JT632xA Series Programmable Electronic Load Users' Manual

JT6321A/JT6322A/JT6323A/

JT6324A/JT6325A/JT6326A

Edition：V2.8

Chapter One: Introduction

JT632xA series electronic load is functioned with 500KHz high-speed synchronous sampling, DSP technology, powerful transient test and multi-aspect intelligence analysis. All these four functions are fully integrated into automatic test function, which makes JT632xA series electronic load very suitable for testing power supply when produced in large quantity. Besides, JT632xA series electronic load also possesses the features of current rising slew rate programmable, high-speed dynamic loading and programmable list function, which makes JT632xA series electronic load satisfying most of R&D requirements. Moreover, JT632xA series load's synchronous control function can satisfy the synchronous loading requirements of multi-output power supply and satisfy single-output power supply requirement for big power.

Features:

★ Max. power: 300W; Max. current: 60A； Max. voltage: 500V.
★ Support up to 16 loads synchronous loading & dynamic test, fit for testing multi-output power supply.
★ Support up to 16 loads parallel mode for high power.
★ 500KHz synchronous sampling with 10Hz，10uA，0.1mV stable resolution.
★ Support the measurement of ripple voltage/current (Vpp/Ipp), peak voltage/current (Vp+/Ip+) and valley voltage/current (Vp-/Ip-).
★ The current rising and falling slew rate are both programmable.
★ Support CC, CV, CP & CR mode.
★ Support accurately simulating LED electronic load loading.
★ Support CP & CR mode when in CV/CC source and support CV/CC source detecting and matching when in CR mode.
★ Support up to 50KHz dynamic loading mode and peak voltage (Vp+) and valley voltage (Vp-) measurement.
★ Support over current protection test (OCP) and maximum power point capture (Pmax).
★ Support load effect measurement.
★ Support high-speed dynamic frequency sweep function.
★ Support timing measurement.
★ Support over voltage protection test (OVP).
★ Built-in waveform generator. In list mode, different waveforms can be simulated.
★ Support short-circuit analog function.
★ Support automatic test (A-test) alone.
★ Support battery resistance and battery capacity test.
★ Support remote sensing.
★ Support Von and Voff function.
★ Shortcut supports 20 groups of data storage and read.
★ High-luminance & full view graphic dot matrix screen.
★ Over current, over voltage, over power, over temperature, polarity reversed protection
★ Intelligent fan system. Fan will be automatically initiated according to the temperature.
★ Support external trigger input and output.
★ Standard RS232 interface.
★ Support current waveform output monitoring.
★ Standard SCPI protocol.

Chapter Two: Technical Data

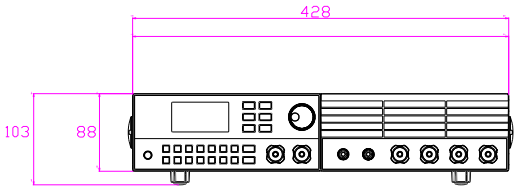
2.1. Technical Data

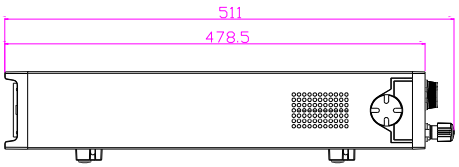
Model		JT6321A		JT6322A	
Input Rating	Power	600W		1200W	
	Voltage	0~15V	0~150V	0~15V	0~150V
	Current	0~12A	0~120A	0~24A	0~240A
	Min. operating voltage	1.4V@120A		1.4V@240A	
CC Mode	Range	0~12A	0~120A	0~24A	0~240A
	Resolution	0.2mA	2mA	0.5mA	5mA
	Accuracy	0.03%+0.05%FS			
CV Mode	Range	0~15V	0~150V	0~15V	0~150V
	Resolution	0.2mV	2mV	0.2mV	2mV
	Accuracy	0.03%+0.03%FS			
CP Mode	Range	600W		1200W	
	Resolution	16Bits			
	Accuracy	0.1%+0.1%FS			
CR Mode	Range	0.012Ω~50KΩ		0.006Ω~25KΩ	
	Resolution	16Bits			
	Accuracy	(0.1+0.04R)%		(0.1+0.08R)%	
LED Mode	Bandwidth	100kHz 以上			
	Rd Coefficient	0.001~1			
Dynamic Operation Mode	Range	10uS~50S			
	Resolution	2uS			
	Accuracy	1uS+20PPM			
	Slew rate	2.4A/mS~4.8A/uS		4.8A/mS~9.6A/uS	
Voltage Meas.	Range	0~15V	0~150V	0~15V	0~150V
	Resolution	0.1mV	1mV	0.1mV	1mV
	Accuracy	0.02%+0.03%FS			
Current Meas.	Range	0~12A	0~120A	0~24A	0~240A
	Resolution	0.1mA	1mA	0.1mA	1mA
	Accuracy	0.03%+0.05%FS			
Ripple Meas.	Range	0~15V	0~150V	0~15V	0~150V
	Bandwidth	10Hz~100kHz			
	Resolution	1mV	10mV	1mV	10mV

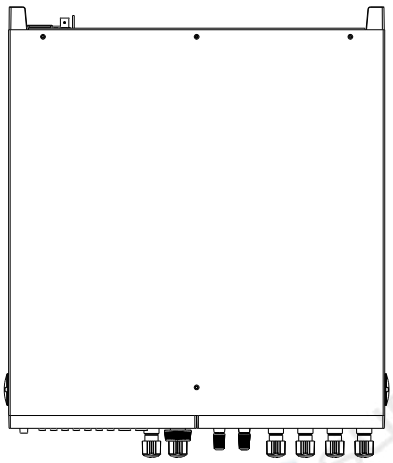
Model		JT6323A		JT6324A	
Input Rating	Power	600W		1200W	
	Voltage	0~50V	0~500V	0~50V	0~500V
	Current	0~6A	0~60A	0~12A	0~120A
	Min. operating voltage	2.8V@60A		2.8V@120A	
CC Mode	Range	0~6A	0~60A	0~12A	0~120A
	Resolution	0.1mA	1mA	0.2mA	2mA
	Accuracy	0.03%+0.05%FS			
CV Mode	Range	0~50V	0~500V	0~50V	0~500V
	Resolution	0.5mV	5mV	0.5mV	5mV
	Accuracy	0.03%+0.03%FS			
CP Mode	Range	600W		1200W	
	Resolution	16Bits			
	Accuracy	0.1%+0.1%FS			
CR Mode	Range	0.047Ω~50KΩ		0.024Ω~25KΩ	
	Resolution	16Bits			
	Accuracy	(0.1+0.02R)%		(0.1+0.04R)%	
LED Mode	Bandwidth	100kHz 以上			
	Rd Coefficient	0.001~1			
Dynamic Operation Mode	Range	10uS~50S			
	Resolution	2uS			
	Accuracy	1uS+20PPM			
	Slew rate	1.2A/mS~2.4A/uS		2.4A/mS~4.8A/uS	
Voltage Meas.	Range	0~50V	0~500V	0~50V	0~500V
	Resolution	0.1mV	1mV	0.1mV	1mV
	Accuracy	0.02%+0.03%FS			
Current Meas.	Range	0~6A	0~60A	0~12A	0~120A
	Resolution	0.01mA	0.1mA	0.1mA	1mA
	Accuracy	0.03%+0.05%FS			
Ripple Meas.	Range	0~50V	0~500V	0~50V	0~500V
	Bandwidth	10Hz~100kHz			
	Resolution	1mV	10mV	1mV	10mV

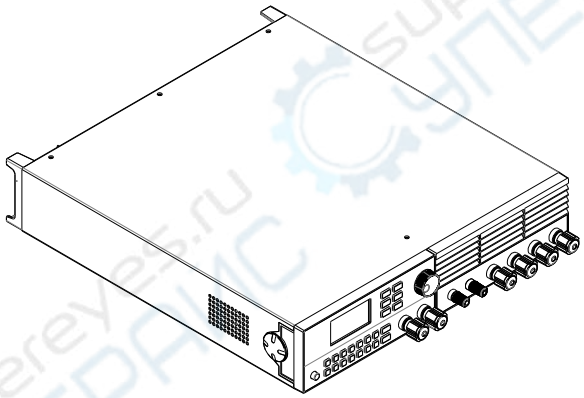
Model		JT6325A		JT6326A	
Input Rating	Power	1500W		1500W	
	Voltage	0~50V	0~500V	0~15V	0~150V
	Current	0~12A	0~120A	0~24A	0~240A
	Min. operating voltage	2.8V@120A		1.4V@240A	
CC Mode	Range	0~12A	0~120A	0~24A	0~240A
	Resolution	0.2mA	2mA	0.5mA	5mA
	Accuracy	0.03%+0.05%FS			
CV Mode	Range	0~50V	0~500V	0~15V	0~150V
	Resolution	0.5mV	5mV	0.2mV	2mV
	Accuracy	0.03%+0.03%FS			
CP Mode	Range	1500W		1500W	
	Resolution	16Bits			
	Accuracy	0.1%+0.1%FS			
CR Mode	Range	0.024Ω~50KΩ		0.006Ω~25KΩ	
	Resolution	16Bits			
	Accuracy	(0.1+0.04R)%		(0.1+0.08R)%	
LED Mode	Bandwidth	100kHz 以上			
	Rd Coefficient	0.001~1			
Dynamic Operation Mode	Range	10uS~50S			
	Resolution	2uS			
	Accuracy	1uS+20PPM			
	Slew rate	1.2A/mS~2.4A/uS		2.4A/mS~4.8A/uS	
Voltage Meas.	Range	0~50V	0~500V	0~15V	0~150V
	Resolution	0.1mV	1mV	0.1mV	1mV
	Accuracy	0.02%+0.03%FS			
Current Meas.	Range	0~12A	0~120A	0~24A	0~240A
	Resolution	0.2mA	2mA	0.1mA	1mA
	Accuracy	0.03%+0.05%FS			
Ripple Meas.	Range	0~50V	0~500V	0~15V	0~150V
	Bandwidth	10Hz~100kHz			
	Resolution	1mV	10mV	1mV	10mV

2.2. Installation Dimension









2.3. Additional Characteristics

AC power input range (which can be selected by selector switch at the back panel)：

