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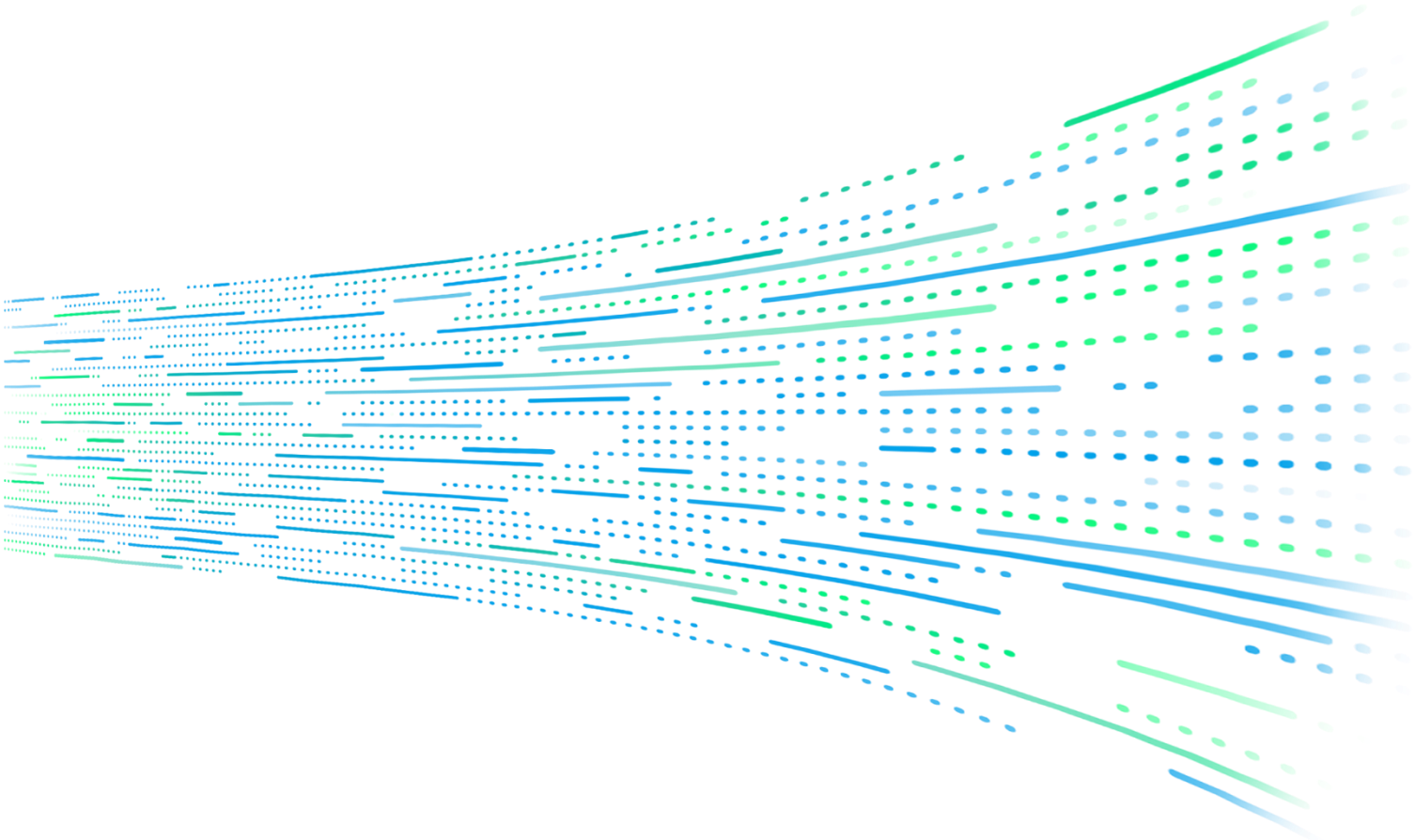
Operation and Programming Manual

DC Electronic Load
63202A-20 Series



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DC Electronic Load
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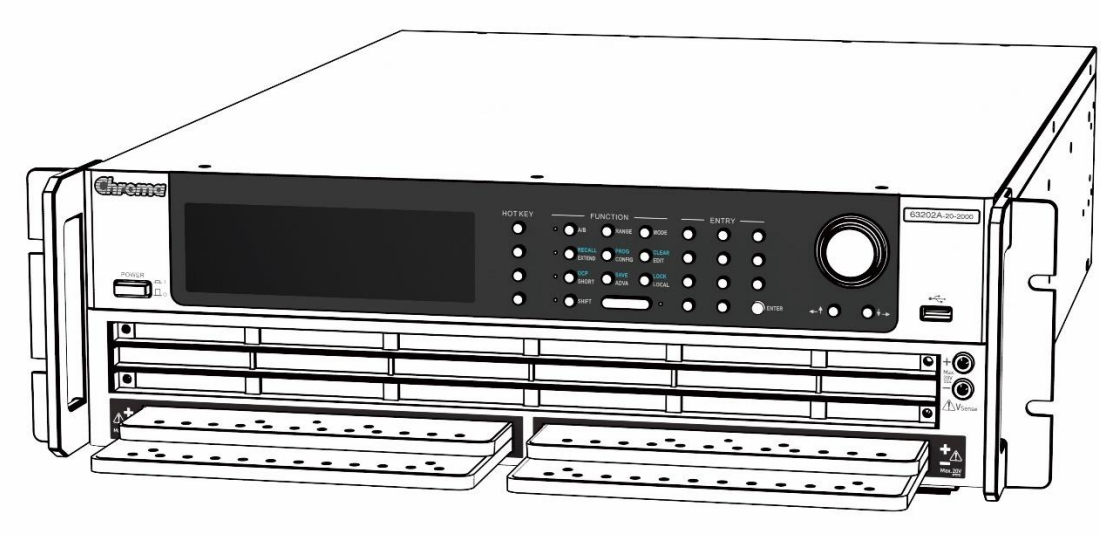

Version 1.0
August 2024

Legal Notices

The information in this document is subject to change without notice.

Chroma ATE INC. makes no warranty of any kind with regard to this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Chroma ATE INC. shall not be held liable for errors contained herein or direct, indirect, special, incidental, or consequential damages in connection with the furnishing, performance, or use of this material.

CHROMA ATE INC.
88 Wenmao Rd., Guishan Dist., Taoyuan City 333001, Taiwan

Warranty

All of Chroma's instruments are warranted against defects in material and workmanship for a period of one year from the 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.

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Chroma undertakes no liability for any special or consequential damages, or any of our customer's compensation responsibilities to third parties, arising from use or access of our product.

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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, EU Directive 2011/65/EU, and 2015/863/EU.

“×” indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006, EU Directive 2011/65/EU, and 2015/863/EU.

Remarks:
1. The CE marking on the product is a declaration of product compliance with EU Directive 2011/65/EU and 2015/863/EU.
2. This product complies with EU REACH regulations and no SVHC is in use.

Disposal

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliances for disposal at least 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, EU Directive 2011/65/EU, and 2015/863/EU.

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

1. Chroma is not fully transitioned to lead-free solder assembly at this moment; however, most of the components used are RoHS compliant.
2. The environment-friendly usage period of the product is assumed under the operating environment specified in each product's specification.
3. This product complies with EU REACH regulations and no SVHC is in use.

Disposal

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

www.chromaate.com Chroma

CE

Declaration of Conformity

For the following equipment :

Programmable DC Electronic Load

(Product Name/ Trade Name)

63202A-20-2000, 63202A-20-1000

(Model Designation)

Chroma ATE Inc.

(Manufacturer Name)

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

(Manufacturer Address)

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

EN 55011:2016+A1:2017+A11:2020+A2:2021 Group 1 Class A

EN IEC 61326-1:2021 Class A, EN IEC 61326-2-2:2021

EN IEC 61000-3-2:2019+A1:2021, EN 61000-3-3:2013+A1:2019

EN IEC/BS EN IEC 61326-1:2021(industrial electromagnetic environment)

EN 61000-4-2:2009, EN IEC 61000-4-3:2020, EN 61000-4-4:2012,
EN 61000-4-5:2014+A1:2017, EN 61000-4-6:2014, EN 61000-4-8:2010,
EN IEC 61000-4-11:2020

EN/BS EN 61010-1:2010+A1:2019

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

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

Chroma ATE Europe B.V.

(Authorized Representative Name)

Morsestraat 32, 6716 AH Ede, The Netherlands

(Authorized Representative Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU/Vice President

(Position/Title)

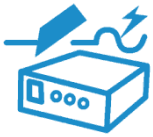
Taiwan	**2024.05.22**	Vincent Wu.
(Place)	(Date)	(Legal Signature)

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate the 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 device.

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 the 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 manual.
	**High temperature:** This symbol indicates the temperature is hazardous. Do not touch to avoid personal injury.
	**Protective grounding terminal:** This symbol indicates that the terminal must be connected to the ground before operating 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 and modifications in this manual at each revision.

Date	Version	Revised Sections
Aug. 2024	1.0	Complete this manual.

Table of Contents

1. Overview

1.1 Introduction

This manual describes the specifications, installation, and programming of 63202A-20 Series high power DC Electronic Loads.

1.2 Description

The 63202A-20 Series DC Electronic Load is equipped with a processor, two system bus connectors, a USB port, a digital signal output and input port, an optional Ethernet card, GPIB card, and CAN BUS card for purchase, along with front panel buttons and other circuits common to all load modules.

The programmable DC electronic load is suitable for designing, manufacturing, and evaluating applications and power parts for the CUP and GPU power supply. This chapter contains the specifications applicable to this series of electronic loads and the application's main features. Other chapters in this manual cover instructions for installing, operating, and programming electronic loads.

1.3 Features

- Support CC (Constant Current), CR (Constant Resistance), CV (Constant Voltage), CP (Constant Power), and CCD (Constant Current Dynamic) operating modes.
- Programmable slew rate, load levels, load periods and start loading 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 Specification.)
- Selective voltage and current ranges.
- Remote sensing capability.
- 255 sets of memories to save/recall user-defined timings.
- 10 sets of programs to link files for automatic test.
- A/D converter with precision measurement.
- Short circuit simulation.
- Master/Slave parallel control mode allows synchronous load control under static and dynamic loading modes.
- Automatic GO/NG inspection to examine if the UUT is within specification.
- 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, Ethernet, or CAN BUS.
- Isolated voltage and current to monitor the waveform output.
- Isolated external Vdc reference input to control the Load current.

1.4 Specification

CAUTION

- This equipment is not intended for performing CAT II, III, or IV measurements.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided may be impaired. The load terminals can only be connected to SELV circuits (double insulated from the Mains supply circuit).

Notice

1. This device is for indoor use only.
2. The allowed operating height of this device is 2,000 meters.
3. The pollution degree is 2.
4. The transient overvoltage reaches overvoltage category II.

Electronic Load Specifications

Model	63202A-20-1000	63202A-20-2000
Voltage*2	0-20V	
Current	0-1000A	0-2000A
Power	0-2000W	
Min. operating Voltage*3	0.125V@ 1000A	0.25V@ 2000A
Constant Current		
Range	250 / 500 / 1000 A	500 / 1000 / 2000 A
Resolution	5 / 10 / 20 mA	
Accuracy	0.05%+0.05%F.S.	
Constant Voltage		
Range	4 / 10 / 20 V	
Resolution	0.1 / 0.2 / 0.35 mV	
Accuracy	0.025%+0.025%F.S.	
Constant Resistance		
Range	0.0002Ω-2Ω(4V/2kW) 0.012Ω-120Ω (10V/2kW) 0.1Ω-1000Ω (20V/2kW)	0.0001Ω-1Ω(4V/2kW) 0.06Ω-60Ω (10V/2kW) 0.05Ω-500Ω (20V/2kW)
Resolution	0.01m/0.1m/1mΩ	
Accuracy*4	Vin/Rset*(0.2%)+0.2% IF.S.	
Constant Power		
Range	500 / 1000 / 2000W	
Resolution	5 / 20 / 50 mW	
Accuracy*5	0.2%+0.2%F.S.	
Dynamic mode		
Min. operating Voltage*7	0.5V	
Timing		
T1 & T2	0.010-99.999ms/100ms-99999ms	
Resolution	1μs / 1ms	
Accuracy	1μs + 100ppm	
Slew Rate	5mA/μs – 12.5A/μs 10mA/μs – 25A/μs 20mA/μs – 50A/μs	5mA/μs – 25A/μs 10mA/μs – 50A/μs 20mA/us – 60A/us
Resolution	5 / 10 / 20 mA/μs	
Accuracy	5% ± 10μs	
Min. Rise Time	20μs (Typical)*6	20μs (Typical)*7

Current		
Range	250 / 500 / 1000 A	500 / 1000 / 2000 A
Resolution	5 / 10 / 20 mA	
Accuracy	0.2%F.S.	0.2%F.S.
Other		
Input Capacity	160μF+0.125Ω	

Measurement Specifications

Model	**63202A-20-1000**	**63202A-20-2000**
Voltage read back		
Range	4 / 10 / 20 V	4 / 10 / 20 V
Resolution	0.1 / 0.2 / 0.35 mV	0.1 / 0.2 / 0.35 mV
Accuracy	0.015%+0.015%F.S.	0.015%+0.015%F.S.
Input Resistance	530kΩ(Typical)	530kΩ(Typical)
Current read back		
Range	250 / 500 / 1000 A	500 / 1000 / 2000 A
Resolution	10 / 20 / 35 mA	10 / 20 / 35 mA
Accuracy	0.05%+0.05%F.S.	0.05%+0.05%F.S.
Power read back		
Range	0-2000W	0-2000W
Accuracy*[5]	0.1%+0.1%F.S.	0.1%+0.1%F.S.

Input Power and Dimensions

Model	**63202A-20-1000**	**63202A-20-2000**
AC input	100-240VAC, 50/60Hz	
Power Consumption	250VA	
Fuse	T2.5A/250V	
Dimension (HxWxD)*[8]	132.4 x 428 x 600mm / 5.21 x 16.85 x 23.62 inch (3U size)	
Weight	45kg / 99.2lbs	
Air Flow (CFM)	137CFM (max.)	
Noise*[9]	72dB (max.)	

System Specifications

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	10mV		
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*10			
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%		
Warm-up Duration*11	30 minutes		
Temperature Coefficient	100ppm/°C (Typical)		
Withstand Voltage	300Vdc		
Isolation Resistance	50 MΩ, 1000VDC / 25°C / 50% RH		
EMC & Safety	CE		
Output Ripple & Noise (Vp-p) (20MHz)*12	5mV		

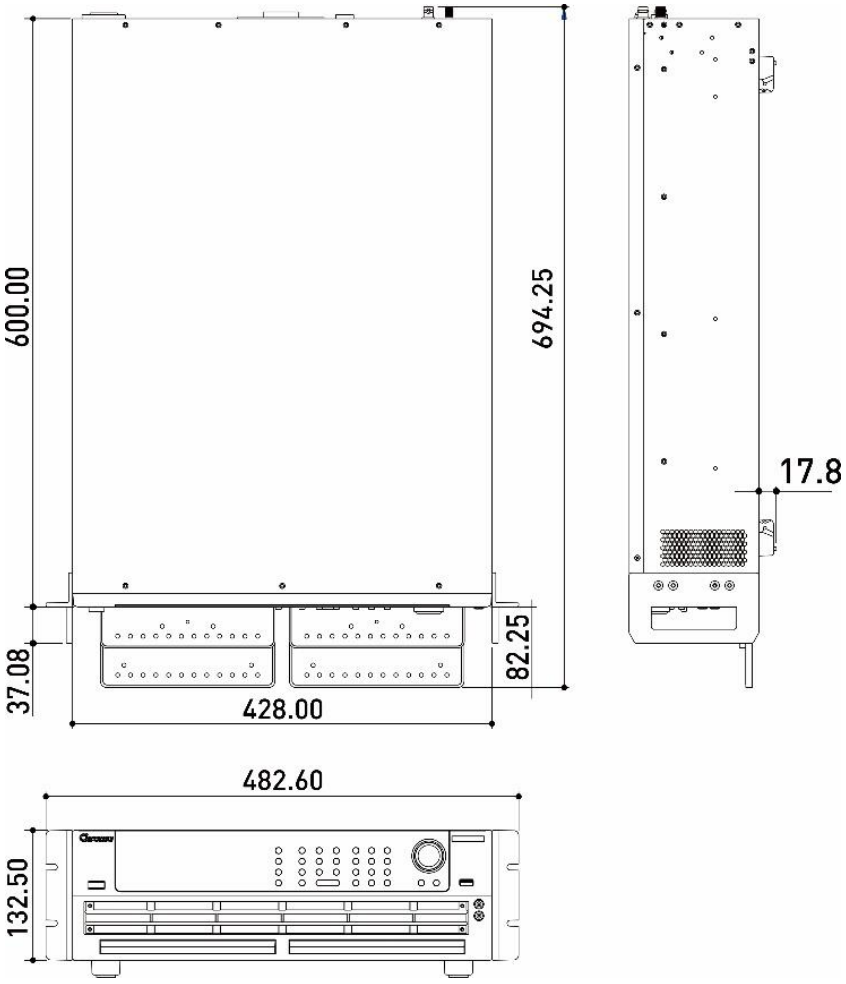
Note

1. The specifications are guaranteed to meet specified performance at a temperature range of 25±5°C.
2. If the operating voltage exceeds 1.1 times the rated voltage, it will damage the equipment permanently.
3. Due to the influence of the on-resistance specification range of the internal power components, when the operating voltage is lower than the minimum, the actual current that each load can pull is different.
4. The accuracy calculation of CR mode is based on the current.
   Example:
   Vin=20V
   Rset=2.5Ω
   IF.S=2000A (I Range: High)
   I=20V/2.5Ω
   I_min=20V/2.5Ω-(20V/2.5Ω*(0.2%)+0.2%*2000A)
   I_max=20V/2.5Ω+(20V/2.5Ω*(0.2%)+0.2%*2000A)
   I_min < I < I_max
5. Power F.S. = Vrange F.S. x Irang F.S.
6. The specification is valid only for loading current >2% F.S. also the current change needs to be greater than 280 to meet the specifications.
7. The specification is valid only for loading current >1% F.S. also the current change needs to be greater than 280 to meet the specifications.
8. Overshoot ≤ 10%, test condition: Wire impedance 18nH/80uΩ, current range from 20 to 2000A, and current slew rate 20A/μs.
9. The height does not include the 17.8mm/0.7-inch foot pads and 82.25mm/3.2-inch output copper bar.

10. The measured maximum noise is tested under the condition of 40°C ambient temperature with full power for 5 minutes or when COOL is selected by Cooling, and 1 meter away from the frame.
11. The short circuit function simulates the maximum current output under the full power limit. This behavior is not equivalent to a mechanical short circuit.
12. All functions of the electronic load operate simultaneously when the power is turned on. However, to achieve accuracy within specifications, it is recommended to warm up the load for more than 30 minutes.
13. Use a 50Ω coaxial cable and 0.1μF & 47μF parallel ceramic capacitors for testing.

1.5 Dimension

- Model 63202A-20-1000 / 63202A-20-2000 (Unit: mm)



2. Installation

2.1 Precautions during Installation

- **Electric shock**
  To prevent the electric shock from occurring, it is recommended to wear insulating rubber gloves before performing electricity-related work before using this device.

- **Moving and transportation**
  The ear rack provided can assist in taking out the device from the rack and moving it around on the table. If there is a need to relocate the device, moving it with more than two people by carrying the chassis is recommended. Do not lift the device directly from the ear rack to avoid causing danger due to excessive weight.

