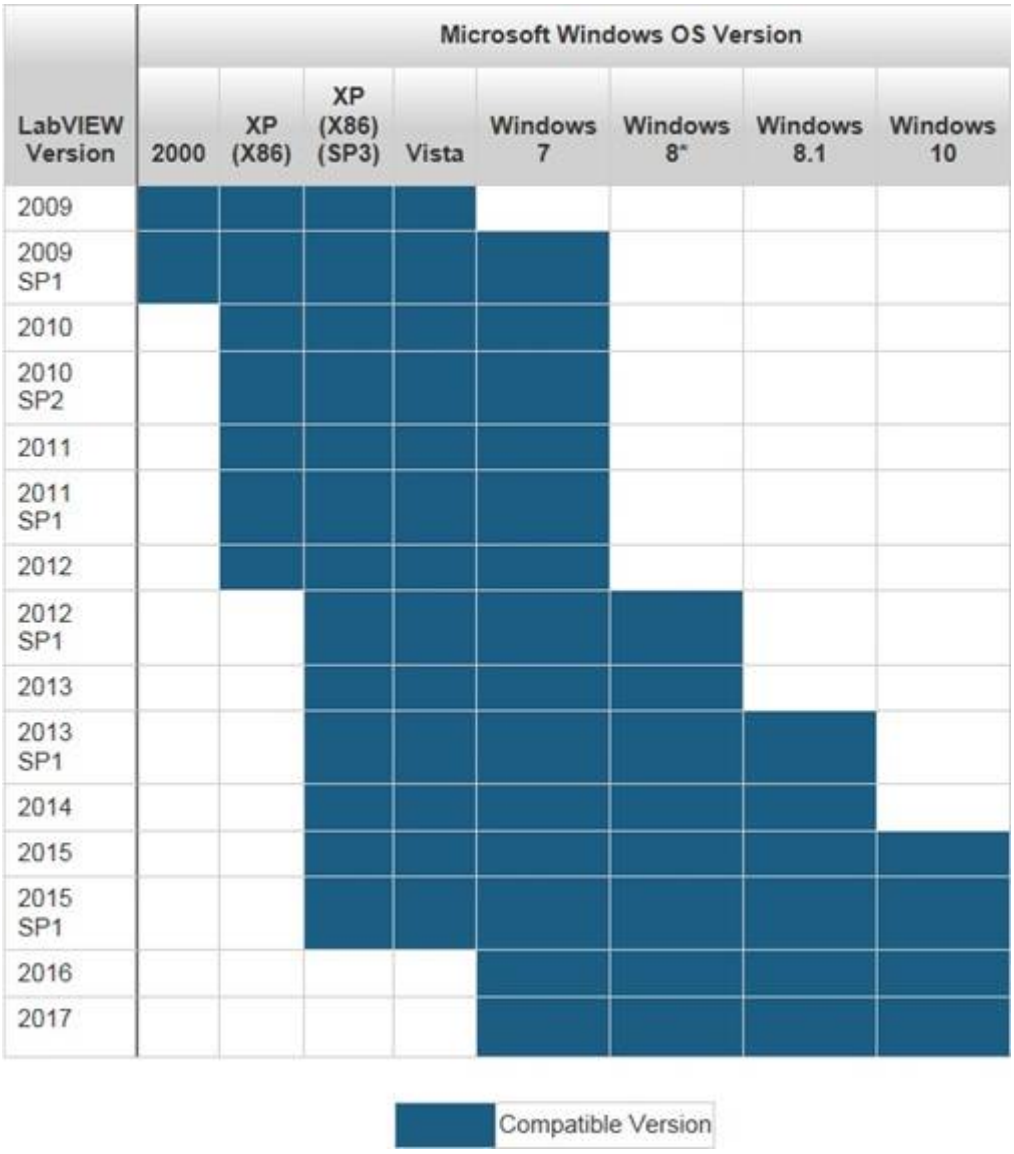
Appendix D Using Program Mode

1. Download the Translator tool.

   Contact the Chroma Global Sales Agency listed in the following URL to get the tool.

   http://www.chromaate.com/english/contact/default.asp

2. Before uing the Translator tool, it needs to install the LabVIEW Runtime Engine first. The mapped OS version is shown in the figure below.



3. Uncompress the Translator tool.

4. Edit the Excel file and save it.

63200A Program_example.xls 2018/2/21 下午 0... Microsoft Excel 9... 89 KB

There is no restriction for Excel file naming; however, the tab naming must be started with Program.

PROG: Set the program no. → 10 programs (1-10) in total and maximum 255 programs are available for setting.
PROG 1 maps to Program1 tab.