(1) AC220V ±10% 50Hz/60Hz (2) AC110V ±10% 50Hz/60Hz

Heat release method： Forced air cooling

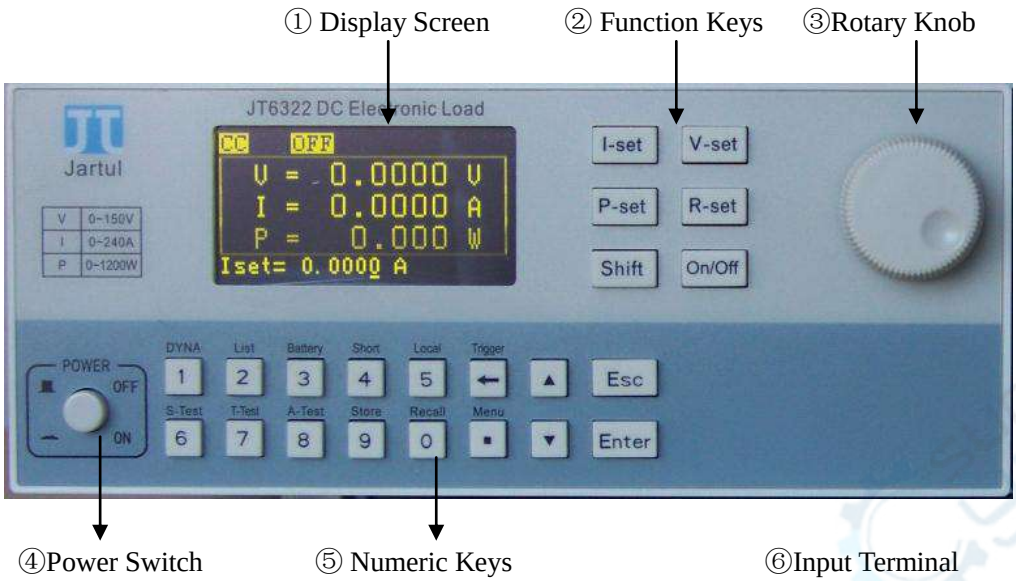
Working temperature： 0~40℃

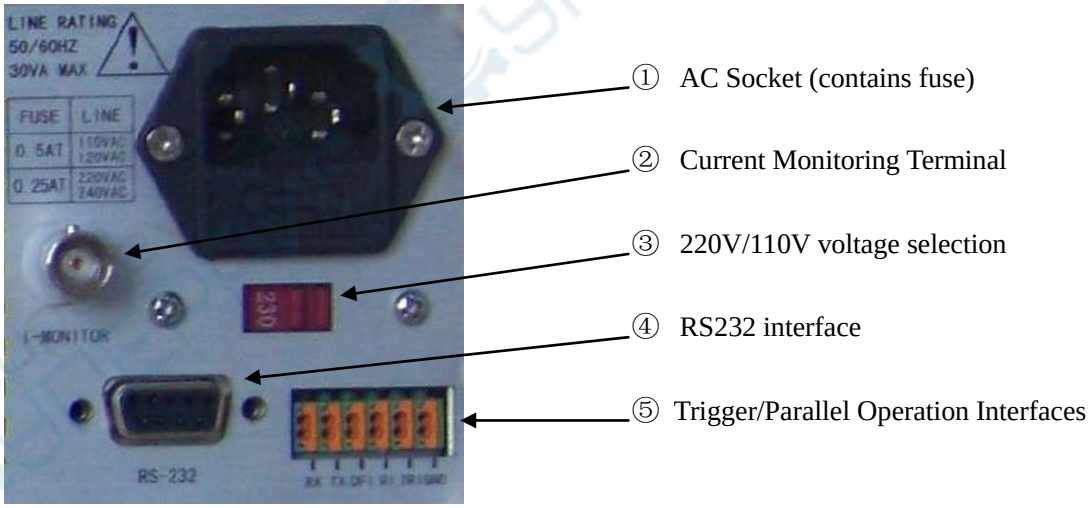
Storage temperature： -20~70℃

Environment: For indoor use with maximum humidity 95%.

Chapter Three： Quick Start

3.1. Front & Back Panel Overview





3.2. Preparation Work before Power-on

1）The electronic load is available of 110V & 220V two kinds of working voltages. Please check if the working voltage of the electronic load matches the power voltage.

2）The fuse of the electronic load should match with the set voltage. Please check if the fuse is correctly installed according to the following table.

AC input voltage setting	AC110V	AC220V
Fuse Specification	T2.5A/250V	T1.25A/250V

3.3. Power-on Self Test

When the electronic load is powered on, it will show the manufacturer, model and software version, etc. Meanwhile, the electronic load will start system self-test. If self-test is not passed, please solve it according to the following table.

Error Information	Solving Methods
ROM Checksum Error	Firmware code calibration error. Contact product manufacturer or distributor.
SN Error	Serial number error. Contact product manufacturer or distributor.
Cal. Data Error	Calibration data error. Recalibrate or contact product manufacturer or distributor.
Temp. Data Error	Temperature data error. Contact product manufacturer or distributor.
ADC / DAC Error	Hardware failure. Contact product manufacturer or distributor.
No Display & Intermittent buzzing	Please check if AC input voltage is too low.

3.4. Characters Showed at Status Bar

ON	Input opens.	OFF	Input closes.
CC	Electronic load is set as CC mode.	CV	Electronic load is set as CV mode.
CP	Electronic load is set as CP mode.	CR	Electronic load is set as CR mode.
DYNA	Electronic load is set as dynamic operation mode.	List	Electronic load is set as programmable list operation mode.
LED	Electronic load is in LED mode.	Auto	Electronic load is in automatic test mode.
RI	Electronic load is in remote disable state.	Trig	Electronic load is waiting for a trigger signal
Shift	Initiate double function keys.	Sense	The remote sensing is initiated.
Rmt	Electronic load is in remote control mode.	Lock	Keyboard is locked and requires the password to unlock.
OC	Electronic load is in over current protection state.	OP	Electronic load is in over power protection mode.

3.5. Characters Showed at Setting Bar

Iset	Set current in CC mode	Vset	Set voltage in CV mode
Pset	Set power in CP mode	Rset	Set resistance in CR mode

3.6. Characters Showed at Measured Value Bar

V	Measured value of the input voltage	I	Measured value of the loading current
P	Measured value of the Loading average power	R	Measured value of the equivalent resistance
Vpp	Peak to peak value of the input ripple voltage	Ipp	Peak to peak value of the loading ripple current
Vp+	Peak value of the input voltage	Vp-	Valley value of the input voltage
Ip+	Peak value of the loading current	Ip-	Valley value of the loading current

V	Voltage unit-Volt	A	Current unit-Ampere
W	Power unit-Watt	R	Resistance unit-Ohm
V+	Peak voltage value unit-Volt	V-	Valley voltage value unit-Volt
A+	Peak current value unit-Ampere	A-	Valley current value unit-Ampere
Vp	Peak to peak ripple voltage unit-Volt	Ap	Peak to peak ripple current unit-Ampere

3.7. Keys

Common Keys

I-Set	Start or set CC mode	V-Set	Start or set CV mode
P-Set	Start or set CP mode	R-Set	Start or set CR mode
Shift	Enable or disable double function keys	On/Off	Input turns on or turns off.
0~9	Numeric keys	·	Decimal point key
←	Backspace key	Esc	Escape key
▲	Arrow key	▼	Arrow key
Enter	Confirmation key		

Double Function Keys

（Double function keys can be effective only when ***Shift*** key is pressed. And the screen will show the word ***Shift*** at the right corner of the screen.

DYNA	Start or set dynamic mode	List	Start or set List mode
Battery	Start or set battery test mode	Short	Enable or disable short-circuit function
Local	Operate by front panel	Trigger	Trigger operation
S-Test	Static intelligent test mode	T-Test	Dynamic intelligent test mode
A-Test	Automatic test mode	Store	Data storage
Recall	Data recall	Menu	Main menu
▲	Shortcut of Changing display formats.	▼	Shortcut of changing data measuring rate

3.8. Ports at the rear panel

The electronic load has six 10MHZ isolated ports which are used for the input and output of trigger signals, and the synchronous control of multiple electronic loads.

Port	Single load mode	Master mode	Slave mode	Property
GND	Ground isolation	Ground isolation	Ground isolation	Ground isolation
TRIG	Trigger signal input	Trigger signal input	Reserved	Input
RI	Disable remote signal input	Synchronous input of slave loads' signals	Synchronous input of master load' signals	Input
DFI	Device failure indication	Synchronous output of master load' signals	Synchronous output of slave loads' signals	Output
TX	Trigger signal output	UART data output	UART data output	Output
RX	Reserved	UART data input	UART data input	Input

Limit Parameters (Operating beyond this limit value may damage equipment interface)

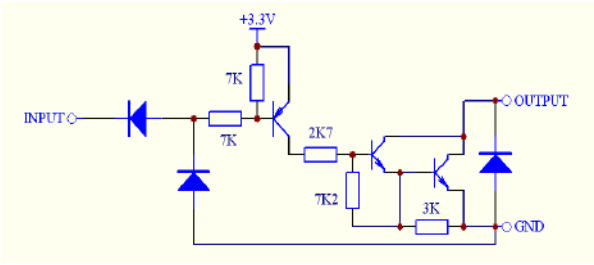
Parameters	Description	Limit Value	Unit
V_{CEO}	Pull-up voltage output from OC gate	-0.5 ~ 50	V
I_{CEO}	Sink current output from OC gate	0~100	mA

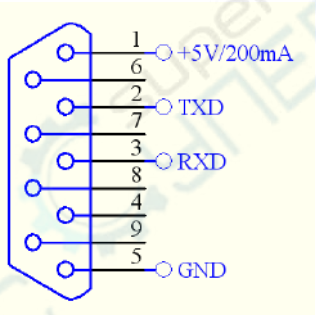
V_I	Input voltage	-0.5~12	V

Working Condition

Parameters	Description	Min	Type	Max	Unit
VIH	“H” Input voltage	2.7	3.3	12	V
VIL	“L” Input voltage	0	0	1	V
Note：input open equaling “H”，short circuit in input and GND equaling “L”					

The following left diagram is the electrical principle diagram of input port and output port. The electronic load also has a standard isolated RS232 port and a 5V/200mA isolated power supply output port. Please refer to the following right diagram for its wiring method. The electronic load also has a current monitoring terminal (I-MONITOR) for monitoring the loading waveform, which output range is 0-10V with 50Khz band width.