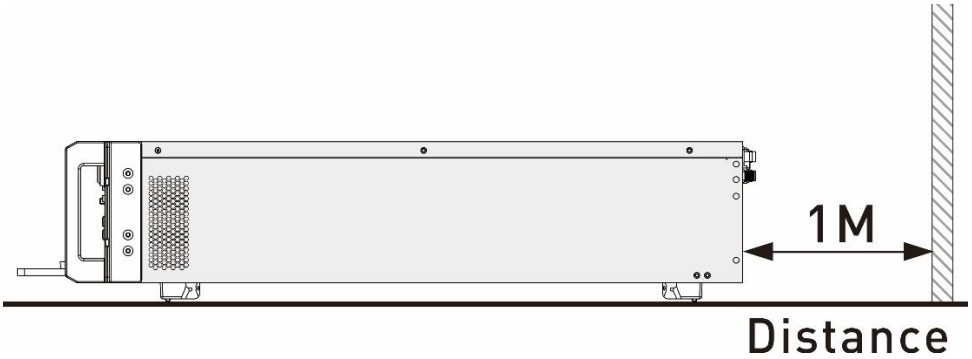
⚠WARNING

1. Only accessories that meet the manufacturer's specifications should be used.
2. Do not disable the grounding plug for safety reasons. Please use a grounded power outlet.
3. Do not block any ventilation holes to prevent the device from overheating. Keep ventilation slits uncovered during operation. Failure to do so will result in the instrument overheating and possible damage to internal components.
4. The power plug serves as a disconnecting device and should be always available. It should be near the equipment and easy to unplug.
5. If the instrument is not used according to the instructions specified by the manufacturer, the protection of the instrument may be affected.
6. According to the IEC 60227 standard, European certified power cords shall not be lighter than lightweight polyvinyl chloride sheathed flexible cords where H03 VV-F or H03 VVH2-F (equipment weight under 3 kg), H05 VV-F or H05 VVH2 - F2 (equipment weight over 3 kg) are designated. Rated to at least 3G 0.75 mm² (rated current up to 10 A) or 3G 1.0mm² (rated current over 10 A up to 16A) wire or larger, and a power cord less than 2m in length must be used.

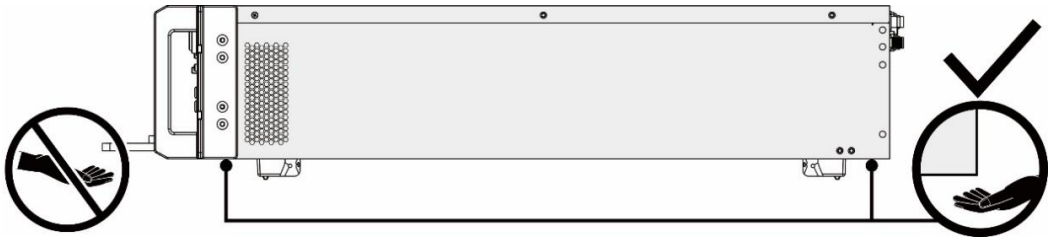
⚡CAUTION Do not place heavy objects over 40kg to avoid damaging the electronic load.

CAUTION

1. Avoid the warm air flowing back to the inlet from the air outlet.
2. At least 1 meter away from obstacles for the air outlet is recommended.



CAUTION It is prohibited to use the output copper bars to move the electronic load.



2.1.1 In Case of Emergency

- **When emergency occurs**
  To avoid greater danger in an emergency, such as electric shock, the UUT, or electronic load burnout, be sure to take the following steps.

  - First, turn off the power switch.
  - Next, unplug the power cord.
  - Contact Chroma's technical service center for assistance.

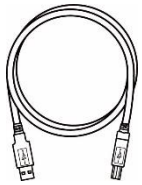
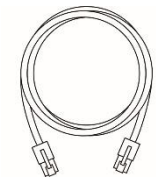
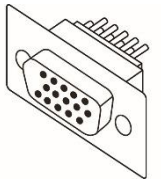
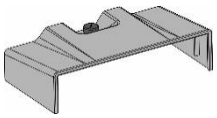
2.2 Precautions for Maintenance

There are no general maintenance items for users to perform on this device (except those specified in the manual).

When an abnormality occurs to this device, please contact Chroma or its agents. Do not perform maintenance work by yourself to avoid unnecessary dangers or cause greater damage to the device.

2.3 Inspection

Standard package:

				
W38-034000 USB*1	W31-422009 Network cable system bus*2	W38-001049 Red/Black test wire *1	H61-501550 Screw M5x15L*56	N22-000034 D-SUB 3-row 15P*2
				
W34-000903 BNC*2	G29-000034 Connector cover *2	G32-005010 Mounting bracket (USB)*1	G32-005011 Mounting bracket (RJ45)*2	G29-000179 Output protective cover *2

As soon as the instrument is unpacked, inspect any damage that might have occurred in shipping. Keep all packing materials in case 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.

2.4 Installing Comm. Interface Extended Slot

The USB, GPIB (optional), Ethernet (optional), CAN BUS (optional), and other buses can be used for remote operation.

CAUTION The Electronic Load can be damaged by discharge (static electricity). Please follow the standard anti-static method when handling or installing the Electronic Load and avoid touching the connectors and circuit boards inside.

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 power will be on when the power cord connects to the correct line voltage and turns 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 settings.

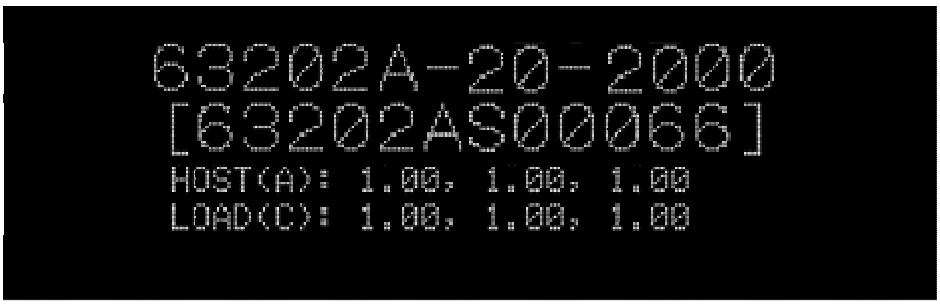
2.4.2 Turn-On Self-Test

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 the 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.



← Model no.

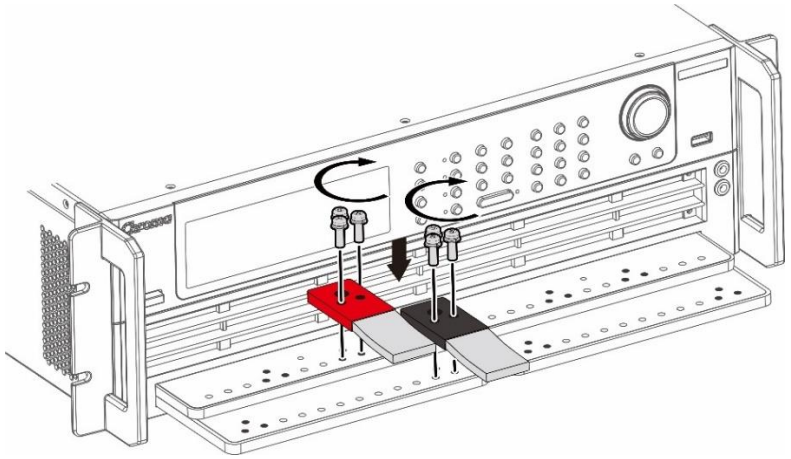
← Serial no.
← Firmware verion
← Firmware verion

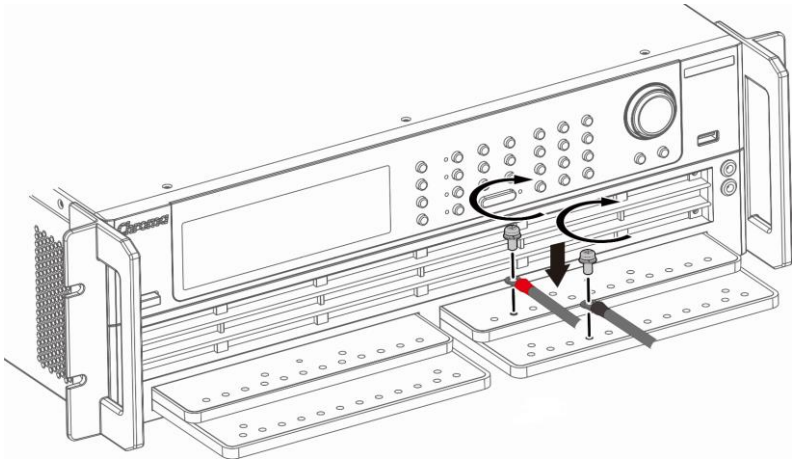
Notice After powering on and entering the main screen, the fan continues running for 30 seconds. At this time, since the electronic load is still in the self-check stage, it is not appropriate to perform any communication or operation.

2.5 Application Connection

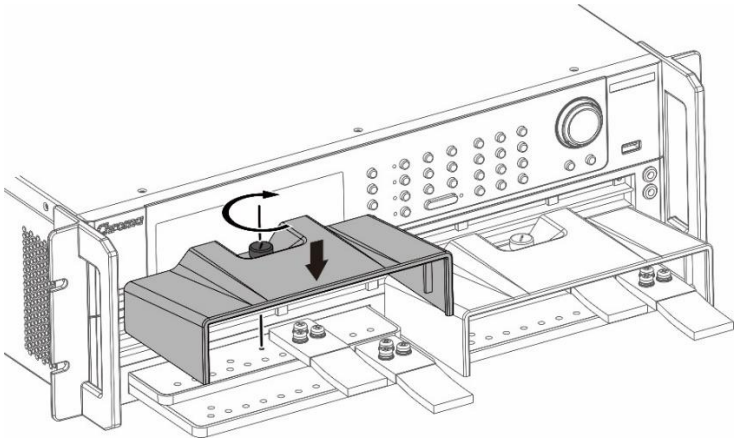
2.5.1 Load Connections

Input connections are made via terminal connectors on the front copper bars. The major considerations for input connections are the wire size, length, and polarity. The wires should be thick enough to avoid 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 to the LOW potential output terminal of the power supply (UUT). The figures below illustrate the typical setup of the Electronic Load, which can be equipped with optional soft copper tape or wires of your own choice.





If the wires are locked and ready for loading, it is recommended to install the standard output protective cover to avoid contact with the output copper bars, which may cause electric shock or short circuit. Please refer to the figure below for installing the output protective cover.



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.

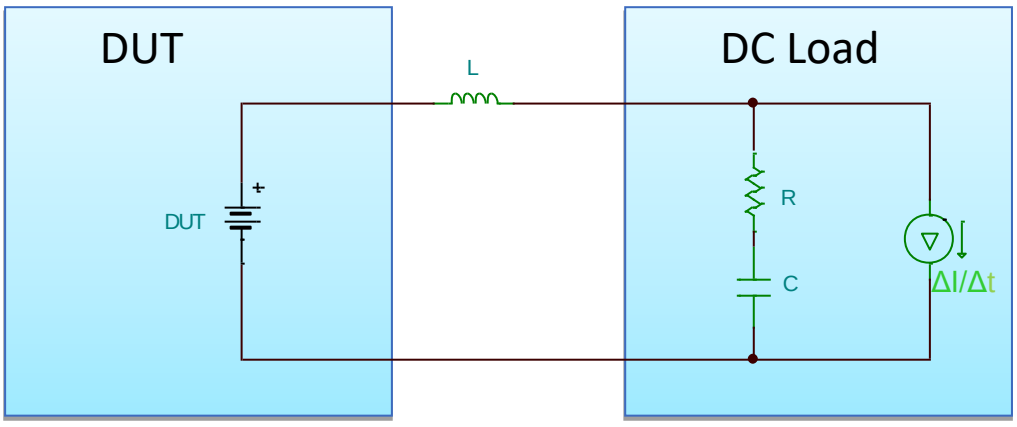
2.5.2 Vsense Remote Sensing Connections

There are two sensing points in the Electronic Load. One is measurement at the Load terminal, and the other is 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 for the measured voltage drop in applications that require long lead lengths; however, it cannot compensate for the voltage drop caused by the load effect from UUT to the load terminal. It is recommended to use Vsense remote sensing in CV, CR, and CP modes to avoid unstable control caused by the voltage difference.

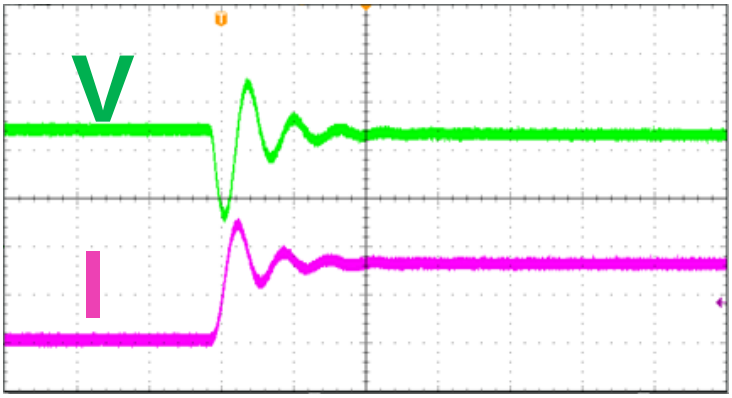
⚡CAUTION When using remote sensing, the Vsense red connector should connect to the UUT high potential output side while the black connector should connect to the UUT low potential output side. When using the Electronic Load UUT Vsense for voltage measurement, the V-sense must connect to the negative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

2.5.3 Impact of Wiring on Electronic Load

The wire length from the UUT to the Electronic Load should be as short as possible and twisted to reduce the impact of wire inductance on system stability.

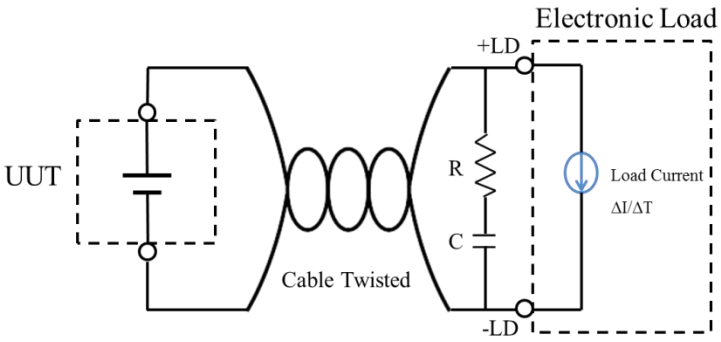


For the R&C inside the DC Electronic Load, please refer to the Input Capacity in the specification sheet.



In CR, CV, and CP modes, the electronic load uses the measured voltage to calculate and load the appropriate current. When the line inductance is large, the input to the electronic load is inductive, and the current phase lags. This situation may cause control problems on the electronic load, leading to instability and oscillation. Thus, it is recommended that the cables be as short as possible and that the positive and negative ends be twisted.

If the transient response is not considered, it is recommended to connect a resistor and a capacitor to the output end of the electronic load, as shown in the figure below. Pay special attention to the capacitor's limits on withstand voltage and ripple current during use to effectively prevent the oscillating waveforms from occurring. It is recommended that R=1~5Ω and C=100~300μF.



2.6 Remote Control Connection

The remote operation of the Load can be done through GPIB, Ethernet, CAN BUS, or USB interface. These connectors on the rear panel connect the Load to the 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 cards.

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's accuracy annually and regularly. The verification procedures are described in Chapter 6. If repair service is required or the product is out of specification, be sure to contact the sales distributors and service locations worldwide listed on Chroma's web page by clicking the following.

Contact | Chroma ATE Inc. | Global

3. Operation Overview

3.1 Introduction

The Chroma 63202A-20 Series Electronic Loads contain a set of front panel keypads, a panel display, two system bus ports, two USB ports, an optional GPIB card, an optional Ethernet card, or an optional CAN BUS card. The user can use the built-in remote control functions to read back the current, voltage, and other status. The store and recall functions can save up to 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 the overall noise level when the Load temperature rises or falls.

A load can operate independently in CC, CR, CV, and CP modes. If your application requires the power or current capacity that 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 the GO/NG check. Moreover, the panel display shows the measurements and deviation of specifications in real time to lead the user to adjust the set parameters.

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

3.2 Front Panel

The front panel contains a power switch, a panel display, hotkeys, function keys, numeric keys, arrow keys, a push button rotary, a USB Host connector, Vsense terminals, and positive and negative terminal copper bars of the Electronic Load.

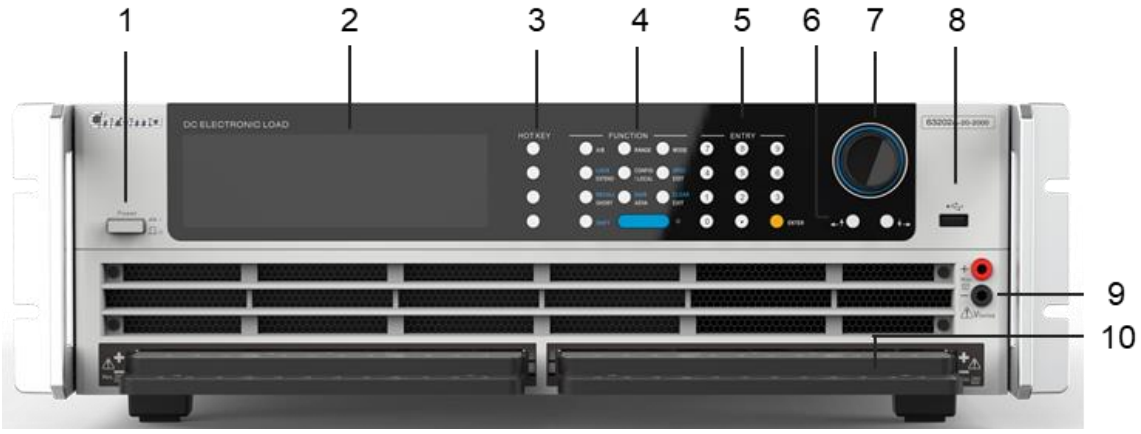


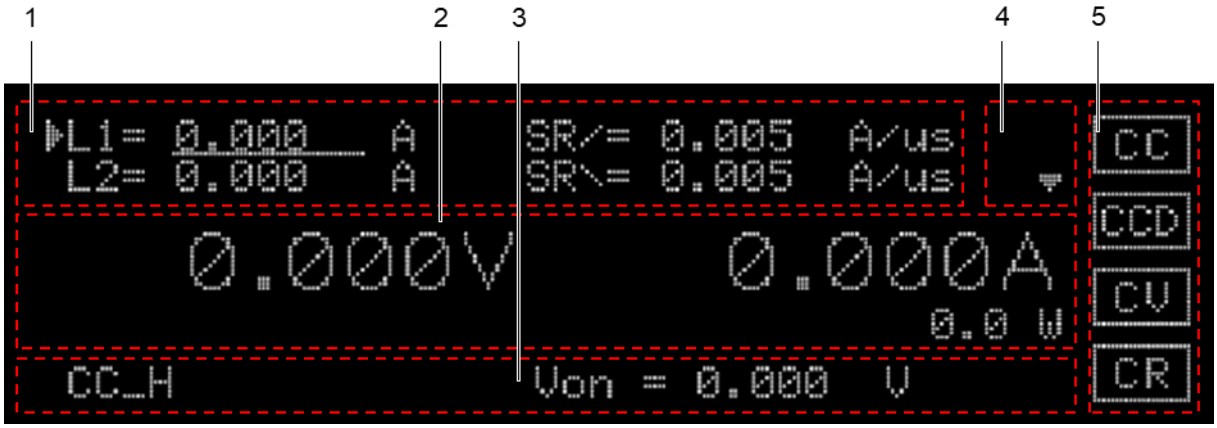
Table 3-1 Front Panel Description

Item	Name	Description	Refer to
1	Power switch	The AC power switch of the Electronic Load is only a functional switch. Only removing the power plug can truly cut off the power supply.	
2	Panel display	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 supported 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 which is equivalent to ENTER to confirm the setting.	3.2.4
8	USB Host	It can import and export the loading settings in UDW and PROG modes, as well as export the Errorlog.	
9	Vsense terminals	When the Vsense terminal is connected to the unit under test (UUT), the electronic load will automatically switch to Vsense; otherwise, the load terminal will be used for measurement.	
10	Electronic load positive and negative terminals	The UUT is connected through this copper bar for loading. The upper copper bar is the positive terminal and the lower copper bar is the negative terminal.	