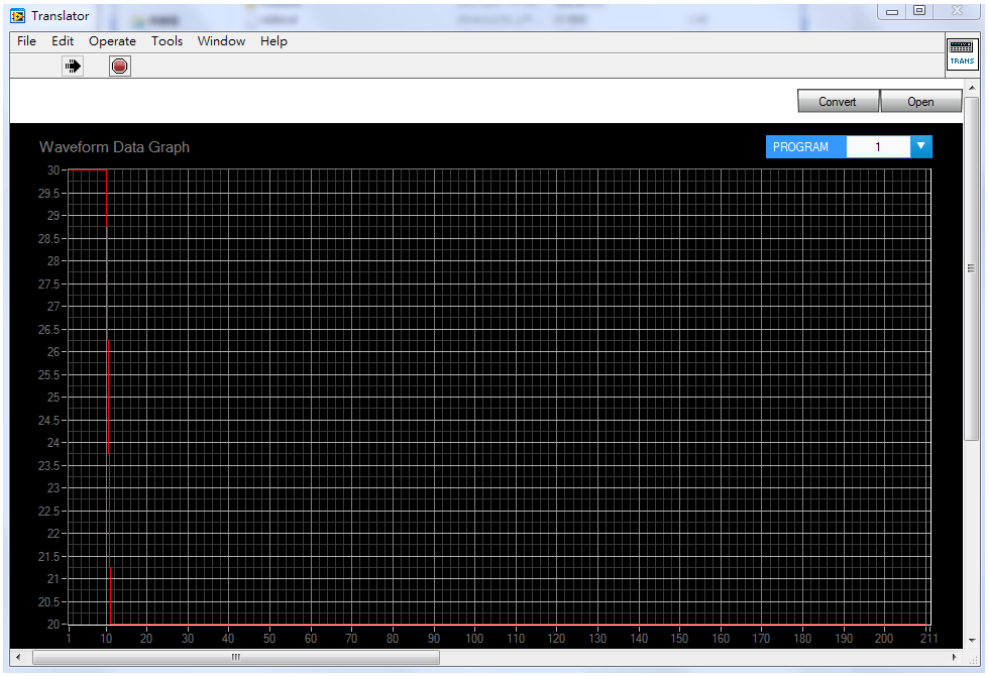
	A	B	C	D	E	F	G	H
1	Total Sequence:			3				
2	Selecte List or Step:			LIST				
3	Repeat:			1				
4	Chain Program:			2				
5								
6	STEP							
7	Type	Mode	Range	Dwell Time (second)	Start Loading (A/Ω/V/W)	End Loading (A/Ω/V/W)	SR↗ (A/μs)	SR↘ (A/μs)
8	SKIP	CC	HIGH	0.001	0	100	5	5
9								
10								
11	LIST							
12	Sequence	Type	Mode	Range	Loading (A/Ω/V/W)	Dwell Time (second)	SR↗ (A/μs)	SR↘ (A/μs)
13	1	AUTO	CC	HIGH	30	0.01	2	2
14	2	AUTO	CC	HIGH	20	0.2	1	1
15	3	SKIP	CV	HIGH	10	30		
16	4							
17	5							
18	6							
19	7							
20	8							
21	9							
22	10							
23	11							
24	12							
25	13							
26	14							
27	15							
28	16							

Program1 Program2 Program3 Program4 Program5 Program6 Program7 Program8 Program9 Program10

5. Execute the Translator.

Translator.exe 2018/2/9 下午 04... 應用程式 3,105 KB

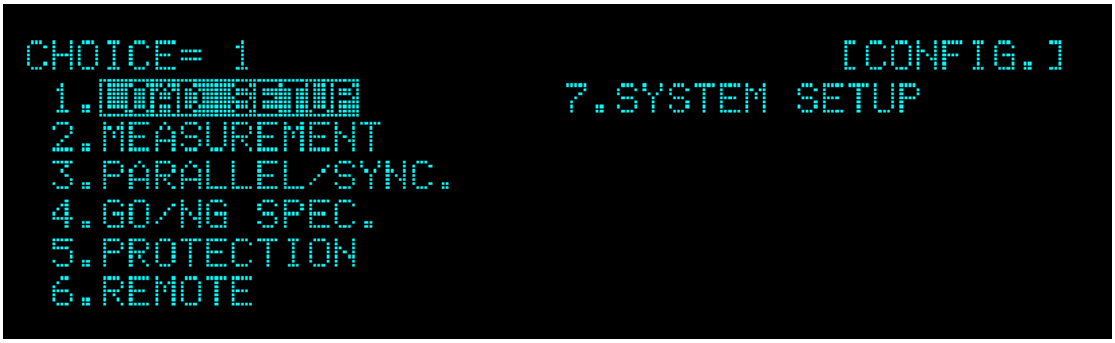
Open a user defined waveform Excel file.



Click Convert to export the udw file. The naming of an udw file must be 8 (or less) English letters or digits. Add a folder named “PROG” in the flash drive and save the file in it.

6. Insert the flash drive to Electronic Load.

Press CONFIG→SYSTEM SETUP.



Press FRONT USB SETUP→IMPORT FILE→PROGRAM FILE→select the deired seq file→ENTER, and the setting is done for testing.

Chroma's Continuous Quality Process
User Manual Customer Feedback

Chroma welcomes all comments and recommendations to improve this publication in the future editions. Please scan the QR code below or click the URL http://www.chromaate.com/survey?n=793ce6db-17ef-4cd3-b0de-8bbd09aa38e0 to fill in the customer feedback form. Thank you!

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