3.9. Menu Operation

Menu			Description
Menu			Main menu
1	**Config**		Configuration
	Config	**Measure Rate**	Setting Measuring rate. (Shortcut: Shift+▼)
		Fast	Data update frequency: 10Hz
		Medium	Data update frequency: 5Hz
		Slow	Data update frequency: 2Hz
		Remote Sense	Setting remote sense
		ON	Enable remote sense
		OFF	Disable remote sense
		Input Recall	Recalling the load state
		ON	Setting the load to its power-off state
		OFF	Setting the load to its power-on state
		Key Sound	Setting the key sound
		ON	The buzzer will sound when any key was pressed.
		OFF	the buzzer will not sound when any key was pressed
		Key Lock	Setting the key lock
		ON	Enable the key lock. Keys will be automatically locked when entering the code and then pausing for 5 seconds.
		OFF	Disable the key lock
		Knob Lock	Setting the rotary knob fine tuning function
		ON	Enable the rotary knob fine tuning function
		OFF	Disable the rotary knob fine tuning function
		Shortcut Call	Setting the shortcut call

			ON		Enable the shortcut call
			OFF		Disable the shortcut call
		Trig.In Ctrl.			Setting the function of the trigger input terminals
			ON		The trigger input terminals are used to control the load input
			OFF		The trigger input terminals are used for timing measurement
		Trig.In Speed			Setting the trigger signals response speed
			High		Quick response, fit for high quality signals (e.g. program-controlled signals)
			Low		Slow response, fit for low quality signals (e.g. foot switch）
		Sync. Mode			Setting synchronous control modes
		Sync. Mode	Sync. Run		Setting synchronous control
				ON	Enable synchronous control
				OFF	Disable synchronous control
			Parallel		Setting parallel control
				ON	Enable parallel control and intelligent power allocation
				OFF	Disable parallel control and intelligent power allocation
			Role		Setting the load role
				Master	Setting the load as the master load
				Slave	Setting the load as the slave load
			Slave ID		Setting the slave load ID. This requires to be set only when the load is set as slave load.
			Scan Slave		Slave load scanning operation. This is used for adjustment when loads are in parallel control. Only the master load has the function.
		Communication			Setting communication parameters
			Baud Rate		Setting Baud Rate (2400~115200)
			Comm Parity		Setting Comm. Parity.（none/even/odd）
			Multi-Point		Setting the multi-point communication
				ON	Enable the multi-point communication
				OFF	Disable the multi-point communication
			Address Set		Setting the load address when in multi-point communication
		Display			Setting personalized display
			Format		Setting display format（shortcut：Shift+▲）
				2 items	Displaying 2 items (Characters displayed are big)
				3 items	Displaying 3 items (Characters displayed are medium)
				6 items	Displaying 6 items (Characters displayed are small)
			Brightness		Setting display brightness
		Default Settings			Restoring to factory-default settings
			Yes		Confirming to restore to factory-default settings
		Device Info			Displaying the device information
	System Set				Setting the system
	System Set	**V Range**			Selecting the voltage range
			High		Setting the voltage as high voltage range
			Low		Setting the voltage as low voltage range
		I Range			Selecting the current range

			High		Setting the current as high current range
			Low		Setting the current as low current range
		I_prot			Setting current protection
		P_prot			Setting power protection
		Von			Setting Von value
		Voff			Setting Voff value
		↗ Rate			Setting current rising slew rate
		↘ Rate			Setting current falling slew rate
		Source			Setting sources of the devices tested
			CV Source		Setting the device tested as CV source
			CC Source		Setting the device tested as CC source
			Auto Detect		Detecting automatically the devices tested
	Dynamic Load				Dynamic mode
	DYNA	**Dynamic Set**			Setting dynamic mode parameters
			Ia		Setting low level current
			Ta		Setting dwelling time of low level current
			Ib		Setting high level current
			Tb		Setting dwelling time of high level current
			↗ Rate		Setting current rising slew rate
			↘ Rate		Setting current falling slew rate
			Mode		Selecting DYNA working modes
			Mode	Continuous	Setting load as continuous mode
				Pulse	Setting load as pulse mode
				Toggle	Setting load as toggle mode
		Enter Dynamic Mode			Starting Dynamic mode
	LED Mode				Setting LED mode
		LED Mode Set			Setting LED mode parameters
			LED Vo		Setting the rated output voltage of the LED power supply
			LED Io		Setting the rated output current of the LED power supply
			Rd Coeff		Setting the Rd coefficient
		Enter LED Mode			Entering LED mode
	List				Setting the List
		File			Selecting List files（1~8）
		Load File			Starting List operation mode
		Edit File			Editing List files
			New Step		Adding a new step to the List file
			Step n		Editing n step(1-200) parameters
				Current	Editing n step loading current
				SR	Editing n step current rising slew rate
				Dwell	Editing n step current dwelling time
				Delete	Deleting the step
		Clear File			Clearing the present List files
		Setup			Selecting the List working mode
			Mode		Setting the List working mode
				Continuous	Continuous mode

				Count	Count mode（1~9999999）
				Step	Single step mode
			Count		Setting the repeating times of the count mode. This is only effective to the count mode.
	Battery				Testing the battery capacity
	Battery	Discharge Set			Setting the battery discharge parameters
			Mode		Setting the battery discharge working mode CC/CP/CR
			Value		Setting the battery loading value at discharge state
			Stop Condition		Setting the battery stopping discharge condition
				Enable	Enable the battery stopping discharge condition
				Voltage	Enable the battery stopping discharge voltage
				Capacity	Enable the battery stopping discharge capacity
				Time	Enable the battery stopping discharge time
				Voltage	Battery stopping discharge voltage
				Capacity	Battery stopping discharge capacity
				Time	Battery stopping discharge time
		Start Test			Starting battery capacity test
	Static Test				Setting the static test
	S-Test	**OCP Test**			Setting the OCP test
		OCP Test	OCP Set		Setting the OCP test parameters
			OCP Set	I start	Setting the starting current value
				I end	Setting the ending current value
				Steps	Setting the No. of current increasing steps
				Dwell	Setting the dwelling time of each step
				V trig	Setting the trigger level of the OCP test
			Start Test		Starting OCP test mode
		Load Effect			Setting load effect
		Load Effect	Load Set		Setting load effect loading parameters
			Load Set	Imin	Setting the low-level loading current
				Imax	Setting the high-level loading current
				Inormal	Setting the normal working current
				Delay	Setting the delay time of the loading current
			Start Test		Starting load effect test
		Volt. Trig.			Voltage level trigger initiate the static test
			Volt. Trig		Enable or disable voltage level trigger
				OFF	Disable the voltage level trigger
				ON	Enable the voltage level trigger
			Vtrig		Setting the trigger voltage
	Transient Test				Setting transient test
	T-Test	**Sweep**			Setting frequency sweep
		Sweep	Sweep Set		Setting frequency sweep parameters
				Imin	Setting low-level current
				Imax	Setting high-level current
				Fstart	Setting the sweep starting frequency
				Fend	Setting the sweep ending frequency

				Fstep		Setting the step frequency
				Dwell		Setting the dwelling time of one frequency
				Duty		Setting the duty cycle
				↗ Rate		Setting the current rising slew rate
				↘ Rate		Setting the current falling slew rate
			Start Test			Starting Sweep test mode
			Sweep Mode			Setting Sweep working modes
				Auto		Automatic mode
				Manual		Manual mode. Users can use rotary knob to fine tune the sweep frequency.
		Timing				Setting timing measurement
		Timing	Load Set			Setting the loading condition
				Mode		Setting the loading mode
				Value		Setting the loading value
			Trig.Start			Setting the trigger starting condition
			Trig.Start	Signal		Setting the trigger signal source
					Voltage	Setting trigger signal source as inputting voltage.
					Current	Setting trigger signal source as loading current.
					Ext.TRIG	Setting trigger signal source as external trigger.
				Edge		Setting the trigger edge
					Rise	Being effective by rising edge trigger
					Fall	Being effective by falling edge trigger
				Level		Setting trigger voltage level
			Trig.End			Setting the trigger ending condition
				Signal		Setting the trigger signal source
				Edge		Setting the trigger edge
				Level		Setting the trigger voltage level
			Start Test			Starting the timing measurement mode
		OVP Test				Setting OVP test
			Vtrig			Setting the trigger voltage level of the OVP test
			Start Test			Starting the OVP test mode
	Auto Test					
	A-Test	File				Selecting automatic test files（1~8）
		Load File				Starting automatic test mode
		Edit File				Editing the file
		Edit File	New Step			Adding a new step to the A-test file
			Step n			Editing the n step parameters in A-test file
			Step n	Load		Setting the loading mode
					Load Mode	Setting the loading mode
					Value	Setting the loading parameters.
				SPEC		Setting the specification type
					SPEC Type	Setting the specification type. This is related to the loading mode.
					Max Limit	Setting the maximum limit of being qualified
					Min Limit	Setting the minimum limit of being qualified

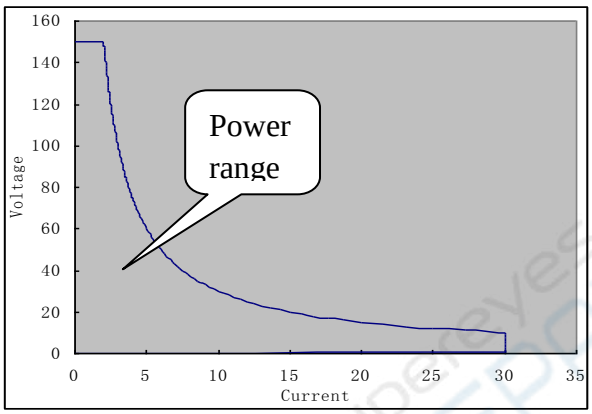
				Delay		Setting the delay time
		Clear File				Clearing the present A-test file
		Setup				Automatic test setup
		Setup	Fail Op.			Setting the handling method when a step value is tested as unqualified
				Continue		Continuing to finish the A-test when a step value is tested as unqualified
				Abort		Stopping the A-test immediately when a step value is tested as unqualified
			Trigger Output			Setting the trigger output
				Condition		Setting the trigger condition
					Pass	Initiating trigger output (TX terminal) when passing the test
					Fail	Initiating trigger output (TX terminal) when failing the test
					End	Initiating trigger output (TX terminal) when finishing the test
					Disable	Disable the trigger output
				Output Mode		Setting trigger output mode
					Level	Voltage level trigger (being effective only with low voltage level)
					Pulse	Pulse trigger（when passing the test, output pulse width is 4.2ms；when failing the test, output pulse width is 8.4ms）
			Auto Run			Setting the automatic run parameters
				Volt. Trig		Enabled or disabled the voltage level trigger
					OFF	Disable the voltage level trigger
					ON	Enable the voltage level trigger
				Vtrig		Setting the trigger voltage level value

Chapter Four: Panel Operation

4.1. System Set

4.1.1. Electronic Load Operation Range

Electronic load works in the range of Rated Current, Rated Voltage and Rated Power. Please refer to the right diagram for JT6312A power range.