3.2.1 Panel Display

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 on the next page for setting.
5. Hotkey: The shortcut for entering the mapped loading mode.



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

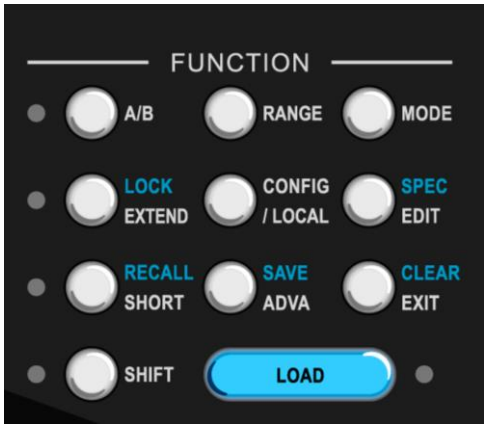


Table 3-2 Function Keys Description

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/Local	It configures the function by setting up the parameters. It can also return to 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 the 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 the lock is enabled.
SPEC	It provides GO/NG to test loading specifications when enabled.
SAVE	It saves the settings of all modes to a specified file (1 to 20).
RECALL	It recalls the settings from the specified file (1 to 20).
CLEAR	It clears the input parameters.

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 a backspace.

The push button rotary has a 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 a backspace.
2. The push button rotary has a push-down function that can perform editing and confirmation functions.

3.3 Rear Panel

The rear panel has 1 ground terminal, 2 BNC connectors, 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.

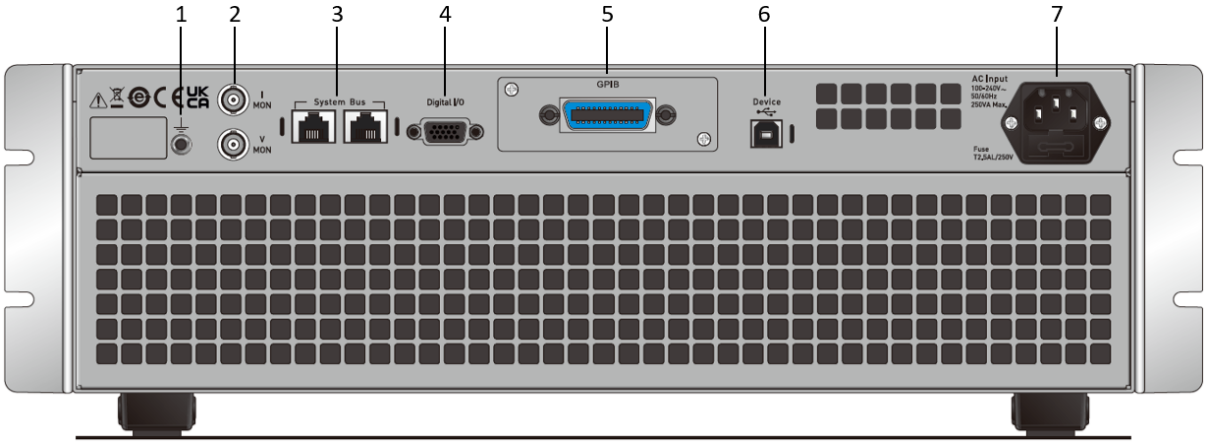


Table 3-4 Rear Panel Description

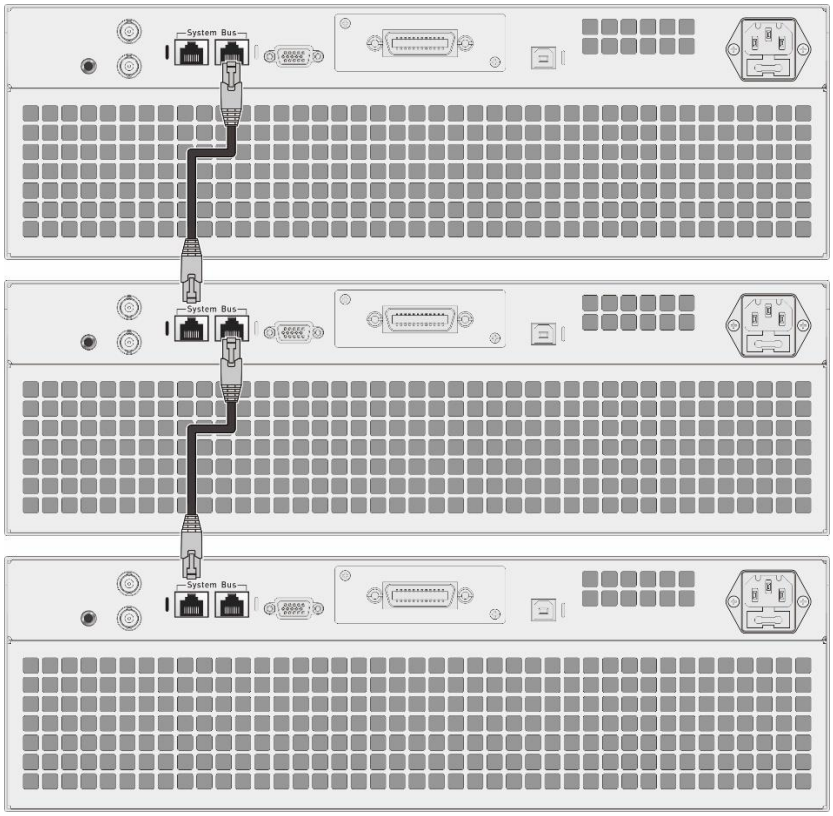
Item	Description	Refer to
1	DC Load grounding terminal	
2	V/I Mon: Two separate BNC connectors to simulate the load voltage and current. VMON is 0~10V mapped to 0V~full scale voltage while IMON is 0~10V that maps to 0A~full scale current.	3.3.1
3	System Bus: The connectors for connecting multiple 63202A-20 Series Load in parallel or series.	3.3.2
4	DIGITAL 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
5	Extended communication interface: There are GPIB, Ethernet, and CAN BUS interfaces for extension.	3.3.4
6	USB Device: It connects the PC and remote controller.	3.3.5
7	The AC power inlet and fuse socket.	

3.3.1 Voltage and Current Monitoring (V/I Mon)

The Electronic Load has two independent BNC connectors to monitor the voltage and current, and 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

The two System Buses on the rear panel 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 properly grounded before connection. For synchronous loading, please refer to the figure below for connecting the System Bus.



⚠WARNING The chassis is grounded through the 3rd pin of the power cord. Be sure the power socket is a 3-pin type and the pin is properly grounded. The parallel cable is a standard Chroma accessory. Do not use the cable of other brands to avoid damaging the equipment. The System Bus is a parallel connecting port of the 63202A-20 Series Electronic Load; do not connect it with other devices to avoid damaging the equipment.

3.3.3 DIGITAL IO

The IO port is a 15-pin D-SUB male connector on the rear panel of 63202A-20 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 follows:

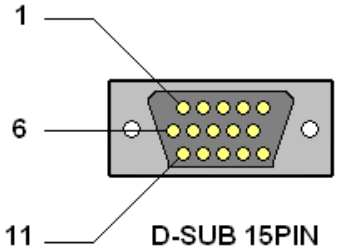


Table 3-5 Pin Assignments of System I/O Port Connector

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 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]: The DO3 default is high level output. If conditions such as Load on / Load off / changing the set value during loading are operated, the output changes to a low level with a width of 40us. It is only applicable to CC, CR, CV, and CP modes.
9. Pin [11:12]: DI[1:2] provides an 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 if 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 the 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. It can only connect to SELV circuits (remaining double insulated from the mains).

3.3.4 Extended Communication Interface

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

See section 3.5.6 for the parameter settings of the GPIB communication interface.

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.

3.4 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 63202A-20 Series Electronic Loads receive commands via the 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 the **LOCAL** key. The user can press **LOCAL** to return to local control mode.

3.5 Configuration

Table 3-6 Main Function Setup Description

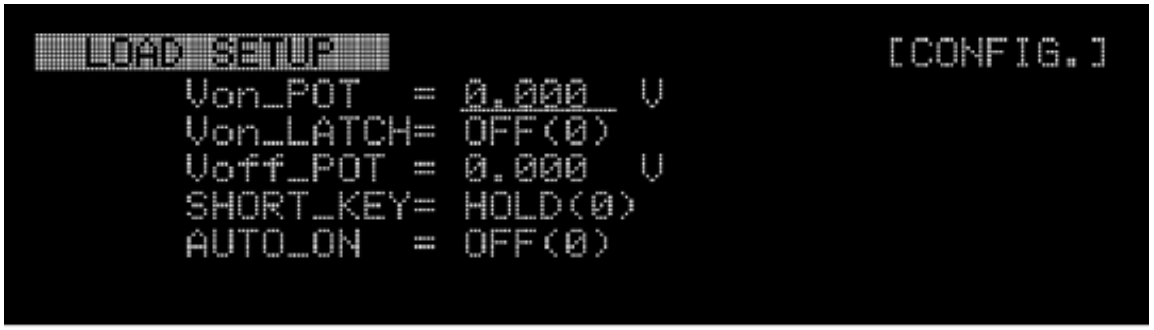
	Main Function	Description	Refer to
Configure	Load Setup	Setup for load parameters.	3.5.1
	Measurement	Setup for measurement parameters.	3.5.2
	Parallel/Sync.	Setup for parallel and sync. functions.	3.5.3
	GO/NG Spec	Setup for spec inspection parameters.	3.5.4
	Protection	Setup for current, power protection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

Table 3-7 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.
	CCD_END	Set after completing the repetition in CCD mode.

Main Function	Sub Function	Description
Measurement	Window T	Set the average measurement time.
	Sign of Voltage	Set the voltage sign for display.
	Digitizing	Set the data capturing function.
Parallel & Sync.	Address	Set the communication address.
	Terminator	Set the terminal resistor.
	Sync.	Set the synchronization function.
Protection	OCP	Over current protection defined by the user.
	OPP	Over power protection defined by the user.
	OVP	Over voltage protection defined by the 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 panel brightness.
	FRONT USB SETUP	Set the USB function on the front panel.
	DATE/TIME	Set the date and time.
	Factory Default	Restore to factory default.
	Information	Show the production information.
	Calibration	Set the calibration function.
	Cooling	Set the fan operation function.
	Sleep mode	Set the sleep mode.

3.5.1 Load Setup



Von_POT, set the start loading voltage level
The current will start loading when the Electronic Load is in the 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 the Load will continue loading current when it reaches Von.
Latch OFF means the loading current will stop when the UUT voltage is lower than Von.
The Von latch default is OFF.

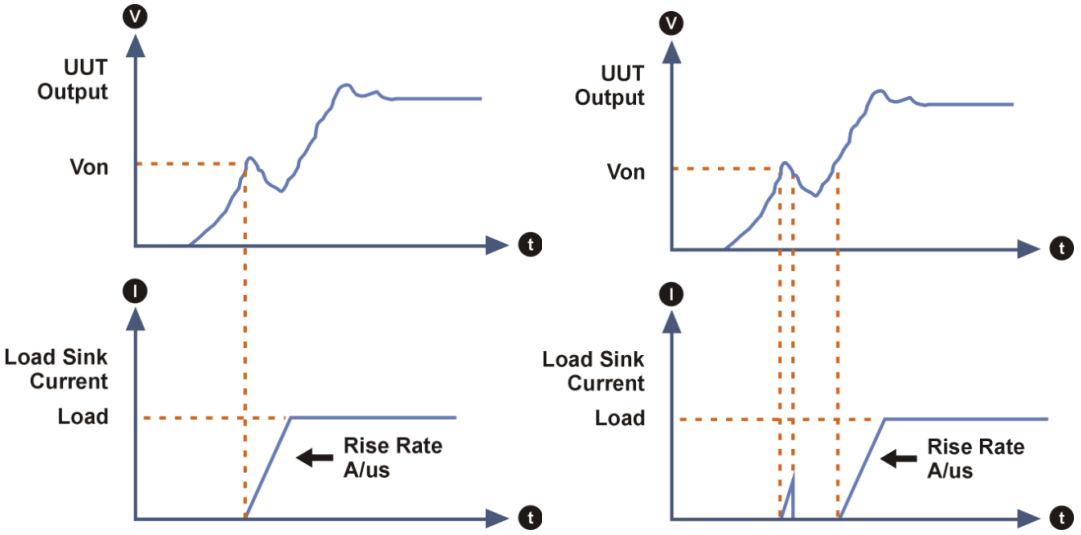


Figure 3-1 Von LATCH ON Current Waveform Von LATCH OFF Current Waveform

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 can simulate the loading conditions. When the UUT output voltage reaches Von, the Electronic Load will start or stop the 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 errors, 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 the 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 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 the SHORT key to enter into Short state and press the SHORT key again to clear the state.

The default is disabled.

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 previously 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 turning off for loading when power is on next time. The default is OFF.

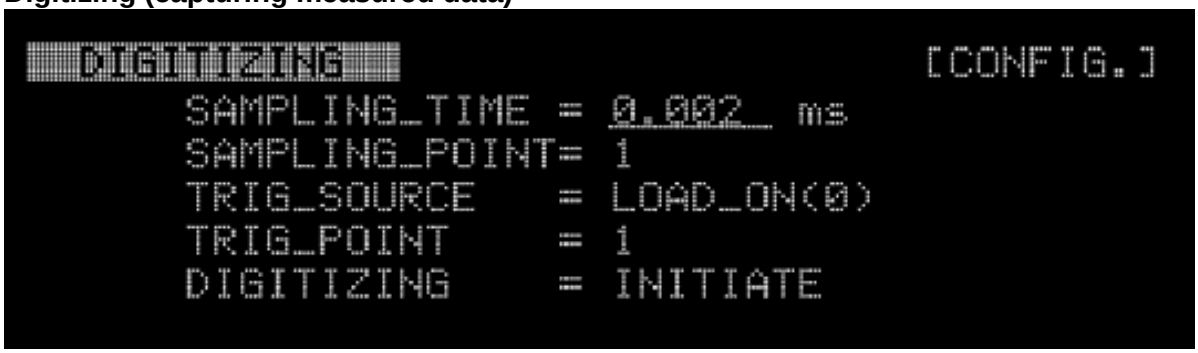
CCD_END function
This function can define the actions to be performed when the CCD mode REPEAT times are completed. It can be set to OFF (0), L1 (1), L2 (2), CC (3), and the default value is OFF (0).

3.5.2 Measurement

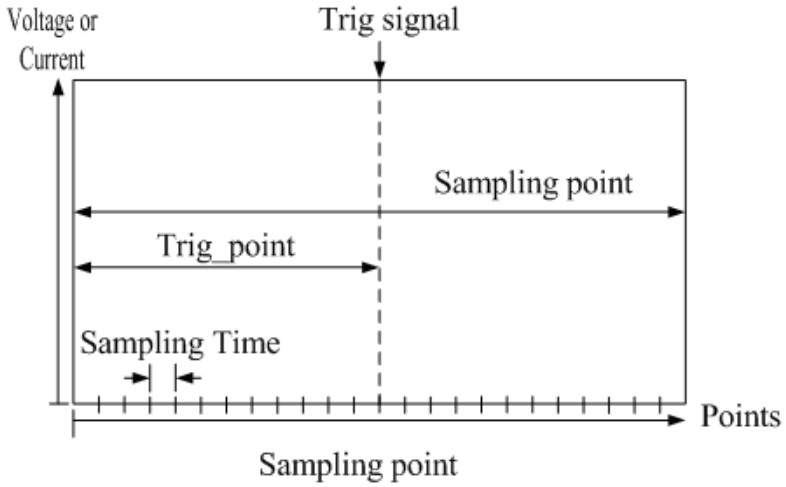
Window Time
This function adjusts the average measurement time.
The setting range is 0.01s~61s and the default is 0.1s.

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 Electronic Load provides data capturing function for recording 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 Sync. Function

The electronic load can set the synchronous loading function. First, complete the SYSTEM BUS connection on the rear panel by setting the Master and Slave to synchronize. When the Master device is loaded for the first time, it will detect the Slave device and perform synchronous loading. When set to Sync. Slave, the operating mode, and the T1/T2 settings of dynamic load mode cannot be changed. It is determined by Sync. Master.

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 be 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 sync group. It can set to DISABLE (0), MASTER (1), SLAVE (2) and the default is OFF (0).

Table 3-8 Sync-supported Modes

Mode	Sync.
CC Mode	○
CR Mode	○
CV Mode	○
CP Mode	○

Mode	Sync.
CCD Mode	○
OCP/OPP Test	○
Program	○
UDW	○
External Waveform	○
Short Function	○

Table 3-9 Sync-supported Functions

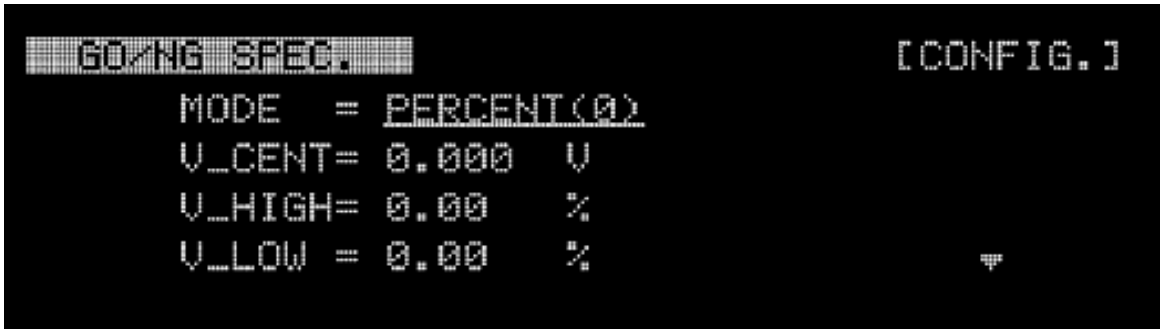
Function	Sync.
DIGITIZING	X
TIMING	○
GO/NG SPEC.	○
PROTECTION	○
SAVE/RECALL	○

CAUTION

1. The first and last loads in the SYSTEM BUS network must turn on the terminal resistor function, and the remaining intermediate sub-units must be set to OFF. The wrong setting of the terminal resistor may cause poor communication.
2. The 63202A-20 series only supports synchronous loading and does not support parallel operation.
3. Under the synchronization setting, the error between Master and Slave is <20us.
4. The 63202A-20 series can load simultaneously with the 63202A-20 series.

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.