4.1.2. Voltage & Current Range

Electronic load is available of 2 voltage ranges and current ranges. Once low voltage range and current range is selected, the corresponding measuring range will become one tenth of that of high level and the resolution will be 10 times higher. Besides, when in low current range, the maximum current slew rate can be set as one tenth of that of high level.

4.1.3. Over Current Protection (OCP)

Electronic load possesses OCP function. This function can ensure the loading current will never exceed the current protection. The current protection can be any value no bigger than rated current.

4.1.4. Over Power Protection (OPP)

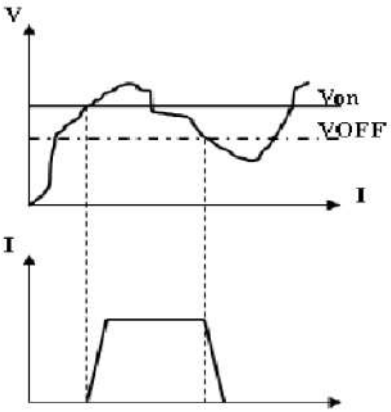
Electronic load possesses OPP function. This function can ensure the loading power will never exceed the power protection. The power protection can be any value no bigger than rated power.

4.1.5. Current Slew Rate

Electronic load supports current rising and falling slew rate programmable. The current input range is related to rated input current. Please refer to the technical data in Section 2.1.

4.1.6. Von/Voff

Electronic load supports Von/Voff function，the working principle of which is as the right diagram. When input voltage is higher than or equals Von voltage, the electronic load will start to sink current. When the input voltage is below or equals Voff value, the input state of the load will be off and the load will stop the current loading.



Von/Voff loading Current Waveform

4.1.7. Types of Measured Sources

There are two types of measured source: CV source and CC source. Please select the right measured source. When in CR mode, the electronic load supports automatically detecting and matching the measured source, so users can set the measured source as “Auto Detect”.

4.2. Input Control

4.2.1. Input On/Off

Electronic load input can be toggled on/off through the ***On/Off*** key on the front panel. When input is on, the word ***ON*** will be showed at the screen status bar. When input is off, the word ***OFF*** will be showed at the screen status bar.

4.2.2. Short Circuit

Electronic load can simulate a short circuit at its input by setting the load with full-scale current. The short circuit can be set on or off by the double function key ***Short*** at the front panel. When short-circuit is on, the word ***Short*** will be showed at the screen status bar. When exiting from short circuit function, the electronic

load will go back to its previous state before running short circuit function. Maximum short circuit current is the protection current set in load system.

4.3. Trigger Operation

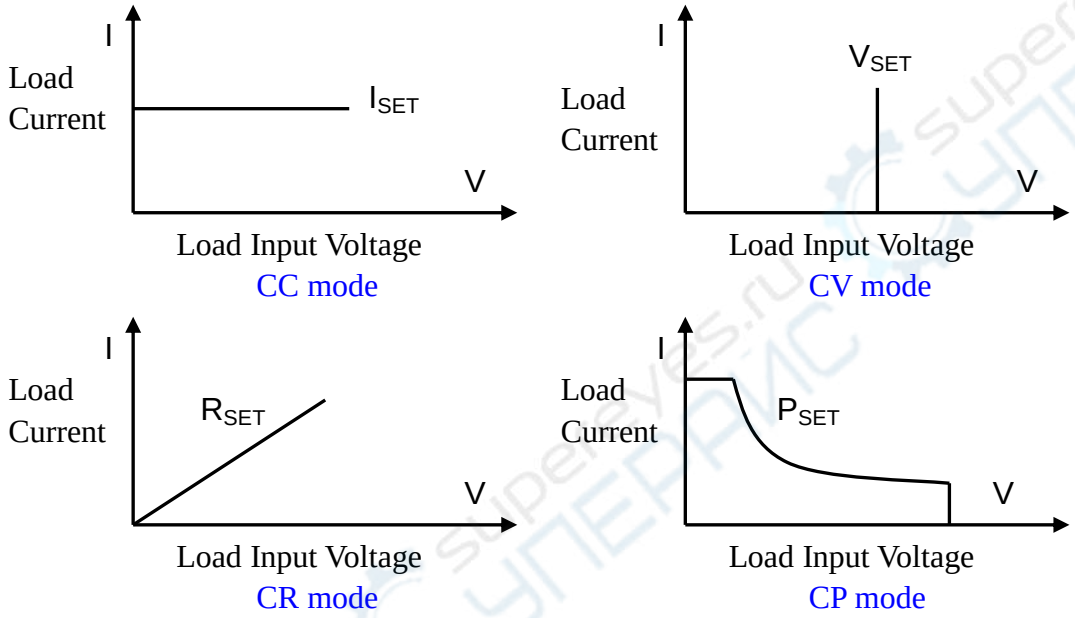
In some special condition, the electronic load requires an external trigger signal so as to launch a program or allow synchronization with other test equipments. The electronic load supplies three trigger methods:

a）Using the double function key ***Trigger*** at the front panel. Pressing the key ***Trigger*** once finishes one trigger.

b）Using the TRIG port at the back panel. Lowing the TRIG port voltage level finishes one trigger.

c）Using the software. Receiving one demand finishes one trigger.

4.4. Basic Operation Modes



4.4.1. Constant Current Mode（CC）

In CC mode, the electronic load will sink a current in accordance with the programmed current value regardless of input voltage. The CC mode can be set by the following steps: first press the key ***I-set*** and then input the programmed current value, followed by pressing the key ***Enter*** for confirmation.

4.4.2. Constant Voltage Mode（CV）

In CV mode, the electronic load will sink current to control the voltage of the source to the programmed voltage value. The CV mode can be set by the following steps: first press the key ***V-set*** and then input the programmed voltage value, followed by pressing the key ***Enter*** for confirmation.

4.4.3. Constant Power Mode（CP）

In CP mode, the electronic load will sink a current according to the programmed power. The CP mode can be set by the following step: first press the key ***P-set*** and then input the programmed power value, followed by pressing the key ***Enter*** for confirmation.

The electronic load not only supports CP mode when measured source is CV source, but also supports CP mode when measured source is CC source. Users should select the source type from ***System Menu***. If users select ***Auto Detect***，this means CV Source is selected.

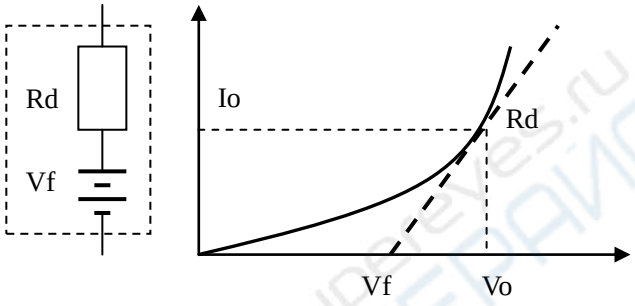
4.4.4. Constant Resistance Mode（CR）

In CR mode, the load will sink a current linearly proportional to the input voltage in accordance with the programmed resistance. The CR mode can be set by the following step: first press the key ***R-set*** and then input the programmed resistance value, followed by pressing the key ***Enter*** for confirmation.

The electronic load not only supports CR mode when measured source is CV source, but also supports CR mode when measured source is CC source. Users should select the source type from ***System Menu***. If users hope the system to automatically detect and match the measured source type, please set the source type as ***Auto Detect***.

4.5. LED Mode

The electronic load has LED simulation function. The LED equivalent circuit diagram, as the right diagram showed, is to connect the resistance ***Rd*** with the voltage source ***Vf*** in series. Its VI curve is equivalent to tangent of the real LED nonlinear VI curve at the operating point (Vo, Io).



In LED mode, three parameters Vo, Io & Rd Coeff need to be set. Io is the rated output current of the measured LED power supply; Vo is the corresponding working voltage when LED power supply is at Io working current. Vo can be known by the VI curve in the LED specifications book. The electronic load is usually used to test several LED in series, so Vo should be set as several times of that of the single LED or as any value within the output voltage range of the LED power supply. Rd Coeff is the ratio of the equivalent series resistance (Rd) with the total equivalent resistance (Vo / Io) of the electronic load, that is, Rdcoeff = Rd / (Vo / Io). In series applications, Rdcoeff value is only related to the VI curve of the selected LED and has nothing to do with the number of LED in series.

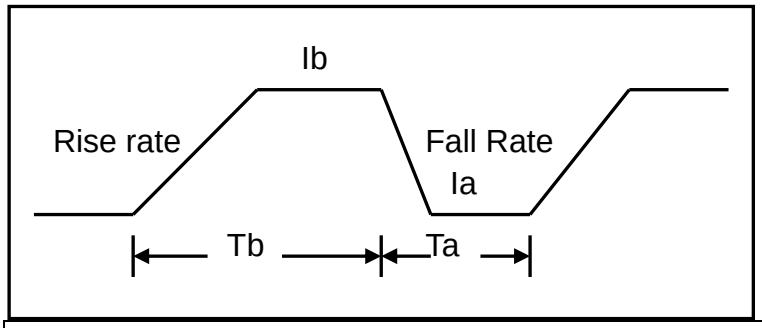
Users can get the Io according to the rated output current of the LED power supply and then count the Rdcoeff with the help the VI curve in the LED specification book. Then adjust the voltage to any value within the output voltage range of the LED power supply. In this way, the electronic load can real simulate LED loading.

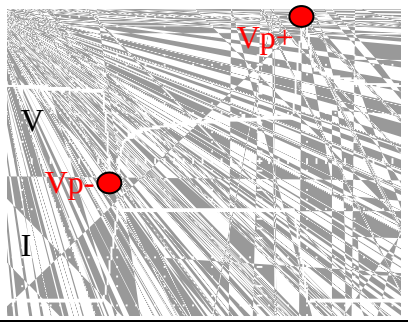
Users can also the shortcut key ***Shift+R-set*** to enter LED mode. When setting those three parameters, users can also use the rotary knob to adjust Vo.

Starting LED Mode：Menu：LED Mode：Enter LED Mode (Shortcut key: ***Shift+R-set***）	
LED mode parameters setting path: Menu：LED Mode ：LED Mode Set：	
Parameters	Description
LED Vo	The corresponding working voltage when LED power supply is at Io working current. Please refer to rated output voltage range of the LED power supply
LED Io	Working current, that is, the rated output current of the LED power supply.
Rd Coeff	Rd coefficient

4.6. Dynamic Operation（DYNA）

Dynamic operation enables the electronic load to periodically switch between two load currents, as might be required for testing the dynamic performance of power supplies. Its working principle is as the following diagram. The electronic load starts loading from current ***Ia***, and after ***Ta*** dwelling time, the current ***Ia*** will rise to current ***Ib*** according to the programmed current rising slew rate. The rising time and the electronic load loading time with current ***Ib*** is called dwelling time ***Tb***. After ***Tb*** dwelling time, the current ***Ib*** will fall to current ***Ia*** according to the programmed current falling slew rate. Then the electronic load will go on loading with current ***Ia***. At the moment of current changing, the input voltage will either become voltage overshoot or voltage drop. And the electronic load will real-time display peak voltage (Vp+) when in overshoot and valley voltage (Vp-) when in drop.





DYNA：Enter Dynamic Mode		
DYNA：Dynamic Set：		
Parameters	Description	Unit
Ia	Low-level loading current	A
Ta	Low-level current dwelling time (range:10uS~50S; resolution: 2uS)	mS
Ib	High-level loading current	A
Tb	High-level current dwelling time (range:10uS~50S; resolution: 2uS)	mS
↗Rate	Current rising slew rate	A/uS
↘Rate	Current falling slew rate	A/uS
Mode	Working modes（Continuous/ Pulse/ Toggle）	-
DYNA working modes setting path DYNA：Dynamic Set: Mode：		
Continuous	In continuous mode，the electronic load will periodically switch between the low and high loading current according to the programmed current slew rate and dwelling time.	
Pulse	In pulse mode, the electronic load current will rise to current ***Ib*** according to the programmed current rising slew rate when receiving a trigger signal. After ***Tb*** dwelling time, the current ***Ib*** will fall to the current ***Ia*** according to the programmed current falling slew rate.	
Toggle	In toggle mode, the electronic load current will rise to the current ***Ib*** according to the programmed current rising slew rate or fall to the current ***Ia*** according to the programmed current falling rate once receiving a trigger signal.	

4.7. List Operation (List)

List function lets you simulate a real electronic load or edit the electronic load loading waveforms. The electronic load will start loading according to the programmed list files. You can program up to 8 files in the list and each file is with 200 steps. The current slew rate of each step can be programmed.

Selecting a list file： List：File：List m （1 ≤ m ≤ 8）		
Clearing a list file： List：Clear File		
Adding a new step to a certain list file： List：Edit File：New Step		
Starting list file： List：Load File		
A step parameters setting path List：Edit File：Step n: （1 ≤ n ≤ 200）		
Parameters	Description	Unit
Current	Loading current	A
Dwell	Dwelling time (range: 10uS-50S, resolution: 2uS)	mS
SR	Current slew rate.	A/uS
List working mode setting path：List：Mode ：		
Continuous	In continuous mode，the electronic load starts loading continuously according to	

	programmed steps sequence.
Count	In count mode, once receiving a trigger signal, the electronic load starts loading according to the programmed steps sequence. After repeating for "Count" times, the electronic load will stop loading. Count setting range can be 1~9999999.
Step	In step mode, once receiving a trigger signal, the electronic load starts loading according to that step setting parameters.

4.8. Measured Items

4.8.1. Average Voltage (V) & Average Current (I) Measurement

The electronic load supports average voltage (V) and average current (I) measurement and display them in real-time. The maximum measuring bandwidth of the load is 250KHZ. Even when the ripple is big, the load can also achieve the accurate measurement. Besides, the load also provides three measuring rates (Refer to the Section 4.18—Personalized Display Setting for the detail). The fastest measuring rate is 10Hz, which satisfy the fast measuring demands while the slowest measuring rate is 2Hz, the stability of which is better even under harsh conditions. The medium measuring rate is 5Hz. Both the voltage and the current can be set into high and low two ranges. When in low range, the load can achieve higher measuring accuracy.

4.8.2. Ripple Voltage (V_{PP}) and Ripple Current (I_{PP}) Measurement

The electronic load supports ripple voltage (V_{PP}) and Ripple current (I_{PP}) measurement and display them in real-time.

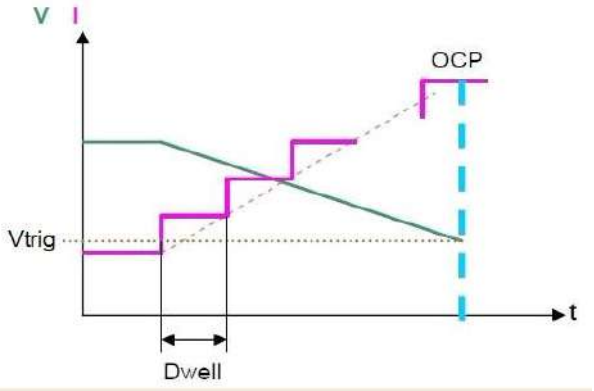
Different from the traditional method of using oscilloscopes add capacitance to measure the ripple, the load measuring ripple possesses good flatness (when in bandwidth range). Therefore, the load can measure the ripple more accurately with high reproducibility.

4.8.3. Peak Voltage（V_{P+}/V_{P-}）and Peak Current（I_{P+}/I_{P-}）Measurement

The electronic load supports peak voltage(V_{P+}/V_{P-}) and peak current (I_{P+}/I_{P-}) measurement and display them in real-time. In dynamic loading mode, this function shows more importance. V_{P+} means the voltage overshoot in transient test while V_{P-} means the voltage drop in transient test. The importance of this function lie in that in automatic test (A-test) (Refer to Section 4.11), the load can achieve the qualification judgment of the transient test.

4.9. Static Test Mode (S-Test)

4.9.1. Over Current Protection Test (OCP)



The electronic load has over current protection function, the principle of which is as the right diagram. The electronic load starts loading from starting current (Istart) and gradually increase the current to the ending current (Iend) according to the programmed steps. When detecting that the input voltage level has decreased to trigger voltage level (Vtrig), the electronic load will think the measured power supply has started OCP and the current at that time is the measured power supply's OCP point. Meanwhile, the electronic load will fully monitor input power, automatically capture maximum power (Pmax) and the voltage (V) & current (I) at the maximum power.

Starting OCP test: S-Test：OCP Test：Start Test
OCP parameters setting path：S-Test：OCP Test：OCP Set:

Parameters	Description	Unit
I start	Starting current	A
I end	Ending current	A
Steps	Total steps of current increasing（1~1000）	-
Dwell	Dwelling time of each step（0.01~999.99）	mS
V trig	Trigger voltage level	V

4.9.2 Load Effect Test (Load Effect)

The electronic load has load effect test function, the principle of which is as the following diagram. The electronic load starts loading at three different currents (Imin, Inormal, Imax). After programmed delay time, the electronic load will automatically record the corresponding voltages when loading at those three different currents and count the electronic load regulation, Δ V and measured power supply resistance according to the following formula.

Vmax = Vdc@Imin　　Vmin = Vdc@Imax

Δ V = Vmax – Vmin　　Rs = Δ V / (Imax – Imin)

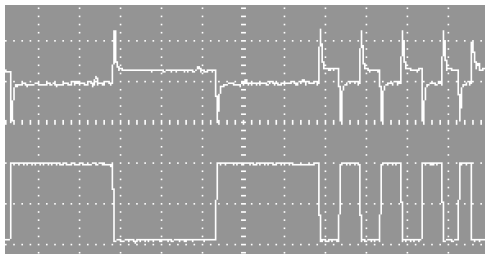
Regulation = Δ V / Vnormal

Starting load effect test：　S-Test：Load Effect：Start Test		
Load effect test parameters setting path：S-Test：Load Effect：Load Set:		
Parameters	Description	Unit
Imin	Low-level loading current	A
Imax	High-level loading current	A
Inormal	Normal working current	A
Delay	Loading current delay time of each step	S

4.10 Transient Test (T-Test)

4.10.1 Dynamic Frequency Sweep (Sweep)

The electronic load has dynamic frequency sweep function. With this function, the electronic load can capture the peak voltage value (Vp+) and valley voltage value (Vp-) of the measured power supply under the worst circumstances. The electronic load periodically switches between two load levels according to the programmed current rising slew rate and falling slew rate, which is similar to the load in dynamic mode. The difference is that the dwelling time of each current level is determined by sweep frequency and duty cycle when in dynamic frequency sweep function. Meanwhile, the sweep frequency starts from starting frequency (Fstart) and rise to ending frequency (Fend) step by step according to the programmed each step frequency (Fstep) and programmed each frequency dwelling time (Dwell). When the electronic load starts sweeping, at the moment of current changing, the input voltage will either become voltage overshoot or voltage drop. And electronic load will real-time display peak voltage (Vp+) when in overshoot and valley voltage (Vp-) when in drop. When sweeping is finished, the electronic load will display the maximum peak voltage, the minimum valley voltage, and the frequency point at which the maximum peak voltage and minimum valley voltage occurs.



Starting sweep test：　T-Test：Sweep：Start Test		
Sweep parameters setting path：T-Test：Sweep：Sweep Set:		
Parameters	Description	Unit
Imin	Low-level loading current	A

Imax	High-level loading current	A
Fstart	Starting frequency, 0.01Hz~50Khz	Hz
Fend	Ending frequency, 0.01Hz~50Khz	Hz
Fstep	Step frequency, 0.01Hz~50Khz	Hz
Dwell	Dwelling time of each frequency, 0.001S~99.999S	s
Duty	Duty cycle, 1%~99%	%
↗ Rate	Current rising slew rate	A/us
↘ Rate	Current falling slew rate	A/us
Sweep mode setting path: T-Test：Sweep：Sweep Mode:		
Auto	Automatic mode	-
Manul	Manual mode. Sweep frequency can be adjusted by rotary knob according to the programmed step frequency (Fstep).	-

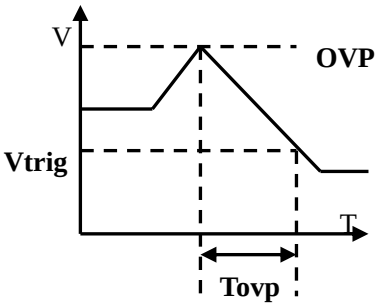
4.10.2 Timing Measurement (Timing)

Electronic load has timing measurement function with 0.1mS accuracy. In programmed condition, the electronic load can automatically capture two trigger signals and count out the time interval of two signals occurring. When finishing test, the electronic load will automatically display the time interval.