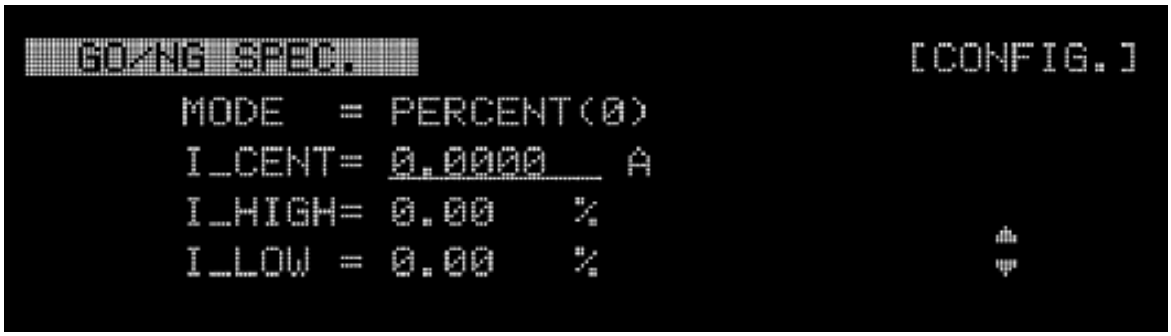


1. Setting the voltage spec.

Parameters:
MODE: There are VALUE and PERCENT two modes for setting.
V_CENTER: The setting for the input reference level.
V_HIGH: The parameter setting is the voltage level when the MODE is set to VALUE and the

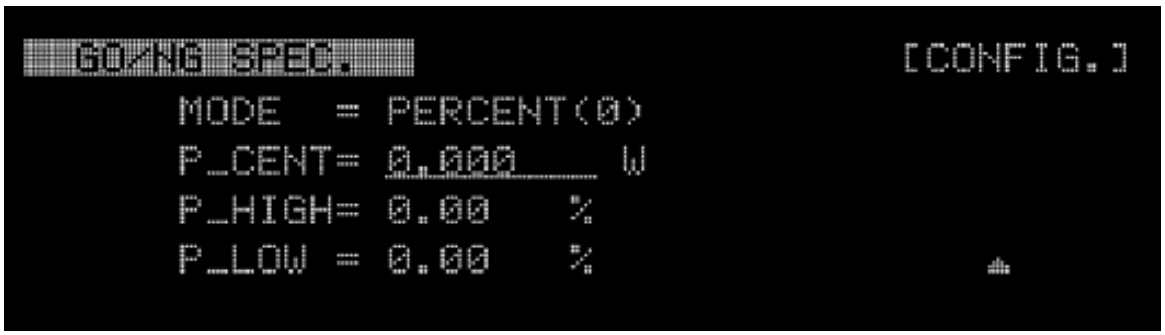
percentage range (0 to 100%) when the MODE is set to PERCENT.
V_LOW: The parameter setting is the voltage level when the MODE is set to VALUE and the percentage range (0 to 100%) when the MODE is set to PERCENT.

2. Setting the current spec.



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

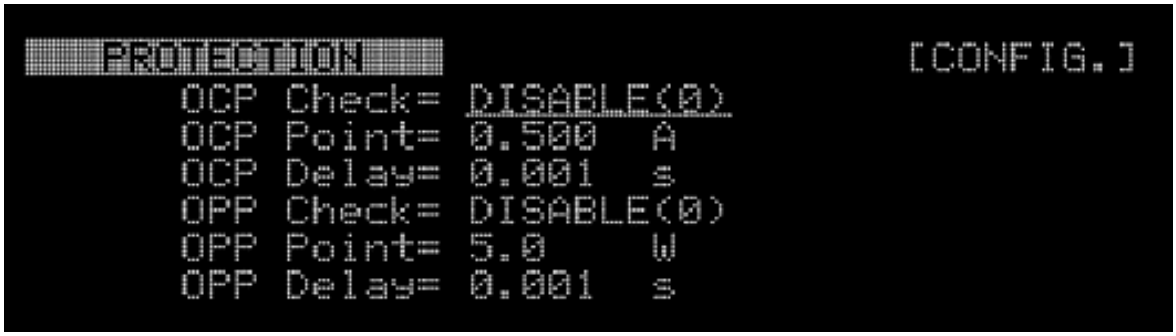
3. Setting the power spec.



Parameters:
MODE: There are VALUE and PERCENT two modes for setting.
P_CENTER: The setting for the input reference level.
P_HIGH: The parameter setting is the 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 the 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 User-defined Protection



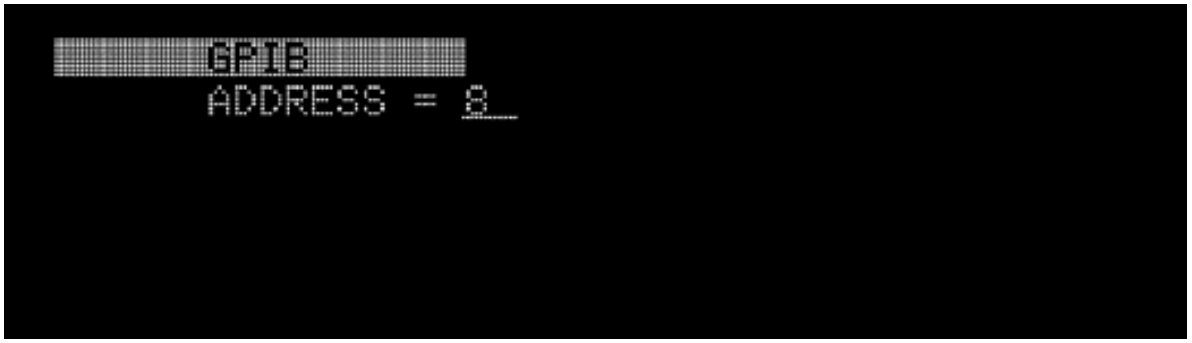
OCP (over current protection defined by the user)
The Electronic Load has over current protection that can be customized for different UUTs to prevent them from being damaged due to error operation.

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

OVP (over voltage protection defined by the user)
The Electronic Load has over voltage protection that can be customized for different UUTs to prevent them from being damaged due to error operation.

3.5.6 Setting Remote Communication Interface

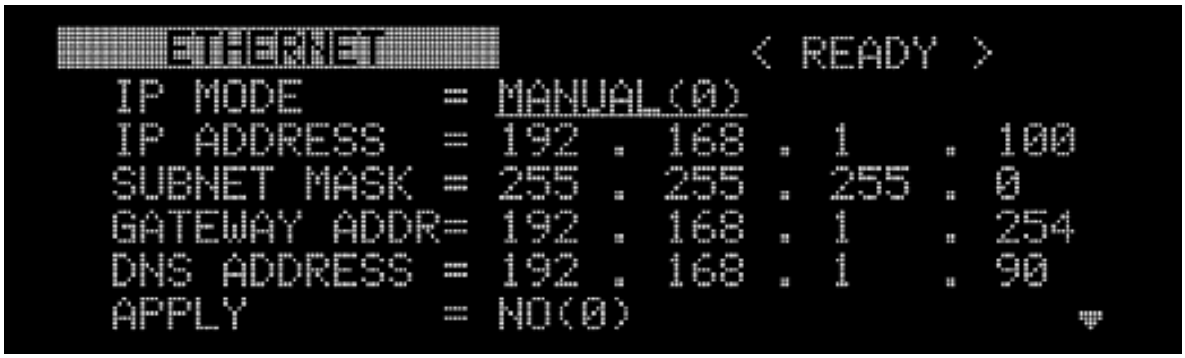
GPIB
It sets the GPIB address.



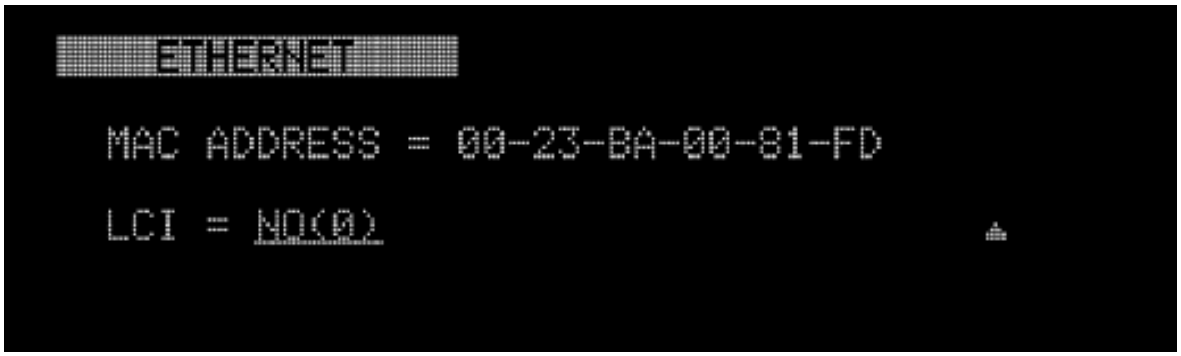
ETHERNET
It sets the ETHERENT address. The Ethernet supports the connection speed at 10 or 100 Mbit/s.

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.

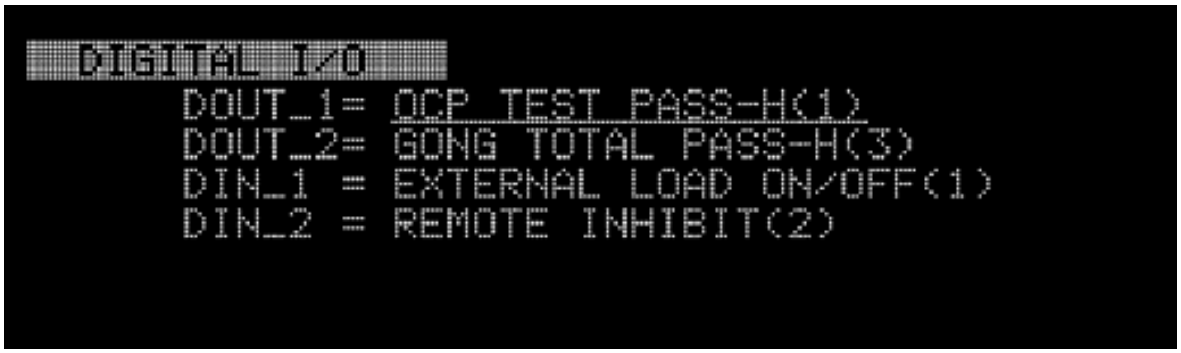


The ETHERNET 2/2 page shows the MAC ADDRESS and LCI (LAN Configuration Initialize) settings.



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 63202A-20 Series rear panel.



DOUT_1/DOUT_2 can be 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 be 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 be 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%.

Front USB Setup
The USB on the front panel has import and export functions. The import function can import the UDW and Program mode loading data without using software or manual setup. See Appendix B and C for the detailed information. The export function can export the related parameters set by the UDW and Program to other devices without manually setting them again.

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 the model number, serial number, and firmware version.

Calibration
It is the calibration function.

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

Cooling
It can select the fan control mode to AUTO (0), QUIET (1), and COOL (2). The default is AUTO (0).

- AUTO mode is an automatic control mode. The higher the internal temperature detected, the faster the fan speed. The maximum noise is about 72dB in this mode. When the ambient temperature exceeds 40°C, it is beyond the electronic load's guaranty range and the OTP protection may be triggered during use.
- QUIET mode is defined for use in a laboratory environment. To ensure normal operation

of this mode, it is recommended to use it in an ambient temperature of 25°C and 1kW condition. The maximum noise is about 55dB in this mode. If OTP protection is triggered during use, please confirm if the operating environment complies with the recommendations.

- COOL is a mode to dissipate heat. When turned on, the fan speed is fixed to high. The maximum noise is about 72dB in this mode. When the ambient temperature exceeds 40°C, it is beyond the electronic load's warranty range and the OTP protection may be triggered during use.

Sleep Mode

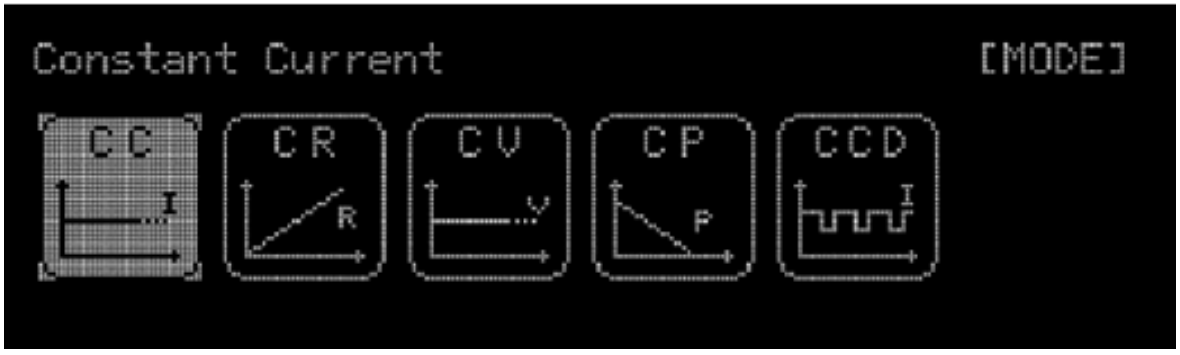
Sleep mode can be set to save energy, the default is OFF (0). The time range for entering the sleep mode is 5~60 mins, and the default is 5 mins. The time starts to count when the sleep mode is set to ON. The load will enter sleep mode when the count reaches the set time under the conditions of no Load on, no communication, and no touch of the front panel buttons.

Notice Energy-saving sleep mode turns off the panel display and needs to be woken up through the front panel buttons and communication interface.

3.6 Basic Operation Modes

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

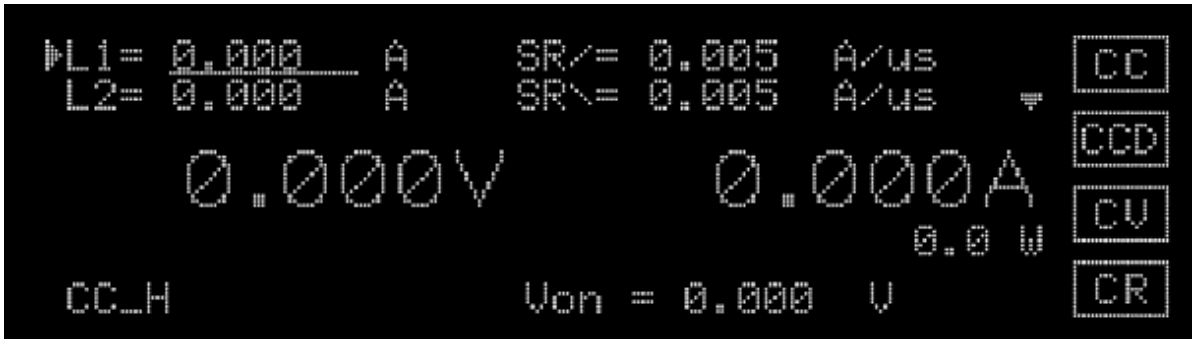
When you press MODE key to program a mode, the Load will change to a new mode. In a change of modes the Load's input is momentarily disabled before a new mode is enabled. The parameters in current, resistance, or voltage mode can be programmed easily when the mode is selected.



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 the 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 by 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 the 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 a 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 the middle range, you must select the high range. To change the range, press the RANGE key a few times until the panel range indicator is active at what you select. The mode change will affect the Load, and 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. The slew rate determines the rate at which the Load level changes from one load level state to another. Figure 3-2 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

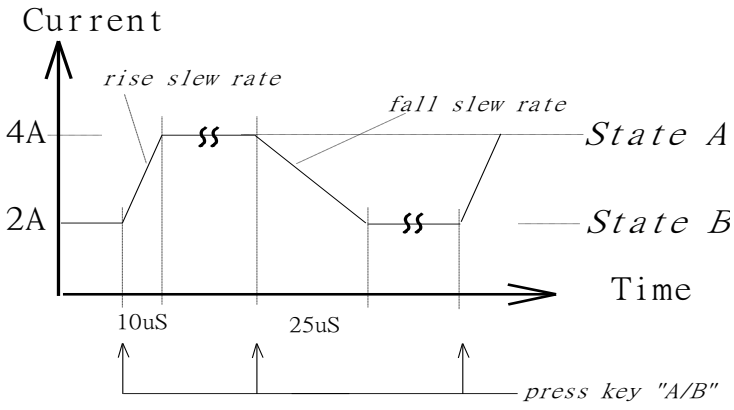
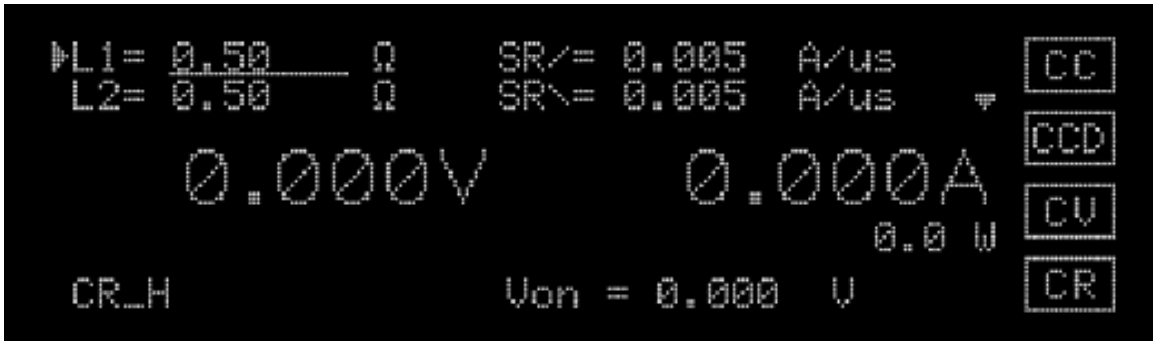


Figure 3-2 Load Level after Pressing A/B Key

3.6.2 Constant Resistance Mode

In CR mode, the Load will sink a resistance by the programmed value regardless of the input voltage. To enter 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 the 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 a low resistance setting. If any value is over the limit of the low range, you must select the middle range. When any value is over the maximum of the middle range, you must select the high range. To change the range, press the RANGE key a few times until the panel range indicator is active at what you select. The mode change will affect the Load, and 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.

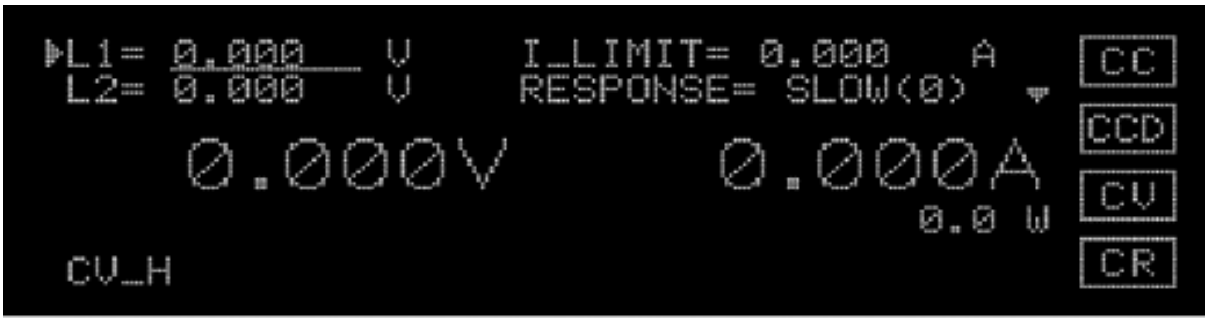
A/B State Switch

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. The slew rate determines the rate at which the Load level changes from one load level state to another.

CAUTION It is suggested to use a remote sensing 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 4 types of response speeds: FAST, NORMAL, SLOW, and UD. In general, the CV mode may be unstable due to impedance mismatch with the electronic load caused by low UUT output capacitance (<300uF), long wiring configuration, UUT output impedance, UUT control, etc. When it occurs, please contact the global distribution and service locations listed on the Chroma website for assistance. 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. The recommended setting is 1.1 times the UUT maximum current.
RESPONSE: Set the Electronic Load response speed to UD, FAST, NORMAL, or SLOW.
I_RANGE: Set the current measurement range of the 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 settings. If any value is over the limit of the low range, you must select the middle range. When any value is over the maximum of the middle range, you must select the high range. To change the range, press the RANGE key a few times until the panel range indicator is active at what you select. The mode change will affect the Load, and 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.

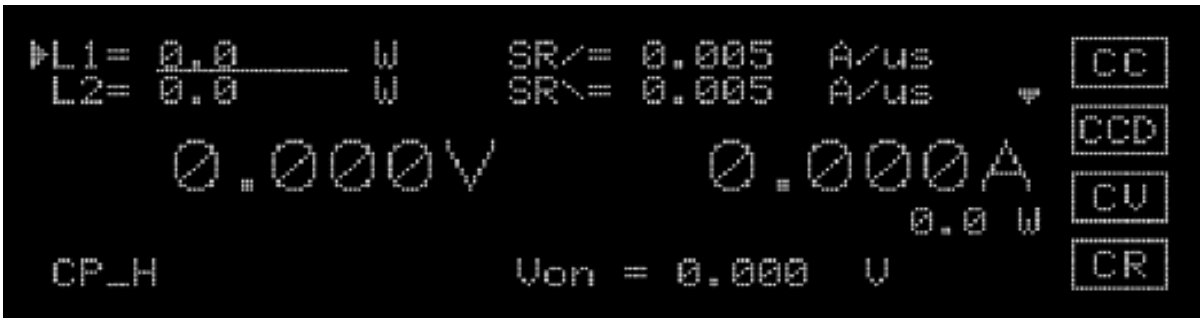
A/B State Switch

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. The slew rate determines the rate at which the Load level changes from one load level state to another.