Starting timing measurement: T-Test：Timing：Start Test	
Timing measurement loading parameters setting path: T-Test：Timing：Load Set	
Parameters	Description
Mode	Loading working mode (choices: CC / CV / CP / CR / OFF）
Value	Load setting value
Starting trigger parameters setting path: T-Test：Timing：Trig. Start Ending trigger parameters setting path: T-Test：Timing：Trig. End	
Signal	Trigger signal source（choices: TRI / Voltage / Current）
Edge	Trigger methods selection（choices: rising edge (Rise)/ falling edge (Fall)）
Level	Trigger voltage level

4.10.3 Over Voltage Protection (OVP) Test

The electronic load has over voltage protection (OVP) test function. After capturing peak voltage and falling edge of the input voltage, the electronic load will start a trigger at programmed trigger voltage level (Vtrig) at the falling edge. And the peak voltage at the trigger voltage level point will be regarded as the measured power supply OVP point. The time interval from peak voltage occurring to trigger occurring will be the measured power supply OVP response time (Tovp). The Tovp measuring accuracy is 2uS.



Starting OVP test: T-Test：OVP Test：Start Test	
OVP test parameters setting path: T-Test：OVP Test：	
Parameters	Description
Vtrig	Protection Trigger voltage level, which should be higher than the output voltage level of the measured power supply under the overvoltage protection.

4.11 Automatic Test (A-Test)

Automatic test function is often used to test products in the production line. The electronic load start loading and test according to the programmed steps in the A-test files, and automatically judge if the measured power supply passed or failed the test.

You can program up to 8 files and each file is with 50 steps. The loading condition (Load), specification (SPEC) and delay time of each step can all be programmed. The delay time can be set as either waiting a trigger signal or any time ranging from 0.1S to 99S.

Loading condition supports several working modes. Each working mode is with different specification items. Please refer to the following table for the details.

A-Test files selection: A-Test：File：List m (1 ≤ m ≤ 8)	
Clearing A-Test files: A-Test：Clear File	
Adding a new step to A-Test file：A-Test：Edit File：New Step	
Starting A-Test mode: A-Test：Load File	
Working mode parameters setting path: A-Test：Edit File：Step n：Load：Mode：	
Parameters	Description
CC	Constant current mode
CV	Constant voltage mode
CP	Constant power mode
CR	Constant resistance mode
DYNA	Dynamic loading mode
OCP	OCP test mode
Sweep	Dynamic sweep mode
Load Effect	Load effect test mode
LED	LED mode
Tested items parameters setting path: A-Test：Edit File：Step n：SPEC：	
Current	Loading current (be effective in CC,CV,CP,CR& LED working modes)
Voltage	Input voltage (be effective in CC,CV,CP,CR& LED working modes)
Power	Loading power (be effective in CC,CV,CP,CR& LED working modes)
Resistance	Equivalent resistance (be effective in CC,CV,CP,CR& LED working modes)
Vpp	Ripple voltage (be effective in CC,CV,CP,CR, DYNA & LED working modes)
Ipp	Ripple current (be effective in CC,CV,CP,CR, DYNA & LED working modes)
Vp+	Peak voltage (be effective in CC,CV,CP,CR, DYNA, Sweep & LED working modes)
Vp-	Valley voltage (be effective in CC,CV,CP,CR, DYNA, Sweep & LED working modes)
Ip+	Peak current (be effective in CC,CV,CP,CR, DYNA & LED working modes)
Ip-	Valley current (be effective in CC,CV,CP,CR, DYNA & LED working modes)
OCP	Over current protection (be effective in OCP mode)
Pmax	Maximum power (be effective in OCP mode)
Reg.	Load regulation (be effective in Load Effect mode)
ΔV	The voltage difference when loading at Imin & Imax (be effective in Load Effect mode)
Rs	Power supply series resistance (be effective in Load Effect mode)
A-Test failing items processing methods setting path：A-Test：Setup：Fail Op.：	
Continue	Continue to finish all the tested items even when a certain step tested item failed the test.
Abort	End the automatic test immediately when a certain step tested item failed the test.
A-Test trigger condition parameters setting path：A-Test：Setup：Trigger Output：Condition：	
Pass	When passing the test, initiate the trigger output (TX terminals)
Fail	When failing the test, initiate the trigger output (TX terminals)
End	When finishing the test, initiate the trigger output (TX terminals)
Disable	Disable the trigger output.

A-Test trigger output methods setting path: A-Test：Setup：Trigger Output：Mode：	
Level	Voltage level trigger (being effective only with low voltage level)
Pulse	Pulse trigger (low voltage level pulse. When passing the test, output pulse width is 4.2ms； when failing the test, output pulse width is 8.4ms)
A-Test trigger output methods setting path：A-Test：Setup：AutoRun：Volt.Trig.：	
OFF	Disable automatic run mode of the voltage level trigger.
ON	Enable the automatic run mode of the voltage level trigger.

4.12 Battery Capacity Test (Battery)

The electronic load has battery capacity test function. Battery discharge test can be operated in CC, CR and CP mode. How to stop discharge, there are three conditions can be selected to set: voltage, capacity and time. When starting the test, the electronic load will real-time display battery discharge duration time, accumulated mAh battery capacity and WH battery capacity. When the battery voltage falls to the programmed ending voltage, the electronic load will finish the test and stop loading.

Starting battery capacity test: Battery： Start Test	
Battery capacity testing parameters setting path: Battery ： Discharge Set：	
Parameters	Description
Mode	Discharge operation modes: CC、CP & CR modes.
Value	Loading parameters (In CC mode, value refers to current value. In CP mode, value refers to CP mode. In CR mode, value refers to resistance value.)
Stop condition	Stop discharge condition
Enable	Enable the discharge condition. The ending voltage, discharge capacity and discharge time can be enabled or disabled respectively.
Voltage	Setting the discharge stopping voltage.
Capacity	Setting the discharge stopping capacity. The unit can be Ah/Wh.
Time	Setting the discharge time. The unit is second.

4.13 Multi Loads Synchronous Control

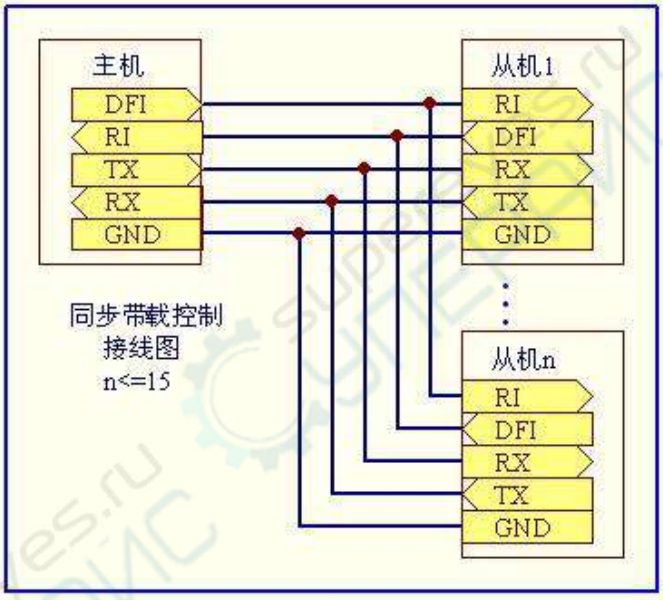
The electronic load has multi loads synchronous control function. When in synchronous control, the electronic load supports up to 16 loads Sync. loading & dynamic test, with one load as master load and other loads as slave loads, very fit for testing multi-output power supply. The addresses of slave loads cannot be the same. The effective range of the addresses is from 1 to 15. Besides, the electronic load also support up to 16 loads parallel operation for high power. In parallel operation, the electronic load will start intelligent power allocation and all the slave loads will be disabled.

After connecting the loads in parallel and setting the parameters of each load, scan the slave loads first, then initiate the master-slave synchronous control. When the master load is restarted, the slave loads will be scanned automatically once. So if master load is powered on after slave loads booting up, it is no need to scan the slave loads manually. If the slave loads are powered on or powered off, the master load will also be scanned automatically once.

Scanning the slave loads: Menu：Config：Sync. Mode：Scan Slave	
Setting the addresses of slaves loads: Menu：Config：Sync. Mode：Address	
Synchronous control parameters setting path: Menu：Config：Sync. Mode：	
Parameters	Description

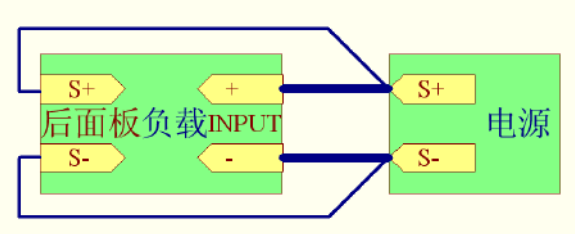
Sync. Run	Synchronous control. ***ON*** means enable the function; ***OFF*** means disable the function.
Parallel	Parallel control. ***ON*** means enable the intelligent power allocation; ***OFF*** means disable the intelligent power allocation.
Role	Setting the role of the electronic load. ***Master*** means setting this load as master load and ***Slave*** means setting this load as slave load.

Working Mode	Parameters	Status
Single load mode	Sync. Run	OFF
Setting the master load when in synchronous control	Sync. Run	ON
	Parallel	OFF
	Role	Master
Setting the slave loads when in synchronous control	Sync. Run	ON
	Parallel	OFF
	Role	Slave
Setting the master load when in parallel operation	Sync. Run	ON
	Parallel	ON
	Role	Master
Setting the slave loads when in parallel operation	Sync. Run	ON
	Parallel	ON
	Role	Slave



4.14 Remote Sensing

In order to eliminate the effect of the inevitable voltage drop in the load leads, the electronic load is equipped with remotes sensing, which can provides greater accuracy by allowing the load to regulate directly at the source's output terminals, as well as measure the voltage there. The connecting method is as right diagram.



If the remote sensing is enabled, the word ***Sense*** will be showed at the Screen.

4.15 Protection Functions

4.15.1 Over Voltage Protection

The electronic load has OVP protection. When the input voltage is 5% higher than the rated voltage, the electronic load will shut down the input immediately and display ***OVER VOLT***. Meanwhile, overvoltage alarm will be triggered until the input voltage is back to the rated voltage range.

4.15.2 Over Current Protection

The electronic load has over current protection. When input current is higher than the programmed over current protection value, the electronic load will display ***OC*** and alarm once. Meanwhile, the electronic load will start loading according to the programmed over current protection value in CC mode.