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

3.6.4 Constant Power Mode

In CP mode, the Load will sink a current by the programmed power. To enter 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 the 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 settings. If any value is over the limit of the low range, you must select the middle range. When any value is over the maximum of the middle range, you must select the high range. To change the range, press the RANGE key a few times until the panel range indicator is active at what you select. The mode change will affect the Load, and 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.

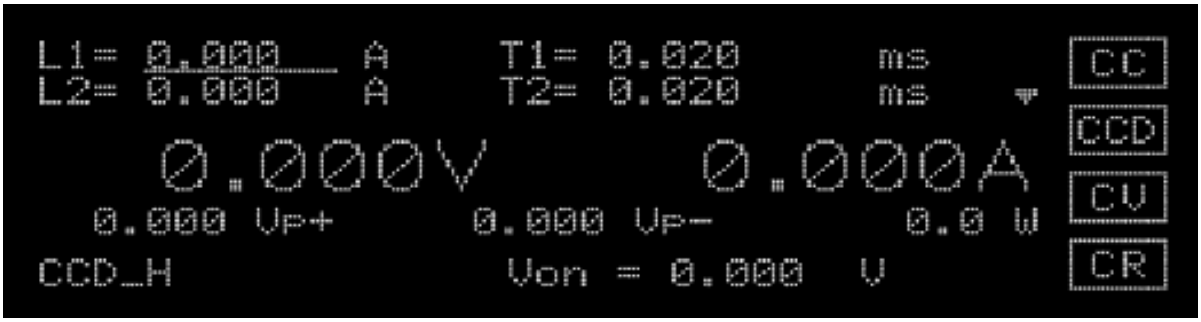
A/B State Switch

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. The slew rate determines the rate at which the Load level changes from one load level state to another.

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

3.6.5 CCD Mode

In CCD mode, the Load will sink a dynamic current by the programmed current and dynamic timing regardless of the input voltage. To enter 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 times to repeat (0=infinite loop).
Vrange: Set the voltage measurement range of the 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 a low current setting. If any value is over the limit of the low range, you must select the middle range. When any value is over the maximum of the middle range, you must select the high range. To change the range, press the RANGE key a few times until the panel range indicator is active at what you select. The mode change will affect the Load, and 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 the 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

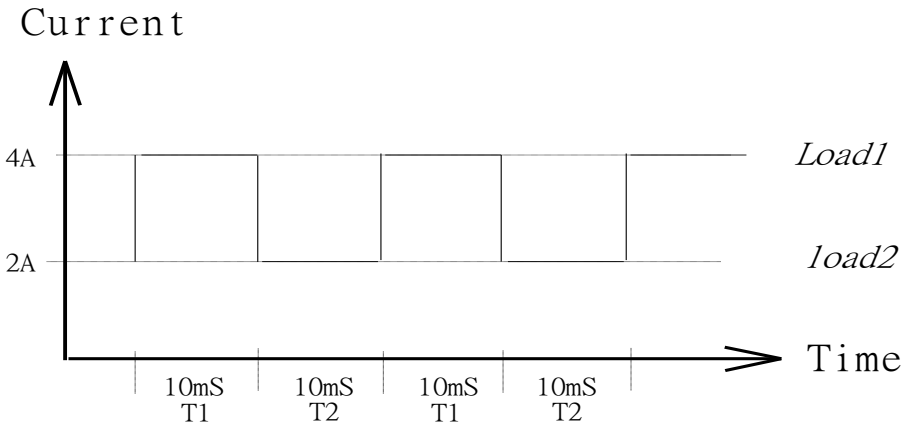


Figure 3-3 Dynamic Current Waveform

3.7 Advance Mode

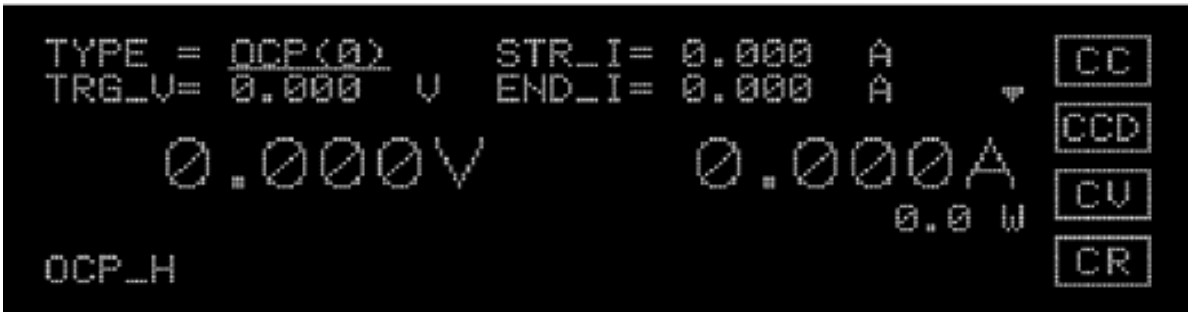
The Electronic Load has useful advanced functions. Press ADVA to enter into the Advance page and use the left/right arrow key to select the desired mode and press Enter.

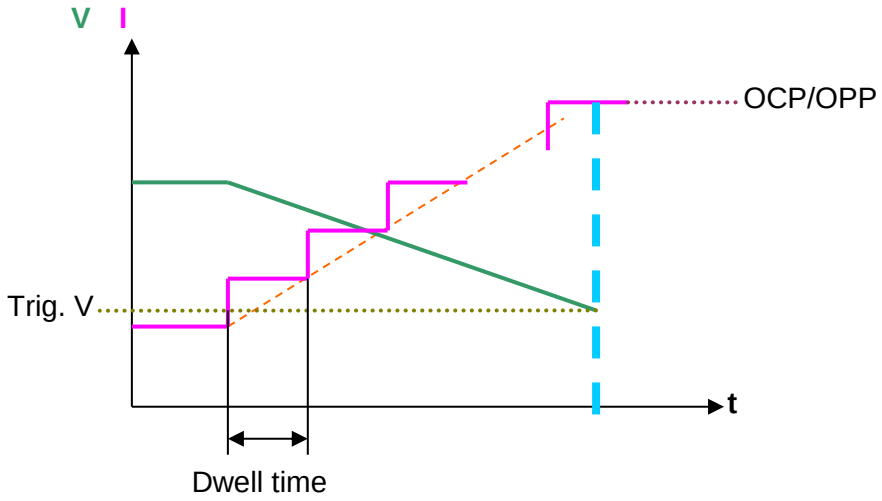
The parameter set in all modes will be rescaled to fit the resolution of that parameter. In local mode, any value can be set by the keypad. When the programmed parameter is over the boundary, the Load will set the maximum or minimum level. In remote mode, the programmed value cannot be over the boundary.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

3.7.1 OCP and OPP

The OCP (or OPP) provides ramped-up current (or power) for the Load to test the UUT voltage whether has reached the 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_V: Set the trigger voltage. When the UUT output voltage is lower than the trigger level, the Load will stop loading current.
STR_I/P: Set the current start level.
EDN_I/P: 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 the start to the end of a set current level. The set range is 10μs to 1,000ms.
SPEC H/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.

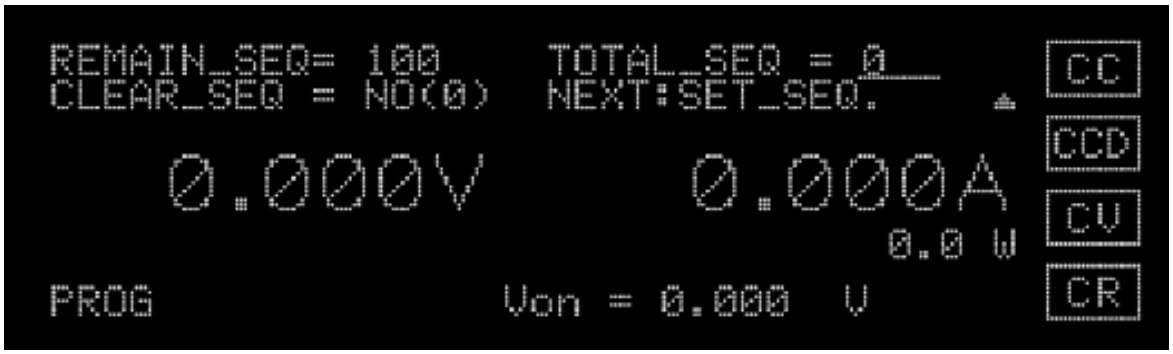
3.7.2 Setting a Program Sequence

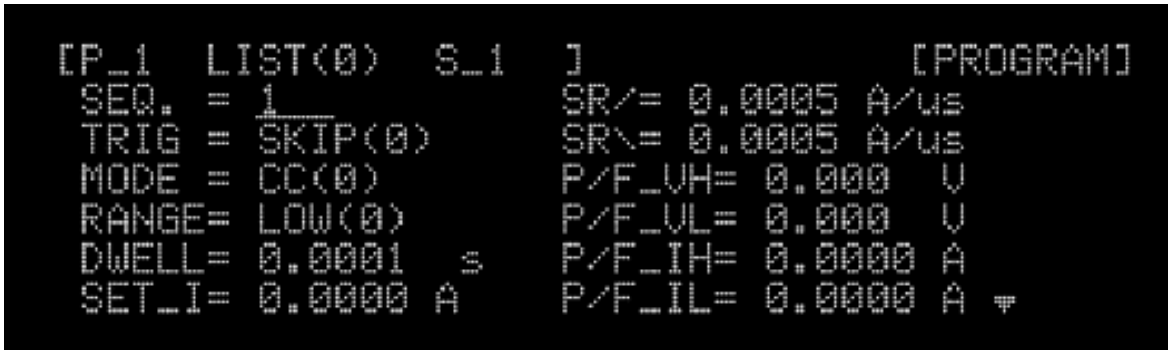
In PROG mode, the user can select the Electronic Load to do basic testing via the programmed sequences. Moreover, different program sequences can be linked for auto execution.

The function of the 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 a total of 255 sequences in program 1. Different sequence combinations 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 program 4 to 10 has 227 sequences left for editing. The user can use the program chain to link programs 1, 2, and 3 to execute the program sequence in 5→8→15, or to link programs 2, 3, and 1 to execute the program sequence in 8→15→5. In other words, the programs can be linked in any way 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 are 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 the 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 the 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 specifications 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 C* for detailed information.

3.7.3 UDW (User Defined Waveform)

The User Defined Waveform can simulate the actual sinking current and capture or edit the current through an oscilloscope. The graphical operating software can easily save the waveform in the internal memory of 63202A-20 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 times to repeat.
INTERP: Set the open linear interpolation.
CHAIN: Set to link other memory.
TRIG: If CHAIN is set to connect to WAVE, this setting defines how to switch between WAVEs. There are SKIP (0), AUTO (1), MANUAL (2), TTL↗ (3), TTL↘ (4), and TTL ↗↘ (5) for setting. The default is AUTO (1). The TTL TRIG setting needs to be controlled through the Digital I/O external signal TRIG_ SEQ.

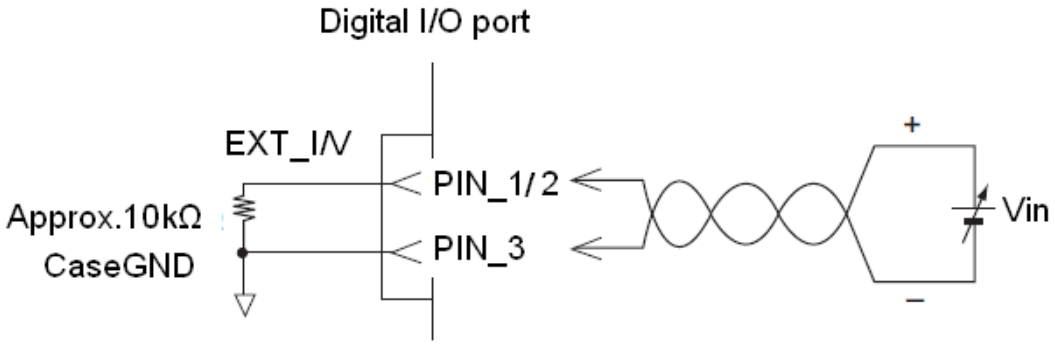
See *Appendix B* for a detailed usage description.

Notice

1. If it is necessary to CHAIN connect each group of WAVEs, the number of REPEATs cannot be set to 0; otherwise, it won't be able to CHAIN the next WAVE.
2. If there is a need to use the external trigger function, you should wait for the value set by the WAVE to complete loading before providing an external trigger signal to switch to the next WAVE.

3.7.4 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 the rear panel. The external signal 0 to 10V maps to the sinking condition from 0 to full scale.



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 limit of the low range, you must select the middle range. When any value is over the maximum of the middle range, you

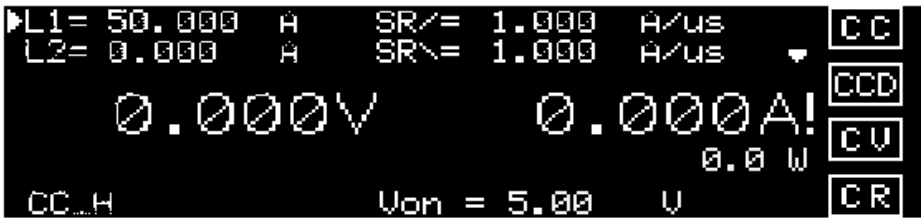
must select the high range. To change the range, press the RANGE key a few times until the panel range indicator is active at what you select. The mode change will affect the Load, and so will the change of range. Both of them will cause the input to go through an off-state. The new setting will change the input immediately at a rate determined by the slew rate setting.

3.7.5 Warnings

Warning	Description
OPP1	The device rated power is 1.03 times over.
OPP3	It is over the user-defined power.
OV1	The voltage range is 1.1 times over.
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. It is 100°C for series models.
OTP2	The temperature difference between internal modules is too big.
REV	The voltage is reversed.
MODULE ERROR	The internal power supply is abnormal or the module is damaged.
FAN ALARM	The fan function is abnormal. This is a warning and the load will not be aborted. Please contact the local service center.
I_SPEC WARNING	The module loading function is abnormal. This is a warning and the loading will not be aborted. Please contact the local service center.

Notice For any doubts regarding the protection message, or if the problem persists and cannot be eliminated, please contact Chroma Electronics Technical Service Center.

When the Electronic Load triggers FAN ALARM or I_SPEC WARNING, an exclamation mark will be displayed after the current measurement value on the panel, as shown in the figure below. The user can use the command "LOAD:WARNing?" to understand the warning items. The warning will disappear after restarting. However, if the problem has not been eliminated, the warning will be triggered again when used.



4. Remote Operation

4.1 Overview

This section describes how to program the 63202A-20 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 63202A-20 Series that are 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 electronic load 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 63202A-20 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. The electronic load 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 a 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, 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 the 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 of 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 (see *Separators and Terminators*).

4.2.4 Arbitrary Block Data Format

The arbitrary block data returned by the query command may be in 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.

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

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

4.3 Language Dictionary

Commands for operating the 63202A-20 Electronic Load remotely are grouped into subsystems. 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 the 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 are enabled by the 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 a 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
63202A-20-2000	Model
63202AS000001	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,63202A-20-2000,63202AS000001,1.00,1.00,1.00

****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 ~ 20, 0: Factory default file, 1~20: 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 ~ 20
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 the 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 the 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 63202A-20 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, OCPL, OCPM, OCPH, PROG, UDWL, UDWM, UDWH, EXTL, EXTM, EXTH, OPPL, OPPM, OPPH

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, OCPL, OCPM, OCPH, PROG, UDWL, UDWM, UDWH, EXTL, EXTM, EXTH, OPPL, OPPM, OPPH
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 the electronic load.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: LOAD:PROTection?
Return Parameter: <NR1>

Bit Position	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Condi-tion	Calibra-tion	OVP3	OTP2	MAX_ LIM	RMT _INH	VCC	FAN	SYNC	OTP	OPP3	OPP2	OPP1	OCP3	OCP2	OCP1	REV	OV2	OV1
Bit Weight	131072	65536	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Query Example: LOAD:PROT?

LOAD:WARNing?

Type: Channel-Specific
Description: This command returns the electronic load status.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: LOAD:WARNing?
Return Parameter: <NR1>

Bit Position	1	0
Condition	Ispec	FAN
Bit Weight	2	1

Query Example: LOAD:WARN?

LOAD:PROTection:CLEar

Type: Channel-Specific
Description: This command resets the status of the 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,63202A-20-2000,63202AS000001,1.00,1.00,1.00

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 the sink current to 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 the sink current to 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 the 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+>, 0.01s ~ 61.00s, Resolution = 10ms, 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:AUTO:ON

Type: Channel-Specific
Description: Set the load module to perform auto load 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 the 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 to 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 the SHORT key function to disable.
CONF:SHOR:KEY 1 Set the 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 DI1 type for 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 DI2 type for 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 DO1 type for 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 DO2 type for 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 the user-defined 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 the user-defined 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 to enable or disable the user-defined OPP function.
Setting Syntax: CONFigure[:PROTection]:OPP<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, DISABLE | 0, ENABLE | 1
Setting Example:
- CONF:OPP DISABLE — Set the user's defined OPP function to DISABLE.
- CONF:OPP 1 — Set the user's defined 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 the user-defined 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 the user-defined 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

CONFigure[:PROTection]:OVP

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

CONFigure[:PROTection]:OVP:POINt

Description: Set the voltage limit for the user-defined OVP function.
Setting Syntax: CONFigure[:PROTection]:OVP:POINt<space><NRf+>[suffix]
Setting Parameter: Refer to respective specification for valid value range.
Setting Example: CONF:OVP:POIN 10 Set the voltage limit to 10V.
CONF:OVP:POIN MAX Set the voltage limit to the maximum value.
CONF:OVP:POIN MIN Set the voltage limit to the minimum value.
Query Syntax: CONFigure[:PROTection]:OVP:POINt?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Volt]
Query Example: CONF:OVP:POIN?
CONF:OVP:POIN? MAX
CONF:OVP:POIN? MIN

CONFigure[:PROTection]:OVP:DELay

Description: Set the delay time for the user-defined OVP function.
Setting Syntax: CONFigure[:PROTection]:OVP:DELay<space><NRf+>[suffix]
Setting Parameter: <NRf+>, 10us ~ 61s, Resolution = 10us, Unit = Second
Setting Example: CONF:OVP:DEL 0.02 Set the delay time = 20ms
CONF:OVP:DEL 20ms Set the delay time = 20ms
CONF:OVP:DEL MAX Set the delay time = max. value
CONF:OVP:DEL MIN Set the delay time = min. value
Query Syntax: CONFigure[:PROTection]:OVP:DELay?[<space><MAX | MIN>]
Return Parameter: <NR2>, [Unit = Second]

Query Example: CONF:OVP:DEL?
CONF:OVP:DEL? MAX
CONF:OVP:DEL? MIN

CONFigure:FAN:MODE

Description: Set the fan control mode.
Setting Syntax: CONFigure:FAN:MODE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, AUTO | 0, QUIET | 1, COOL | 2
Setting Example: CONFigure:FAN:MODE AUTO Set to AUTO mode.
CONFigure:FAN:MODE COOL Set to COOL mode.
Query Syntax: CONFigure:FAN:MODE?
Return Parameter: <CRD>, AUTO, QUIET, COOL
Query Example: CONFigure:FAN:MODE?

CONFigure:CCD:END

Description: Set the end status when CCD mode execution is finished.
Setting Syntax: CONFigure:CCD:END<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, OFF | 0, L1 | 1, L2 | 2, CC | 3
Setting Example: CONFigure:CCD:END OFF Set to LOAD OFF status.
CONFigure:CCD:END CC Set to the loading value executed by CC mode last time.
Query Syntax: CONFigure:CCD:END?
Return Parameter: <CRD>, OFF, L1, L2, CC
Query Example: CONFigure: CCD:END?

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 the 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+>, 10μs ~ 99.999ms, Resolution = 1μs, Unit = Second

Setting Example:	CURR:DYN:T1 10ms	Set the dynamic duration T1 = 10ms.
	CURR:DYN:T1 10	Set the dynamic duration T1 = 10s.
	CURR:DYN:T1 MAX	Set the dynamic duration T1 as the maximum value.
	CURR:DYN:T1 MIN	Set the dynamic duration T1 as the 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+>, 10μs ~ 99.999ms, Resolution = 1μs, Unit = Second

Setting Example: CURR:DYN:T2 10ms — Set the dynamic duration T2 = 10ms.
CURR:DYN:T2 10 — Set the dynamic duration T2 = 10s.
CURR:DYN:T2 MAX — Set the dynamic duration T2 as the maximum value.
CURR:DYN:T2 MIN — Set the dynamic duration T2 as the 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 the falling slew rate to 2.5A/μs.
RES:STAT:FALL 1A/μs — Set the falling slew rate to 1A/μs.
RES:STAT:FALL MAX — Set the falling slew rate to the maximum value of the static load.
RES:STAT:FALL MIN — Set the falling slew rate to the minimum value of the 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 the current range to High.
RES:STAT:IRNG M — Set the current range to Middle.
RES:STAT:IRNG 0 — Set the current range to Low.
Query Syntax: RESistance:STATic:IRNG?
Return Parameter: <CRD>, LOW, MIDDLE, HIGH [Unit = None]
Query Example: RES:STAT: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 the voltage of load L1 as 8V.
VOLT:STAT:L1 24V	Set the voltage of load L1 as 24V.
VOLT:STAT:L1 MAX	Set the voltage of load L1 as the maximum value.
VOLT:STAT:L1 MIN	Set the 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 the voltage of load L2 as 8V.
VOLT:STAT:L2 24V	Set the voltage of load L2 as 24V.
VOLT:STAT:L2 MAX	Set the voltage of load L2 as the maximum value.
VOLT:STAT:L2 MIN	Set the 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:]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 stopped.
-2,-2,-2 denotes OCP test is ready to execute what is waiting for Von or other conditions.
-3,-3,-3 denotes OCP test is executed.
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 the 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 stopped.
-2,-2,-2 denotes OPP test is ready to execute what is waiting for Von or other conditions.
-3,-3,-3 denotes OPP test is executed.
Query Example: OPP:RES?

[ADVance:]USER:WAVeform:NSELect

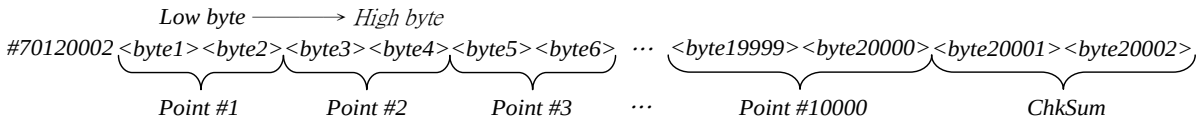
Type: Channel-Specific
Description: Set the active waveform to run for the user-define waveform function.
Setting Syntax: [ADVance:]USER:WAVeform:NSELect<space><NRf+>
Setting Parameter: <NRf+>, 1 ~ 10, Resolution = 1, Unit = None
Setting Example: USER:WAV:NSEL 5 Set active waveform = 5
USER:WAV:NSEL 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 suffixes.)
Setting Syntax: [ADVance:]USER:WAVeform:DATA<space><Arg1>,<Arg2>, <Arg3>,<Arg4>,<Arg5>[,<Arg6>]
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 the waveform:
Arg3: <NR1>, 0 ~ 100000, Resolution = 1, Unit = None.
Set the **chain** parameter of the waveform:
Arg4: <NR1>, 0 ~ 10, Resolution = 1, Unit = None.
Set the **interpolation** function of the waveform:
Arg5: <NRf>, NO | 0, YES | 1, Unit = None.
Set the **trigger source** to execute the next waveform:
Arg6: <NR1>, SKIP | 0, AUTO | 1, MANUAL | 2, EXTERNAL | 3, RISE | 3, FALL | 4, BOTH | 5
Setting Example: USER:WAV:DATA 1,0.001,1,0,YES,4
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: 1,0.00200,2,2,YES,TTL\

[ADVance:]USER:WAVeform:DATA:POINt

Type: Channel-Specific
Description: This command sets the user-define waveform data in binary format. The waveform consists of several points corresponding to sampling points that the user specified in the format of 16 bits 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 < Point#1…Point#n > summary.**

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 "#70120002xxxxxxxxxxxxx…….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 the 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 the waveform data limit
6: ChkSum Error
Query Example: USER:WAV: DATA:STAT?

[ADVance:]USER:WAVeform:EXEcute:STATus?
Type: Channel-Specific
Description: This command returns the status of the 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 the total remaining points.
ADV:USER:WAV:REM? 1 Return waveform #1 remaining 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:]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 the 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 the 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 the 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 the 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 the 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 the 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 the 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 the 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 the 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?

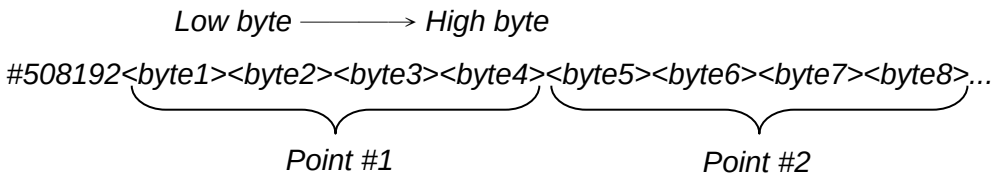
Return Parameter: <CRD>, LOADON, LOADOFF, TTL, BUS, MANUAL
Query Example: DIG:TRIG:SOUR?

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 consists of several points corresponding to sampling points that the user specified in the format of a 32-bit 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 to 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 the 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 the 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 the 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 the end as 8V.
TIM:TRIG:VEND 24V Set the voltage of the end as 24V.
TIM:TRIG:VEND MAX Set the voltage of the end as the maximum value.
TIM:TRIG:VEND MIN Set the voltage of the 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 the 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 the 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 stopped.
-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: Return the results of GO/NG execution.
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: Return the result of the current specification judgment of the GO/NG function.
Query Syntax: SPECification[:PASS]:CURRent?
Query Example: SPEC:CURR?
Return Parameter: <CRD>, IDLE, GO, NG

SPECification[:PASS]:POWer?
Type: Channel-Specific
Description: Return the result of the power specification judgment of the GO/NG function.
Query Syntax: SPECification[:PASS]:POWer?
Query Example: SPEC:POW?
Return Parameter: <CRD>, IDLE, GO, NG

SPECification[:PASS]:VOLTage?
Type: Channel-Specific
Description: Return the result of the voltage specification judgment of the GO/NG function.
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 ignore it.
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 means ignore it.
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 means ignore it.
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 means ignore it.
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 means ignore it.
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 means ignore it.
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 channels 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 means ignore it.
Setting Syntax: SPECification:VOLTage:C<space><NRf+>[suffix]
Parameters: Refer to respective specifications 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 means ignore it.
Setting Syntax: SPECification:VOLTage:H<space><NRf+>[suffix]
Parameters: Refer to respective specifications 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 means ignore it.
Setting Syntax: SPECification:VOLTage:L<space><NRf+>[suffix]
Parameters: Refer to respective specifications 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 the 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 cannot use suffixes.)
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 the program:
Arg3: <NR1>, 0 ~ 10, Resolution = 1, Unit = None.
Set the repeat count of the program:
Arg4: <NR1>, 0 ~ 4,000, Resolution = 1, Unit = None.
Set the sequence number in the 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 the program. (**Note:** All setting parameters in this command cannot use suffixes.)
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 the program. (**Note:** All setting parameters in this command cannot use suffixes.)

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,-1,1

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

PROGram:NSELect

Type: Channel-Specific
Description: Select 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 the 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 sequences in the program file as 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 failure of the sequence in the 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 63202A-20 series 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 63202A-20 series to master for sync. dynamic.
SYNC:TYPE SLAVE Set the 63202A-20 series to slave for sync. dynamic.
SYNC:TYPE NONE Disables the 63202A-20 series 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 the 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 the 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	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Condition	Calibra-tion	OVP3	OTP2	MAX_ LIM	RMT _INH	VCC	FAN	SYNC	OTP	OPP3	OPP2	OPP1	OCP3	OCP2	OCP1	REV	OV2	OV1
Bit Weight	131072	65536	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 the 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 and 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 a 1-to-0 transition in the Condition register and 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 the control of USB and Ethernet. If SYST:REM is programmed, the 63202A-20 series will be set in the REMOTE state, and the front panel of the frame will be disabled except for 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 the control of USB and Ethernet. If SYST:LOC is programmed, the 63202A-20 series will be set in the LOCAL state, and the front panel will work.
Setting Syntax: SYSTem:LOCal
Setting Parameter: None
Setting Example: SYST:LOC

SYSTem:SLEEP:MODE

Type: All Channels
Description: This command enables or disables sleep mode.
Setting Syntax: SYSTem:SLEEP:MODE<space><CRD | NR1>
Setting Parameter: <CRD | NR1>, DISABLE | 0, ENABLE | 1
Setting Example: SYSTem:SLEEP:MODE ENABLE Turns on sleep mode.
SYSTem:SLEEP:MODE DISABLE Turns off sleep mode.
Query Syntax: SYSTem:SLEEP:MODE?
Return Parameter: <CRD>, DISABLE, ENABLE
Query Example: SYSTem:SLEEP:MODE?

SYSTem:SLEEP:TIME

Type: All Channels
Description: This command sets the time to enter into sleep.
Setting Syntax: SYSTem:SLEEP:TIME<space><NR1>
Setting Parameter: <NR1>, 5 ~ 60min, Resolution = 1min, Unit = Minute
Setting Example: SYSTem:SLEEP:TIME 5 Sets to sleep in 5 min.
SYSTem:SLEEP:TIME 60 Sets to sleep in 60 min.
Query Syntax: SYSTem:SLEEP:TIME?
Return Parameter: <NR1>, [Unit = Minute]
Query Example: SYSTem:SLEEP:TIME?

SYSTem:SLEEP:TIME: STATe

Type: All Channels
Description: This command queries the time elapsed since the electronic load entered sleep mode.
Setting Syntax: None
Setting Parameter: None
Setting Example: None
Query Syntax: SYSTem:SLEEP:TIME:STATe<?>
Return Parameter: <NR1>, [Unit = Second]
Query Example: SYSTem:SLEEP:TIME:STATe?

SYSTem:SLEEP:WAKEUP

Type:	All Channels
Description:	This command wakes up a sleeping electronic load.
Setting Syntax:	SYSTem:SLEEP:WAKEUP
Setting Parameter:	None
Setting Example:	SYSTem:SLEEP:WAKEUP
Query Syntax:	None
Return Parameter:	None
Query Example:	None

SYSTem:SLEEP:FORCE

Type:	All Channels
Description:	This command forces the electronic load to sleep regardless if the sleep mode is enabled.
Setting Syntax:	SYSTem:SLEEP:FORCE
Setting Parameter:	None
Setting Example:	SYSTem:SLEEP:FORCE
Query Syntax:	None
Return Parameter:	None
Query Example:	None

5. Status Report

5.1 Introduction

This chapter explains the status data structure of Chroma 63202A-20 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 report 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 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 and Questionable Status allow transitions to be programmed. Other register groups, i.e. Channel Summary and 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.

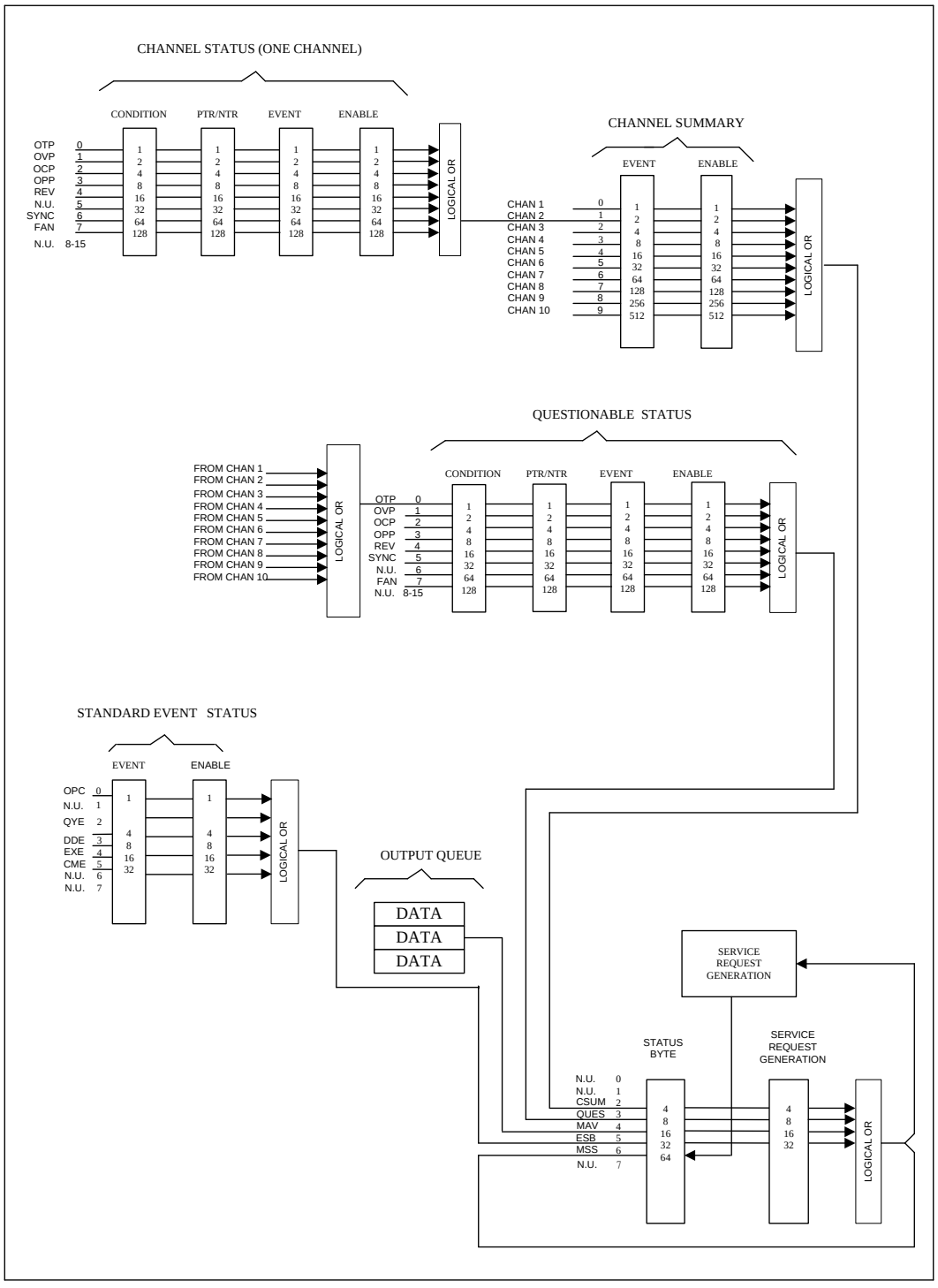


Figure 5-1 Status Registers of Electronic Load

5.2.1 Channel Status

- The Channel Status register informs you of 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 the 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.
OCP3	5	32	User-defined over current protection. 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. 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.
OTP2	15	32768	*Over temperature*. When over temperature condition has occurred on a channel, Bit 15 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.
OVP3	16	65536	User-defined over voltage protection. When an over voltage condition has occurred on a channel, Bit 16 is set and remains set until the over voltage condition is removed and LOAD:PROT:CLE is programmed.
Calibration	17	131072	The electronic load is not calibrated or the calibrated value is wrong. Bit 17 is set and remains set until recalibrated and LOAD:PROT:CLE is programmed.

5.2.2 Channel Summary

- The Channel Summary registers summarize the channel status conditions of 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 are logically ORed to become Bit 2 (CSUM bit) in the Status Byte register.

5.2.3 Questionable Status Register

- The Questionable Status registers inform you of 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 the same as the channel status conditions. Refer to Table 5-1 for a complete description.
- When a corresponding bit of the 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.
OPP1	6	64	Power Error (over power).
OPP2	7	128	Power Error (over power).
OPP3	8	256	User-defined over power protection.
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.
OTP2	15	32768	Over temperature protection between internal modules.
OVP3	16	65536	User-defined over voltage protection.
Calibration	17	131072	Calibrated value error or not calibrated.

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 is data in the queue.

5.2.5 Standard Event Status Register

- 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 the 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 the 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 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 the *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 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 the Chroma 63202A-20 Series. The tests are performed using the 63202A-20 Series models and some required equipment. The required test equipment is listed in Table 6-1. Please refer to the *Performance Tests* section for equipment connection and test procedure. The user can use the verification tables included to check the specification. The performance tests confirm Chroma 63202A-20 Series meets the published specifications. For the detailed info on operation and programming, please see Chapter 3 and Chapter 4.

For any maintenance or repair services, please contact Chroma Sales and Support Offices listed on the website: https://www.chromaate.com/english/contact/default.asp.

6.2 Hardware Requirement

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	40V/375A	Chroma 62150H-40-375 * 6 units
Mainframe		Chroma 63202A-20 Series

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.

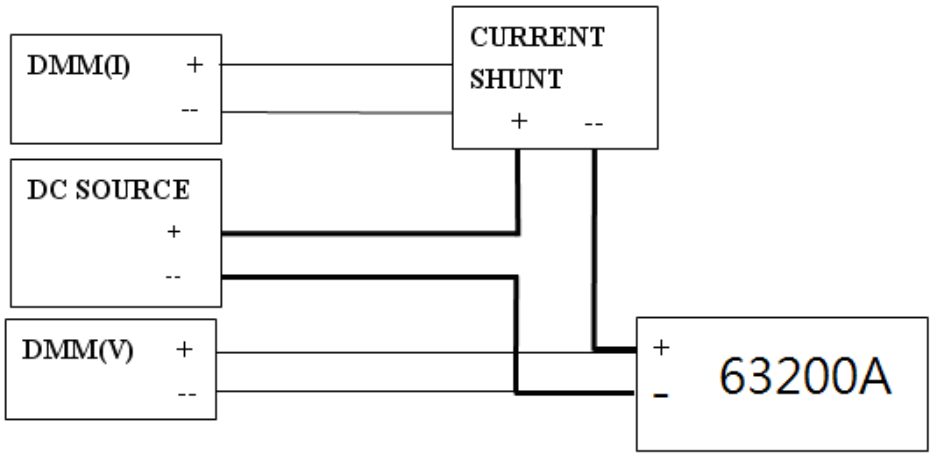


Figure 6-1

6.3 Performance Tests

6.3.1 Current Programming and Measurement Verification

This test verifies if the current programming and measurements are within specifications when operating in CC mode. Each DMM reading and the current displayed on the front panel should be within specification error.

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 the output voltage to 5V. Set the current limit of the 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 the load can be recorded from the current shunt = DMM (I) voltage/current shunt resistor.

Table 6-2

Model	CCH	Shunt Current		DMM Ai Current	Front Panel Display Reading	Front Panel Display Spec.
	Current Setting	Maximum	Minimum			
63202A-20-1000	1000A	1001A	999A			DMM Ai ±1A
	10A	10.505A	9.495A			DMM Ai ±0.505A
63202A-20-2000	2000A	2002A	1998A			DMM Ai ±2A
	20A	21.01A	18.99A			DMM Ai ±1.01A

Checking Medium Current Range

A. After testing 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 the output voltage to 5V. Set the current limit of the DC source larger than the set current in Table 6-3.
D. 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 the load can be recorded from the current shunt = DMM (I) voltage/current shunt resistor.