4.15.3 Over Power Protection

The electronic load has over power protection. When input power is higher than the programmed over power protection value, the electronic load will display ***OP*** and alarm once. Meanwhile, the electronic load

will start loading according to the programmed over power protection value in CP mode.

4.15.4 Over Temperature Protection

The electronic load has over temperature protection. Once the internal temperature exceeds 80℃, the over temperature alarm will be triggered and the electronic load will display ***OVER TEMP***. Meanwhile, the electronic load will turn off the input. Users can press any key to disarm the alarm.

4.15.5 Input Polarity Reversed Protection

When the input are in polarity reversed condition (will cause short circuit), the polarity reversed protection alarm will be triggered and the electronic load will display ***LOC RV***. When the remote sensing is enabled, if the remote input terminals are in polarity reversed state, the electronic load will display RMT RV and the alarm will keep sounding until the polarity is correctly connected.

4.16 Save/Recall Setting

The electronic load supports 20 groups of data saving and recalling, including the parameters set in the system and the parameters set in basic working modes(CC / CV / CP / CR).

Saving Operation: Store n（1~20） Recalling Operation：Recall n（1~20）

4.17 Rotary Knob Usage

In basic working mode, the rotary knob is used to fine-tune the setting value. Meanwhile, after pressing the rotary knob, rotating the rotary knob can fine-tune the resolution. Because there is a key hidden in the rotary knob. In Menu Operation Mode, you can also use rotary knob to select a menu quickly. At this moment, pressing the rotary knob equals pressing the ***Enter*** key. The function that the rotary knob fine-tunes the setting value can be disabled from the ***Config*** Menu.

4.18 Personalized Display Setting

The electronic load supports 3 display formats and display brightness adjustment. The range of display brightness adjustment is from 10 to 100. 10 is the darkest while 100 is the brightness. Besides, the electronic load also supports measuring rate adjusting so as to satisfy the different requirements.

Adjusting the display brightness: Menu：Config：Display：Brightness	
Display format setting path: Menu：Config：Display：Format：（shortcut: <Shift+▲>）	
Parameters	Description
2 items	Simultaneously displaying 2 measured items. The displayed characters are big.
3 items	Simultaneously displaying 3 measured items. The displayed characters are medium.
6 items	Simultaneously displaying 6 measured items. The displayed characters are small.
Adjusting the measuring rate: Menu：Config：Measure Rate：（shortcut: <Shift+▼>）	
Parameters	Description
Fast	Data update rate is 10Hz. Speed is fast, but stability is bad.
Medium	Data update rate is 5Hz. Speed and stability are both medium.
Slow	Data update rate is 2Hz. Speed is slow, but stability is good.

Chapter Five: Communication Protocol (SCPI)

5.1. SCPI Command Introduction

All the programming data and returned data applied to the protocol are ASCII characters. The symbol<NL> stands for “new line” and represents the ASCII coded 0A hexadecimal (or 10 decimal).

Protocols support the following data formats:

1）<NR1>，integer, example: 285

2）<NR2>，number with decimal point, example: 0.285

3）<NR3>，number expressed by scientific notation, example: 2.85E+2

4）<Nrf>，extended format, including **<NR1>,<NR2>,<NR3>**, example: **285**、**0.285**、**2.85E2**.

5）<Nrf+>，including **<Nrf>, MIN, MAX**, example: **285**、**0.285**、**2.85E2**、**MIN**、**MAX.** MIN and MAX are the minimum and maximum limit values that the electronic load can be set.。

6）<Bool>，example: **0 | 1** or **ON | OFF**.

Data unit should follow the data. If the unit is the default unit of the corresponding data type in the following table, then the unit can be omitted.

Data Type	Default unit	Support unit
Voltage	V	mV
Current	A	mA
Power	W	mW
Resistance	ohm	
Slew rate	A/uS	
Time	S	mS

Some mnemonic symbols are used in SCPI protocol commands. These symbols stand for the following meaning:

Mnemonic symbol	Meaning
< >	In angle bracket, it should be the parameters abbreviation.
|	Vertical line is used to separate the alternatives.
[ ]	In square bracket, it should be the optional items.

5.2. Register Introduction

The protocols support the following 4 registers.

a. Questionable Status

Questionable status registers includes three 16 bits registers. They are condition register, event register and enable register. The event register captures changes in conditions corresponding to condition bits in a condition register. An event (QUES bit in the status byte register) becomes true when the corresponding condition bits of the enable register is enabled. Reading an event registers clears the register (all bits set to zero). Condition register is defined as follows:

Bit	Name	Meaning
Bit0	VF	
Bit1	OC	The electronic load is in over current condition.
Bit3	OP	The electronic load is in over power condition.
Bit4	OT	The electronic load is in over temperature condition.
Bit8	RRV	The electronic load is in remote polarity reversed condition.
Bit11	UNR	

Bit12	LRV	The electronic load is in local polarity reversed condition.
Bit13	OV	The electronic load is in over voltage condition.

b. Standard Event Status

The standard event status registers includes two 16 bits registers: event register and enable register. An event (ESB bit in the status byte register) becomes true if the corresponding condition bit of enable register is enabled. Reading of the standard event status register will reset it to zero. Event register is defined as follows:

Bit	Name	Meaning
Bit0	OPC	Operation is completed.
Bit2	QYE	Query error occurs.
Bit3	DDE	Device dependent error occurs.
Bit4	EXE	Execution error occurs.
Bit5	CME	Command error occurs.
Bit7	PON	The electronic load is repowered on.

c. Operation Status

The operation status registers includes three 16 bits registers: condition register, event register and enable register. The event register captures changes in conditions corresponding to condition bits in a condition register. An event (OPER bit in the status byte register) becomes true when the corresponding condition bits of the enable register is enabled. Reading an event registers clears the register (all bits set to zero). Condition register is defined as follows:

Bit	Name	Meaning
Bit0	CAL	The electronic load is in calibration condition.
Bit5	WTG	The electronic load is in waiting for a trigger condition.

d. Status Byte

The status byte registers includes two 8 bits registers: event register and enable register. An event (RQS bit in the status byte register) becomes true if the corresponding condition bit of enable register is enabled. Reading an event registers clears the register (all bits set to zero). Event register is defined as follows:

Bit	Name	Meaning
Bit3	QUES	Questionable. It indicates if an enabled questionable event has occurred.
Bit4	MAV	Message available. It indicates if the output queue contains data.
Bit5	ESB	Event status bit. It indicates if an enabled standard event has occurred.
Bit6	RQS	
Bit7	OPER	

5.3. Common Commands

***CLS: Clear Status Command**

The CLS command executes the following actions: clear these registers.

Standard Event Status Event Register

Questionable Status Event Register

Operation Status Event Register

Status Byte Event Register

Error Queue

Command Syntax: *CLS

***ESE Standard Event Status Enable Command/Query**

This command sets the condition of the standard event status enable register, which determines which events of the standard event status event register are allowed to set the ESB (Event Summary Bit) of the status byte register. A "1" in the bit position enables the corresponding event.

Command Syntax: *ESE <NRf>

Parameters: 0~255

Power On Value Refer to *PSC command

Example: *ESE 128

Query Syntax: *ESE?

Return Parameters <NR1>

***ESR? Standard Event Status Register Query**

This query reads the standard event status register. After reading the register, the register will be cleared as zero. The bits in the standard event status register are defined as the same with those in the standard event status enable register.

Query Syntax: *ESR?

Return Parameters: <NR1>

***IDN? Identification Query**

This query requests the electronic load to identify itself. Its return parameters include four strings separated by comma.

Query Syntax: *IDN?

Return Parameters: <AARD>

Strings	**Description**
JARTUL	Manufacture
JT632xA	Model
xxxxxxxxx	Serial No.
x.xx.xx	Software edition

Example：JARTUL，JT6321A,xxxxxxxxx，A.01.02

***OPC Operation Complete Command**

This command causes the interface to set the OPC bit of the standard event status register as "1" when the electronic load has completed all pending operations.

Command Syntax: *OPC

Query Syntax: *OPC?

Return Parameters: <NR1>

***PSC Power-on Status Clear Command**

This command controls the automatic clearing of the status byte enable register, the operation status enable register, the questionable status enable Register and the standard event status enable register when the electronic load is re-powered on.

1 or **ON** This choice enables the power-on clearing of the listed registers.

0 or **OFF** This choice disable the clearing of the listed registers and they retain their status when a power-on condition occurs.

Command Syntax： *PSC <bool>

Parameters: 0|1|ON|OFF

Query Syntax: *PSC?

Return Parameters: 0|1

***RCL Recall Instrument State Command**

This command restores the electronic load to a state that was previously stored in memory.

Command Syntax： *RCL <NR1>

Parameters: 1~20

Example: *RCL 3

***RST Reset Command**

This command resets the state of the electronic load to its factory default.

Command Syntax: *RST

Parameters： None

***SAV Save Command**

This command stores the present state of the electronic load to a specified location in memory.

Command Syntax： *SAV <NR1>

Parameters: 1~20

Example: *SAV 3

***SRE Service Request Enable Command/Query**

This commands sets the condition of the service request enable register, which determines which events of the status byte register are allowed to set RQS of the status byte register. A "1" in the bit position enables the corresponding event. The bits in the status byte enable register are defined as the same with those in the status byte register.

Command Syntax： *SRE <NRf>

Parameters: 0~255

Power-on Value: Refer to *PSC command

Example: *SRE 128

Query Syntax: *SRE?

Return Parameters: <NR1>

***STB? Read Status Byte Query**

This command reads the status byte register. The status byte register is cleared to be zero when this command is executed.

Query Syntax: *STB?

Return Parameters： <NR1>

***TST? Self-test Query**

These command requests the electronic load make internal self-test and report the errors.

5.4. Required Command

5.4.1. System Command

SYSTem:ERRor?

This command is used to query the error information.

Query Syntax: SYSTem:ERRor[:NEXT]?

Return Parameters: <NR1>，<SRD>

Example: SYST:ERR?

SYSTem:VERSion?

This command is used to query the SCPI version applied to the electronic load. Its format is YYYY.V

Query Syntax: SYSTem:VERSion?

Return Parameters: <NR1>， <SRD>

Example： SYST:VERS?

SYSTem:SENSe

This command is used to turn on or turn off the remote sensing function.

Command Syntax: SYSTem:SENSe[:STATe] <bool>

Parameters: 0 | 1 | OFF | ON

Reset Value: OFF

Example: SYST:SENS ON

Query Syntax: SYSTem:SENSe[:STATe]?