Table 6-3

Model	CCM	Shunt Current		DMM Ai Current	Front Panel Display Reading	Front Panel Display Spec.
	Current Setting	Maximum	Minimum			
63202A-20-1000	500A	500.5A	499.5A			DMM Ai ±0.5A
	5A	5.2525A	4.7475A			DMM Ai ±0.253A
63202A-20-2000	1000A	1001A	999A			DMM Ai ±1A
	10A	10.505A	9.495A			DMM Ai ±0.505A

Checking Low Current Range

A. After testing 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 the output voltage to 5V. Set the current limit of the DC source larger than the set current in Table 6-4.

D. 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 the load can be recorded from the current shunt = DMM (I) voltage/current shunt resistor.

Table 6-4

Model	CCL	Shunt Current		DMM Ai Current	Front Panel Display Reading	Front Panel Display Spec.
	Current Setting	Maximum	Minimum			
63202A-20-1000	250A	250.25A	249.75A			DMM Ai ±0.25A
	2.5A	2.62625A	2.37375A			DMM Ai ±0.12625A
63202A-20-2000	500A	500.5A	499.5A			DMM Ai ±0.5A
	5A	5.2525A	4.7475A			DMM Ai ±0.2525A

6.3.2 Voltage Measurement Verification

This test verifies if the voltage readings on the front panel display are within specifications when operating in CV mode. Each DMM reading and the voltage displayed on the front panel should be within specification error.

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 in 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 the 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 is outputted and record the voltage measured by DMM (V) and the Load.

Table 6-5

Model	DC Source Output Voltage	DMM V Measurement	Front Panel Display Reading	Front Panel Display Spec.
63202A-20-xxxx	20V			DMM (V)±0.006V
	2V			DMM (V)±0.0033V

Checking Medium Voltage Range

A. After testing 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 is outputted and record the voltage measured by DMM (V) and the Load.

Table 6-6

Model	DC Source Output Voltage	DMM V Measurement	Front Panel Display Reading	Front Panel Display Spec.
63202A-20-xxxx	10V			DMM (V)±0.003V
	1V			DMM (V)±0.00165V

Checking Low Voltage Range

A. After testing 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 is outputted and record the voltage measured by DMM (V) and the Load.

Table 6-7

Model	DC Source Output Voltage	DMM V Measurement	Front Panel Display Reading	Front Panel Display Spec.
63202A-20-xxxx	4V			DMM (V)±0.0012V
	0.4V			DMM (V)±0.00066V

Appendix A Precautions for Loading Battery

Since the battery test is often with high power and voltage, paying more attention to the application safety is necessary.

According to the RMA (Return Merchandise Authorization) data, the damaged part is mostly MOSFET for large power, high voltage Electronic Load to be repaired in general, and the possible cause is overvoltage between the connection of MOSFET and UUT. It may only be just a moment, 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 connecting multiple batteries in series to avoid the transmission loss caused by low voltage high current. As a switch is used directly to connect the battery and the applied object, the study shows it is the main cause of LOAD damage. Figure A-1 shows the wire connection of the 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 burnout as the simulation shows in Figure A-3. 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.

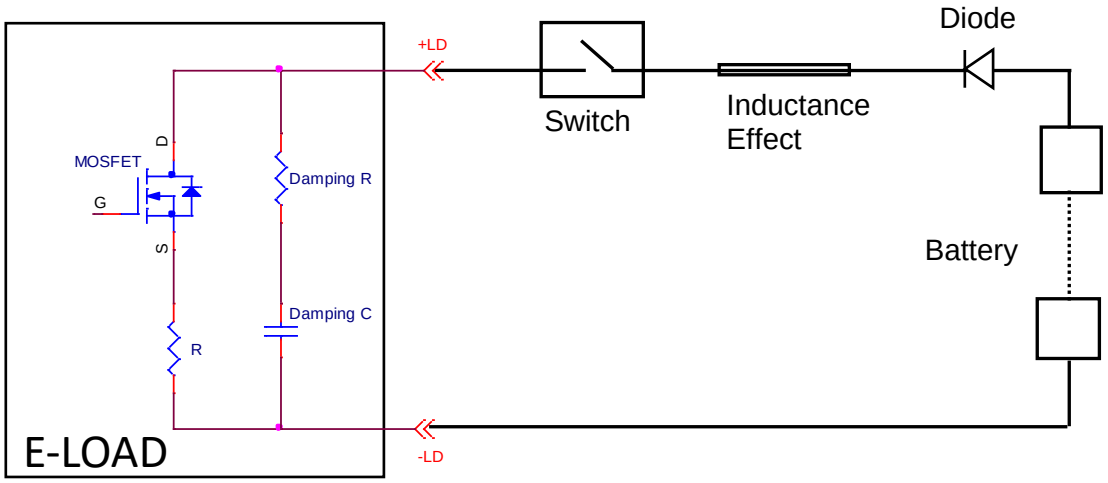


Figure A-1 Wire Connection of Electronic Load and Battery

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

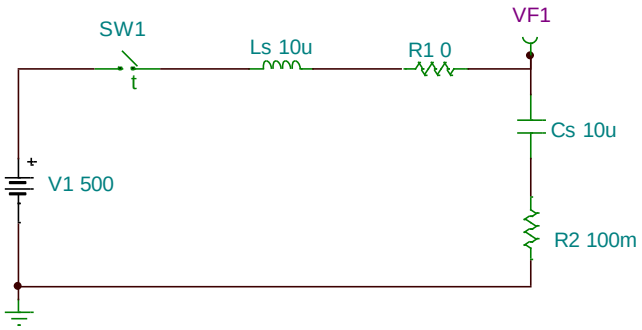


Figure A-2 Simulation Circuit

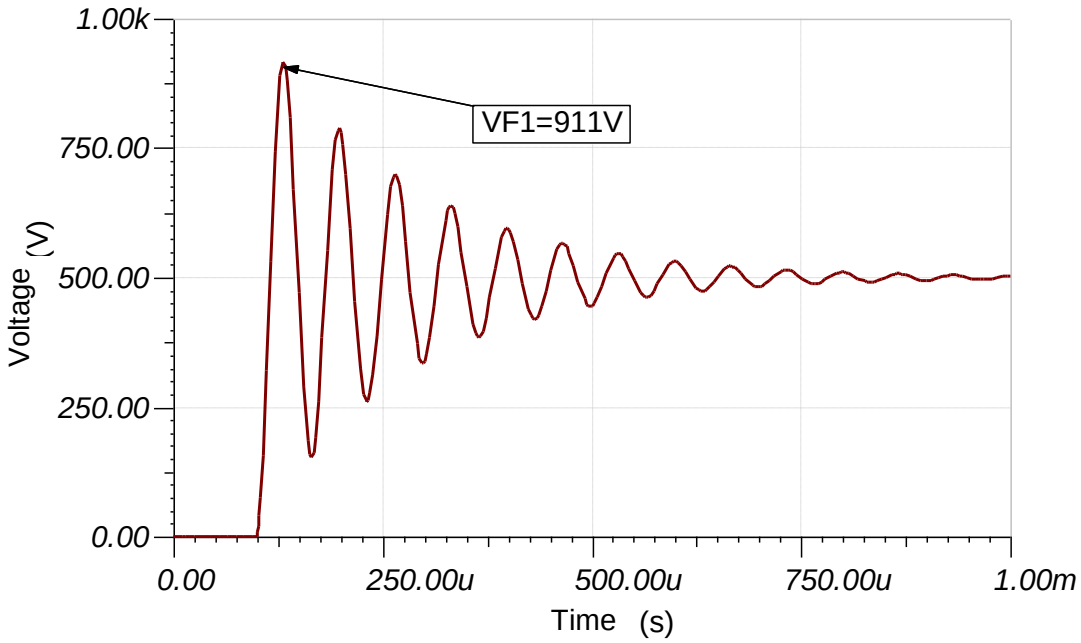


Figure A-3 Simulation of Surge Chart when Switching between Electronic Load and Battery

During the testing procedure if the entire circuit is shorted due to MOSFET breakdown by high voltage and if the energy source is a battery or other source that can provide high power, continuous high current will pass through the 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 an 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 Measure for Improvement

A.1.1 Additional Protection Switch

As the burnout may expand due to the MOSFET damage and continuous energy release from the battery 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.

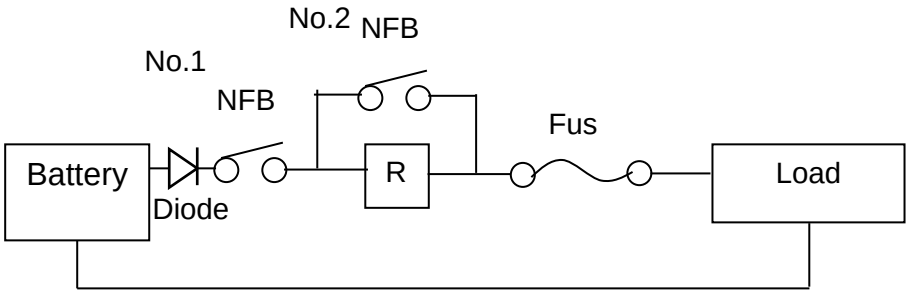


Figure A-4 Wire Connecting Diagram of LOAD and Battery

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

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

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

Note If two or more Electronic Loads are paralleled for a 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 the 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 the 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 cut off from the 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 an NFB of 20A.
- When R is selected, it is suggested to use the resistor of 1W, 100kΩ

- When the Fuse is selected, it has to be larger than the loading discharge current. In this case, the discharge current is 6.6A; therefore, it should use a fuse of 10A.

Appendix B Using UDW Mode

1. Download the Translator tool.

   Contact the Chroma Global Sales Agency listed in the following URL to get the tool.
   http://oss.chromaate.com/extensions/dc_load_translator.html

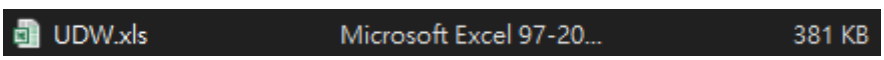
2. Before using the Translator tool, it needs to install the LabVIEW Runtime Engine first. The mapped OS version is shown in the figure below.

LabVIEW Version	Microsoft Windows OS Version							
	2000	XP (X86)	XP (X86) (SP3)	Vista	Windows 7	Windows 8*	Windows 8.1	Windows 10
2009	■	■	■	■				
2009 SP1	■	■	■	■	■			
2010		■	■	■	■			
2010 SP2		■	■	■	■			
2011		■	■	■	■			
2011 SP1		■	■	■	■			
2012		■	■	■	■			
2012 SP1			■	■	■	■		
2013			■	■	■	■		
2013 SP1			■	■	■	■	■	
2014			■	■	■	■	■	
2015			■	■	■	■	■	■
2015 SP1			■	■	■	■	■	■
2016					■	■	■	■
2017					■	■	■	■

■ Compatible Version

3. Decompress 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.

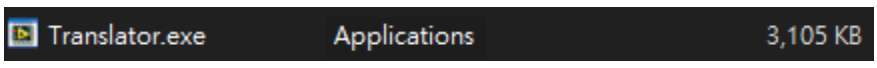
WAVE: WAVE 1 maps to Waveform 1; WAVE 2 maps to Waveform 2. 10 waveforms are available for setting.
INTERV: Set the interval for update.
REPEAT: Set the number of times to repeat.
INTERP: Set the open linear interpolation.
CHAIN: Set to link other memory. If REPEAT is set to 0, only the current WAVE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

If Start is set to 11, the current is compiled from A11. When the length is set to 100, the current is compiled from A11~A110 boxed in red for 100 compiling points.

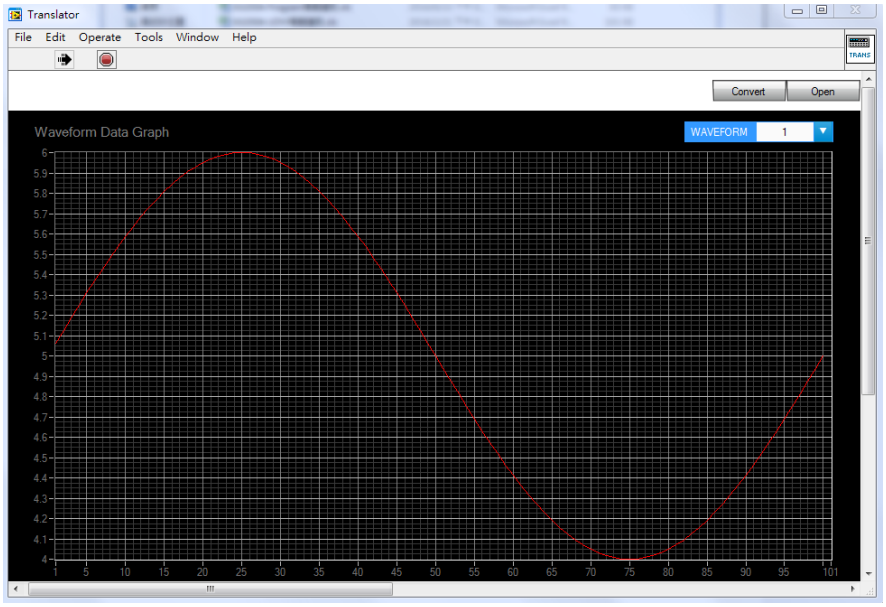
	A	B	C	D	E
1	Waveform:	1			
2	Interval:	0.1	sec	Resolution: 0.00001sec	
3	Repeat:	1			
4	Interpolation:	NO			
5	Chain:	0			
6					
7	Start	11			
8	Length	100			
9					
10	Waveform Data	Unit: Amp.			
11	5.06				
12	5.16				
13	5.20				
14	5.28				
15	5.35				
16	5.42				
17	5.49				
18	5.56				
19	5.63				
20	5.70				
21	5.77				
22	5.84				
23	5.91				
24	5.98				

UDW1 UDW2 UDW3 UDW4 UDW5 UDW6 UDW7 UDW8 UDW9 UDW10

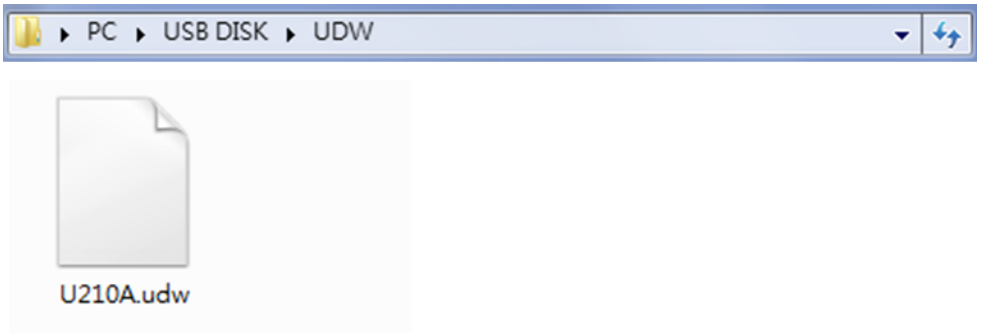
5. Execute the Translator.



Open a user-defined waveform Excel file.

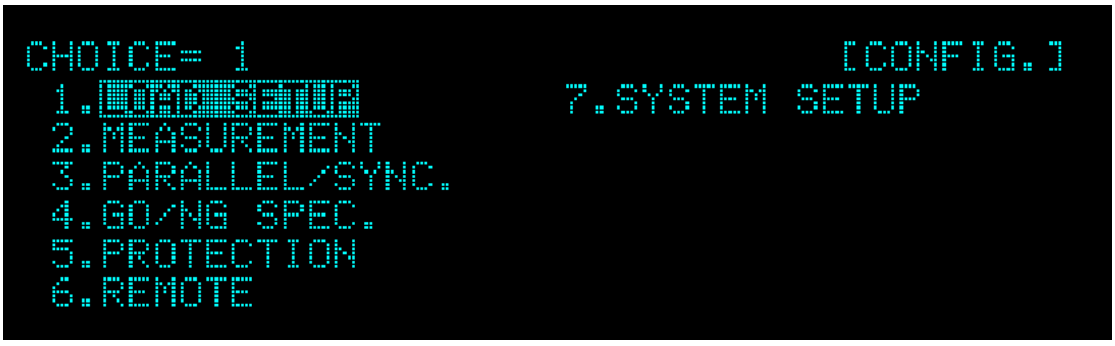


Click Convert to export the udw file. The naming of an udw file must be 8 (or fewer) English letters or digits. Add a folder named “UDW” in the flash drive and save the file in it.



6. Insert the flash drive into the Electronic Load.

Press CONFIG→SYSTEM SETUP.



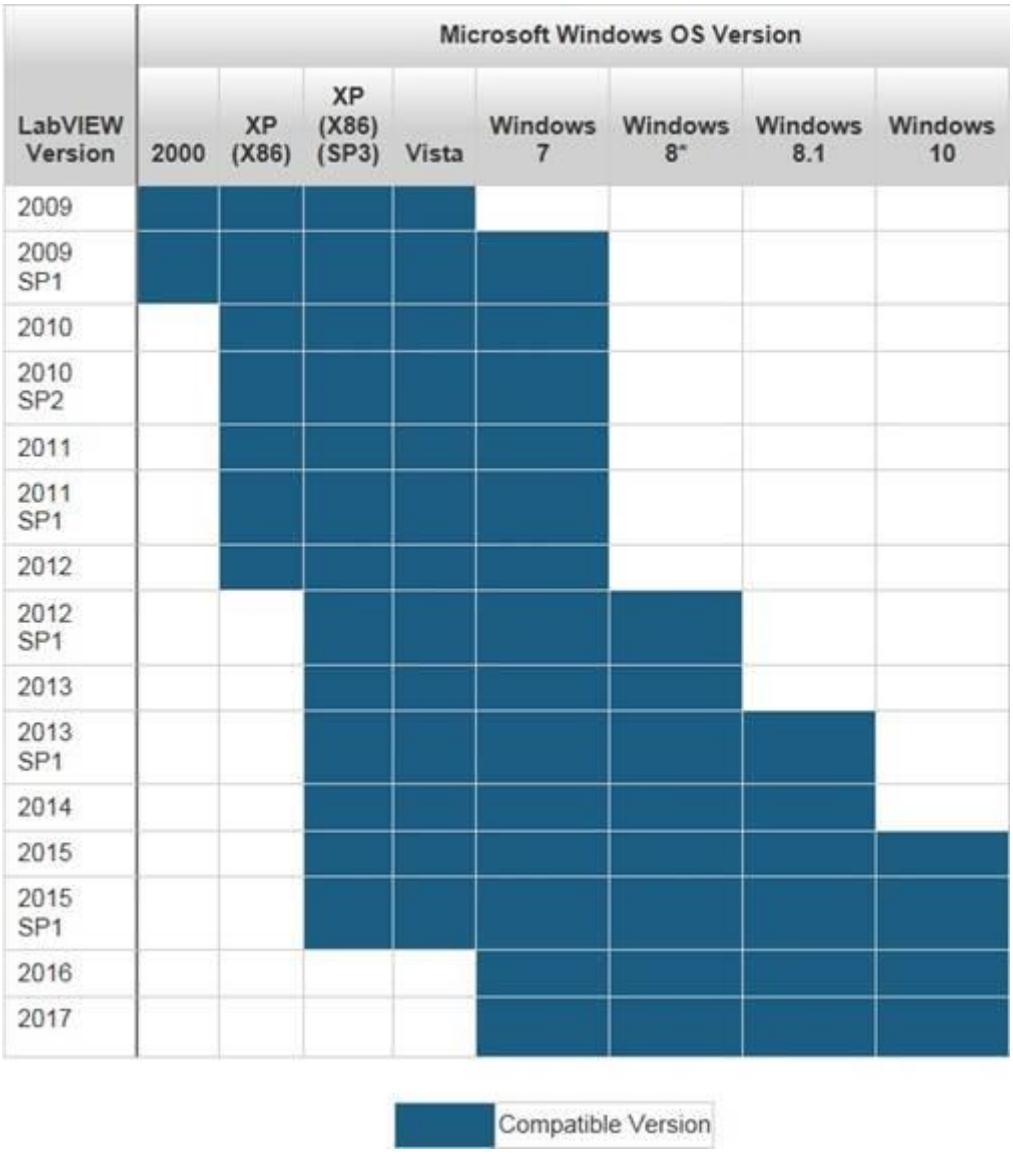
Press FRONT USB SETUP→ IMPORT FILE→ UDW FILE → select the desired udw file→ ENTER, and the setting is done for testing.

Appendix C Using Program Mode

1. Download the Translator tool.

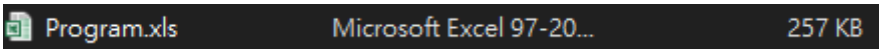
   Contact the Chroma Global Sales Agency listed in the following URL to get the tool.
   http://oss.chromaate.com/extensions/dc_load_translator.html

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



3. Decompress the Translator tool.

4. Edit the Excel file and save it.



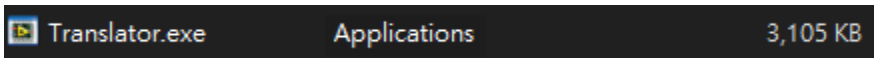
There is no restriction for Excel file naming; however, the tab naming must be started with Program.

PROG: Set the program no. → 10 programs (1-10) in total and a maximum of 255 programs are available for setting.
PROG 1 maps to the Program1 tab.

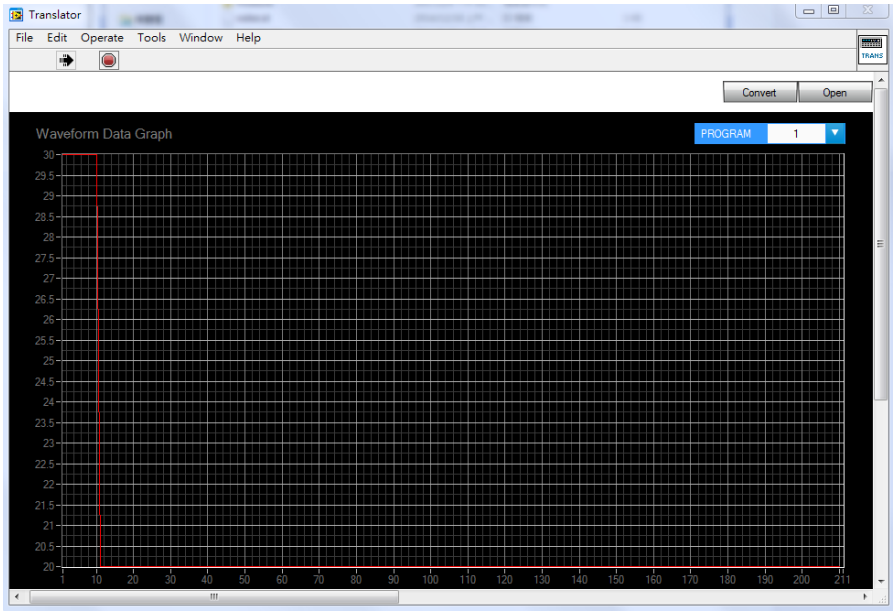
	A	B	C	D	E	F	G	H
1	Total Sequence:			3				
2	Selecte List or Step:			LIST				
3	Repeat:			1				
4	Chain Program:			2				
5								
6	STEP							
7	Type	Mode	Range	Dwell Time (second)	Start Loading (A/Ω/V/W)	End Loading (A/Ω/V/W)	SR↗ (A/μs)	SR↘ (A/μs)
8	SKIP	CC	HIGH	0.001	0	100	5	5
9								
10								
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

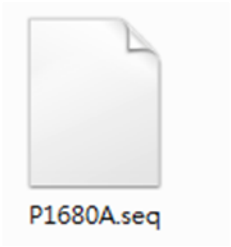
5. Execute the Translator.



Open a user-defined waveform Excel file.

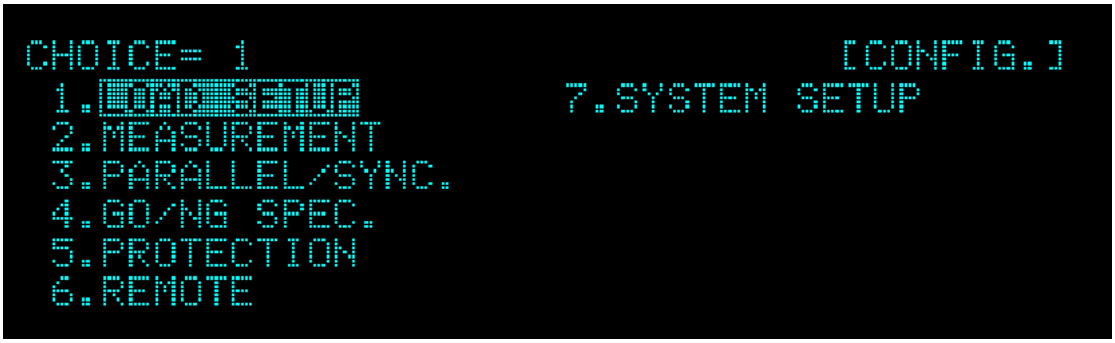


Click Convert to export the udw file. The naming of an udw file must be 8 (or fewer) English letters or digits. Add a folder named “PROG” in the flash drive and save the file in it.



6. Insert the flash drive into the Electronic Load.

Press CONFIG→SYSTEM SETUP.

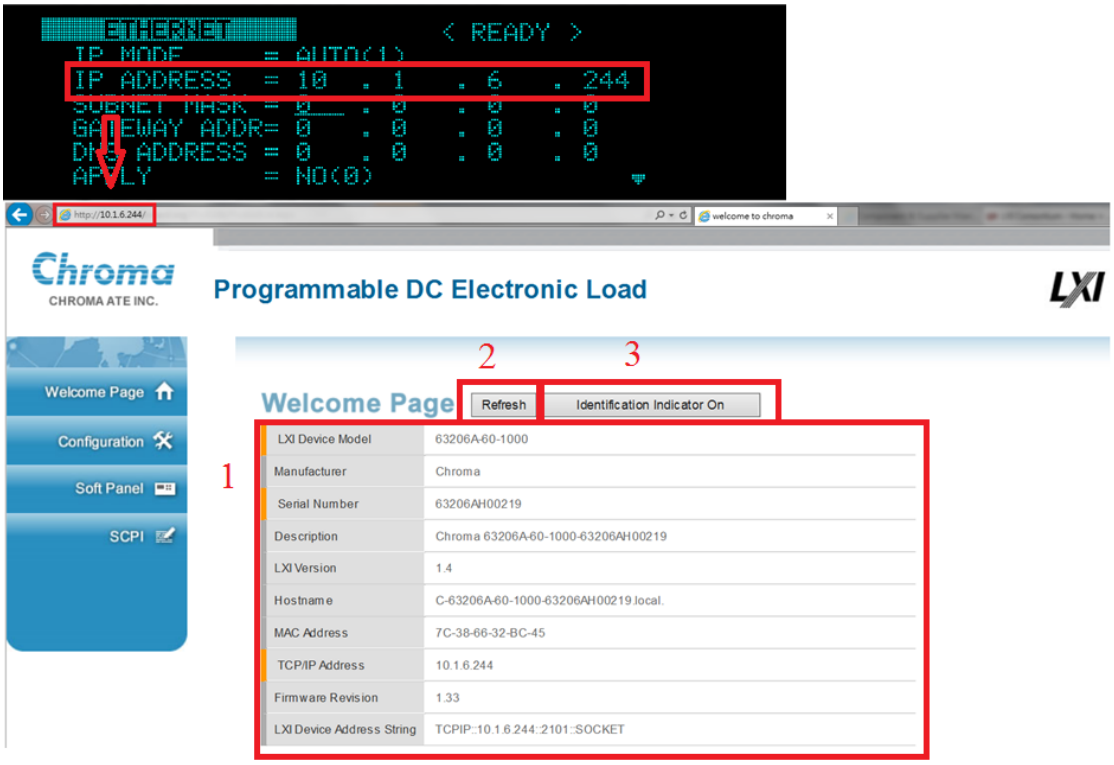


Press FRONT USB SETUP→ IMPORT FILE→ PROGRAM FILE→ select the desired sequence file→ ENTER and the setting is done for testing.

Appendix D Using LXI

Key in the IP address of the Electronic Load to the network address column, and an LXI welcome page will prompt as shown below.

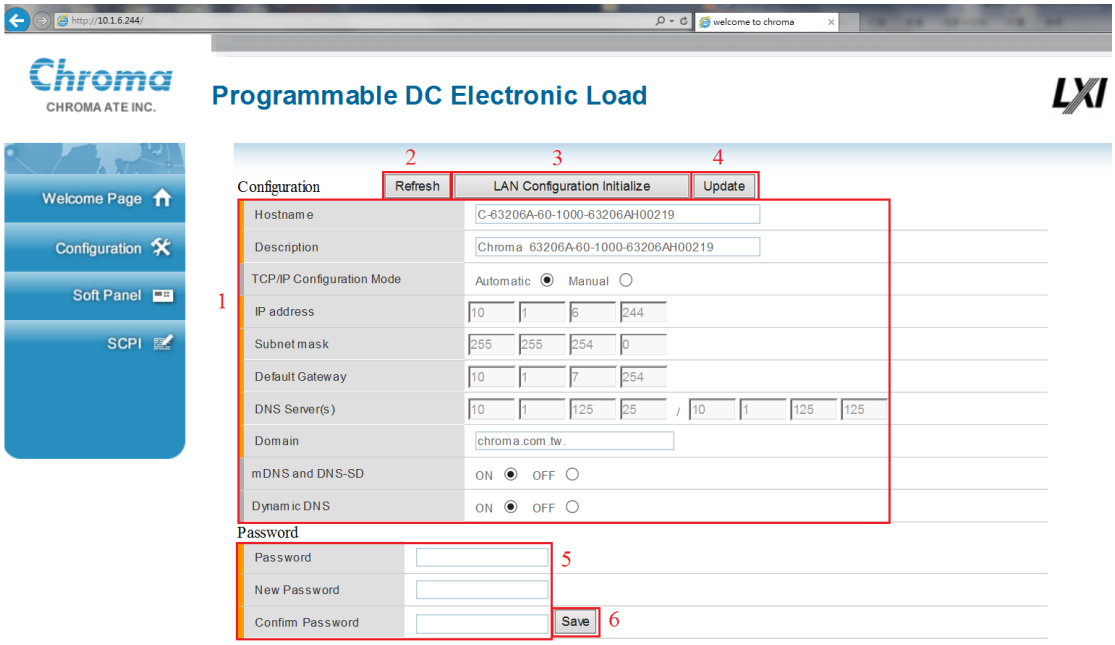
1. Welcome Page



When on the Welcome Page, it will automatically read the related info.

1. The message area displays associate information of the Electronic Load.
2. The Refresh button refreshes the welcome page by rereading the related info.
3. The Identification Indicator On/Off button is used for device identification. Clicking On to enable the identification indicator (shows ID INDICATOR), and clicking Off to disable it.

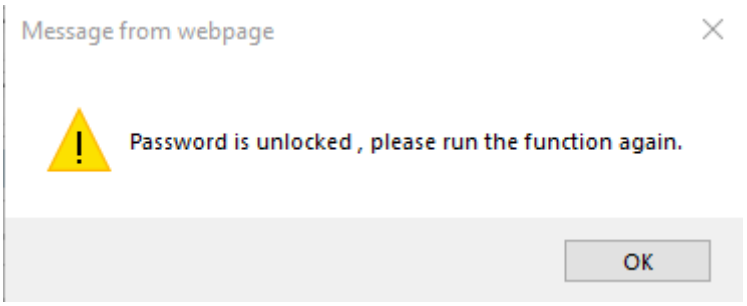
2. Configuration



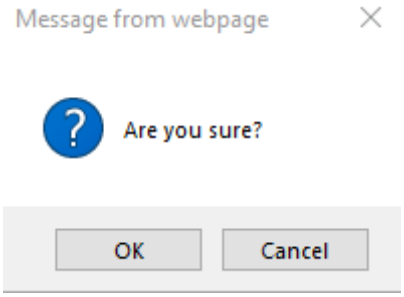
When on the Configuration page, it will automatically read the settings of the present network configuration.

1. The message area displays the network configuration and can edit the parameters including IP address, Subnet mask, Default Gateway, and DNS Server(s) based on the setting of TCP/IP Configuration Mode. It is editable if set to Manual and not editable if set the Automatic.
2. The Refresh button refreshes the page by rereading the related info.
3. The LAN Configuration Initialize button is used to initialize the network. Initialization will not utilize the settings in the message area but reset to the factory default. It requires password confirmation before executing this function. (There is no need to do any confirmation if the system has no password.)

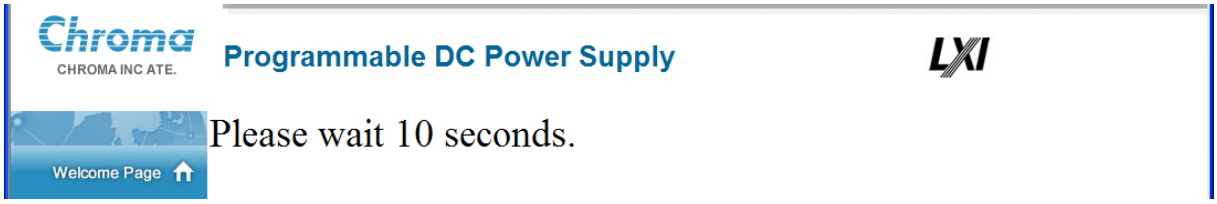
   When the password is entered correctly, a message dialog box will appear as shown below.

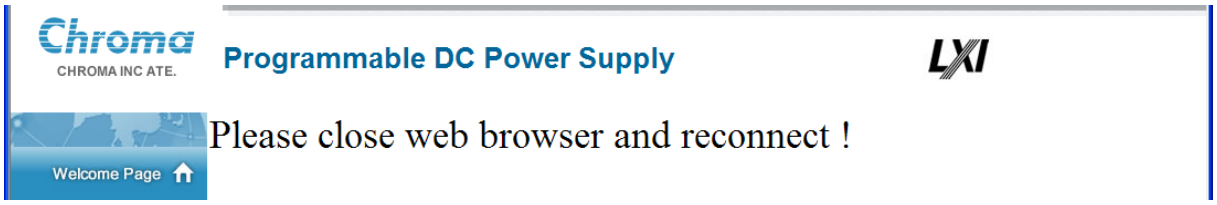


   Click OK and LAN Configuration Initialize again, it will appear a confirmation dialog box. Click OK to start initialization.



A waiting message will appear during initialization. Please follow the instructions to wait for 10 seconds, and then close the browser and reconnect.



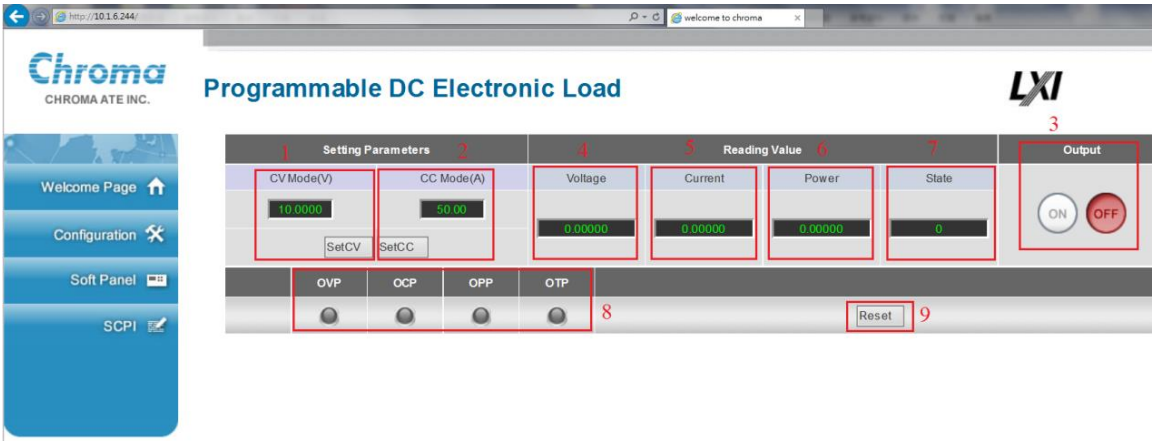


Note : When the initialization is completed, the system password will be set to blank.

4. The function of the Update button (password required) is similar to LAN Configuration Initialize. The difference is that Update will utilize the settings in the message area to reset the network configuration.
5. The password area is used to show the required info for password change:
   a. Password
   b. New Password
   c. Confirm Password

   The password can be 0 ~ 8 characters (password can be empty) with contents to number 0 ~ 9, English letters uppercase A ~ Z or lowercase a ~ z. The system default password is blank.
6. The Save button saves the changed password.

3. Soft Panel



Soft Panel is used to simulate the function of the device panel. If there is a system password, a password window will appear when it is clicked. Enter the correct password, and click it again to enable the function.

Setting Parameters:

1. Voltage: Invalid at present.
2. Current: Set the CC current.
3. Output Mode: Set the Electronic Load on or off.

Item 2 will automatically read the current settings on the device every time entering the Soft Panel page.

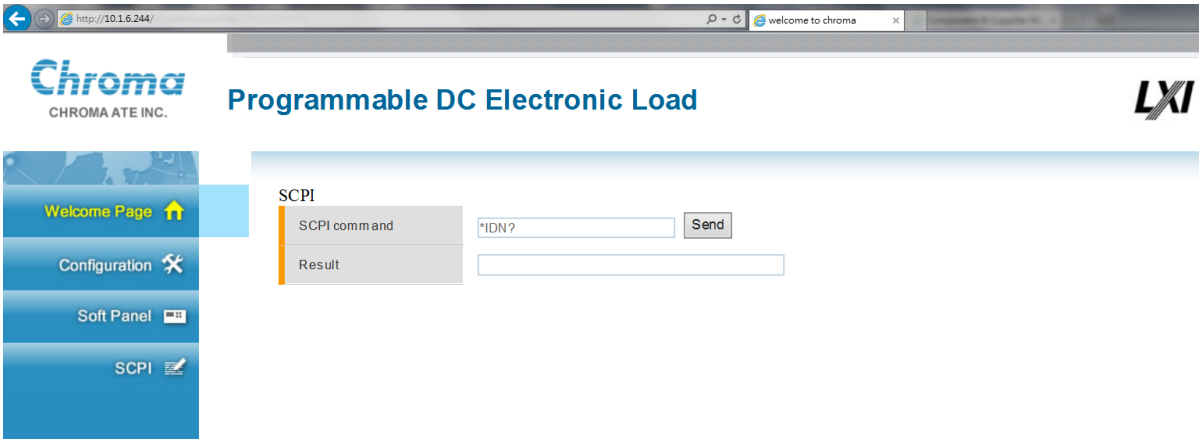
Reading Value:

4. Voltage: Read the device output voltage.
5. Current: Read the device output current.
6. Power: Read the device output power.
7. State: Invalid at present.

Items 4, 5, and 6 will automatically update the value of device output every second.

8. Warning light: If an error occurs, the related warning light will be lit.
9. Reset: It clears the warning light.

4. SCPI



The SCPI is used to send a command string to the device and activate the corresponding function. For related commands, please refer to the device manual.

1. SCPI command: Command string input area.
2. Send (password required): Sends the command string to the device and activates the corresponding function.
3. Result: Display area for the returned message. If the command sent to the device has a corresponding return value, it will be displayed here.

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