Return Parameters: 0 | 1

SYSTem:BEEPer:STATe

This command is used to enable or disable the buzzer.

Command Syntax: SYSTem:BEEPer:STATe <bool>

Parameters: 0 | 1 | OFF | ON

Reset Value: OFF

Example: SYST:BEEP:STAT ON

Query Syntax: SYSTem:BEEPer:STATe?

Return Parameters: 0 | 1

SYSTem:LOCal

This command is used to enable the local operation. All the keys at the front panel of the load are enabled for operation.

Command Syntax: SYSTem:LOCal

Example: SYST:LOC

SYSTem:REMote

This command is used to enable the remote operation. Except the key ***Shift-Local***, all other keys at the front panel of the load are disabled for operation. Exit the remote operation by pressing the key ***Shift-Local***.

Command Syntax: SYSTem:REMote

Example: SYST:REM

SYSTem:RWLock

This command is used to enable the remote operation. All keys at the front panel of the load, including the key ***Shift-Local***, are disabled for operation. Exit the remote operation to local operation by using the command ***SYSTem:LOCal***.

Command Syntax: SYSTem:RWLock

Example: SYST:RWL

5.4.2. Status Command

STATus:QUEStionalbe?

This command is used to read the event register in the questionable status register.

Query Syntax: STATus:QUEStionable[:EVENt]?

Example: STAT:QUES:EVEN?

Return Parameters: <NR1>

STATus:QUEStionalbe:CONDition?

This command is used to read the condition register in the questionable status register.

Query Syntax: STATus:QUEStionable:CONDition?

Example: STAT:QUES:COND?

Return Parameters: <NR1>

STATus:QUEStionalbe:ENABle

This command is used to set or read the enable register in the questionable status register.

Command syntax: STATus:QUEStionable <NRf+>

Parameters: 0 ~ 32767
Example: STAT:QUES:ENAB 32
Query Syntax: STATus:QUEStionalbe:ENABle?
Return Parameters: <NR1>

STATus:OPERation?

This command is used to read the event register in the operation status register.

Query Syntax: STATus:OPERation[:EVENt]?
Example: STAT:OPER:EVEN?
Return Parameters: <NR1>

STATus: OPERation:CONDition?

This command is used to read the condition register in the operation status register.

Query Syntax: STATus:OPERation:CONDition?
Example: STAT:OPER:COND?
Return Parameters: <NR1>

STATus: OPERation:ENABle

This command is used to set or read the enable register in the operation status register.

Command Syntax: STATus:OPERation <NRf+>
Parameters: 0 ~ 32767
Example: STAT: OPER:ENAB 32
Query Syntax: STATus:OPERation:ENABle?
Return Parameters: <NR1>

5.5. Input Setup Command

5.5.1. Input control

[SOURce:]INPut

This command is used to turn on or off the input.

Command syntax: [SOURce:]INPut[:STATe] <bool>
Parameters: 0 | 1 | OFF | ON
Reset Value: OFF
Example: INP 1
Query Syntax: INPut[:STATe]?
Return Parameters: 0 | 1

[SOURce:]INPut:SHORt

This command is used to enable or disable the short-circuit of the input.

Command Syntax: [SOURce:]INPut:SHORt <bool>
Parameters: 0 | 1 | OFF | ON
Reset Value: OFF
Example: INP:SHOR 1
Query Syntax: INPut:SHORt?
Return Parameters: 0 | 1

5.5.2. System Parameters Setup

[SOURce:]CURRent:RANGe

This command is the set the current range. When the set current is in low current range please select the low current range; otherwise select the high current range.

Command Syntax: [SOURce:]CURRent:RANGe <NRf+>
Parameters: 0 ~ MAX | MINimum | MAXimum

Unit: A
Reset Value: MAXimum (high current range)
Example: CURR:RANGE MIN
Query Syntax: [SOURce:]CURRent:RANGe?
Return Parameters: <NR2>

[SOURce:]VOLTage:RANGe

This command is the set the voltage range. When the set voltage is in low voltage range please select the low voltage range; otherwise select the high voltage range.

Command Syntax: [SOURce:]VOLTage:RANGe <NRf+>
Parameters: 0 ~ MAX | MINimum | MAXimum
Unit: V
Reset Value: MAXimum (high voltage range)
Example: SOUR:VOLT:RANGE MIN
Query Command: [SOURce:]VOLTage:RANGe?
Return Parameters: <NR2>

[SOURce:]CURRent:SLEW

This command is used to set the same current rising and falling slew rate.

Command Syntax: [SOURce:]CURRent:SLEW[:BOTH] <NRf+>
Parameters: MIN ~ MAX | MINimum | MAXimum
Unit: A/s
Reset Value: MAXimum
Example: CURR:SLEW 300000
CURR:SLEW 0.3A/uS
Query Syntax: [SOURce:]CURRent:SLEW?
Return Parameters <NR2>

[SOURce:]CURRent:SLEW:RISE

This command is used to set the current rising slew rate.

Command Syntax: [SOURce:]CURRent:SLEW:RISE <NRf+>
Parameters: MIN ~ MAX | MINimum | MAXimum
Unit: A/s
Reset Value: MAXimum
Example: CURR:SLEW:RISE 3000
Query Syntax: [SOURce:]CURRent:SLEW:RISE?
Return Parameters: <NR2>

[SOURce:]CURRent:SLEW:FALL

This command is used to set the current falling slew rate.

Command Syntax: [SOURce:]CURRent:SLEW:RISE <NRf+>
Parameters: MIN ~ MAX | MINimum | MAXimum
Unit: A/s
Reset Value: MAXimum
Example: CURR:SLEW:RISE 3000
Query Syntax: [SOURce:]CURRent:SLEW:RISE?
Return Parameters: <NR2>

[SOURce:]CURRent:PROTection

This command is used to set the current protection value.

Command Syntax: [SOURce:]CURRent:PROTection[:LEVel] <NRf+>

Parameters: 0 ~ MAX | MINimum | MAXimum
Unit: A
Reset Value: MAXimum
Example: CURR:PROT 3
Query Syntax: [SOURce:]CURRent:PROTection[:LEVel]?
Return Parameters: <NR2>

[SOURce:]POWer:PROTection

This command is used to set the power protection value.

Command Syntax: [SOURce:]POWer:PROTection[:LEVel] <NRf+>
Parameters: 0 ~ MAX | MINimum | MAXimum
Unit: V
Reset Value: MAXimum (high range)
Example: POW:PROT 100
Query Syntax: [SOURce:] POWer:PROTection[:LEVel]?
Return Parameters: <NR2>

[SOURce:]VOLTage:[LEVel:]ON

This command is used to set the Von value of the electronic load.

Command Syntax: [SOURce:]Voltage:[LEVel:]ON <NRf+>
Parameters: 0 ~ MAX | MINimum | MAXimum
Unit: V
Reset Value: 1
Example: VOLT:ON 3
Query Syntax: [SOURce:] VOLTage:[LEVel:]ON?
Return Parameters: <NR2>

[SOURce:]VOLTage:[LEVel:]OFF

This command is used to set the Voff value of the electronic load.

Command Syntax: [SOURce:]Voltage:[LEVel:]OFF <NRf+>
Parameters: 0 ~ MAX | MINimum | MAXimum
Unit: V
Reset Value: 0.5
Example: VOLT:OFF 2
Query Syntax: [SOURce:] VOLTage:[LEVel:]OFF?
Return Parameters: <NR2>

5.5.3. Working Mode Control

[SOURce:]FUNCtion

[SOURce:]MODE

These two commands have the same function. Both are used to select the input working mode of the electronic load.

Command Syntax: [SOURce:]FUNCtion <function>
[SOURce:]MODE <function>

Parameters	Working Mode
CURRent	Constant Current Mode
VOLTage	Constant Voltage Mode
POWer	Constant Power Mode
RESistance	Constant Resistance Mode
DYNamic	Dynamic Operation Mode

LED	LED Mode

Reset Value: CURRent

Example: FUNC RES

MODE RES

Query Syntax: [SOURce:]FUNCtion?

[SOURce:]MODE?

Return Parameters: <CRD>

5.5.4. Working Parameters Setup

[SOURce:]CURRent

This command is used to set the current in CC mode.

Command Syntax:

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude] <NRf+>

Parameters: 0 ~ MAX | MINimum | MAXimum

Unit: A

Reset Value: MINimum

Example: CURR 5

Query Syntax: [SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]?

Return Parameters: <NR2>

[SOURce:]VOLTage

This command is used to set the voltage in CV mode.

Command Syntax:

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <NRf+>

Parameters: 0 ~ MAX | MINimum | MAXimum

Unit: V

Reset Value: MAXimum

Example: VOLT 5

Query Command: [SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]?

Return Parameters: <NR2>

[SOURce:]POWer

This command is used to set the power in CP mode.

Command syntax:

[SOURce:]POWer[:LEVel][:IMMediate][:AMPLitude] <NRf+>

Parameters: 0 ~ MAX | MINimum | MAXimum

Unit: W

Reset Value: MINimum

Example: POW 10

Query Syntax: [SOURce:]POWer[:LEVel][:IMMediate][:AMPLitude]?

Return Parameters: <NR2>

[SOURce:]RESistance

This command is used to set the resistance in CR mode.

Command Syntax:

[SOURce:]RESistance[:LEVel][:IMMediate][:AMPLitude] <NRf+>

Parameters: 0 ~ MAX | MINimum | MAXimum

Unit: ohm

Reset Value: MAXimum

Example: RES 5

Query Syntax: [SOURce:]RESistance[:LEVel][:IMMediate][:AMPLitude]?

Return Parameters: <NR2>

[SOURce:]CURRent:DYNamic:HIGH

This command is used to set the high-level loading current in dynamic mode.

Command Syntax: [SOURce:]DYNamic:HIGH[:LEVel] <NRf+>

Parameters: 0 ~ MAX | MINimum | MAXimum

Unit: A

Reset Value: 0

Example: CURR:DYN:HIGH 10

Query Syntax: [SOURce:] DYNamic:HIGH[:LEVel]?

Return Parameters: < NR2>

[SOURce:]CURRent:DYNamic:HIGH:DWELl

This command is used to set the dwelling time of the high-level loading current in dynamic mode.

Command Syntax: [SOURce:] DYNamic:HIGH:DWELl <NRf+>

Parameters: 0.00002 ~ 0.999 | MINimum | MAXimum

Unit: s

Reset Value: 0.00002

Example: CURR:DYN:HIGH:DWELL 10

Query Syntax: [SOURce:] DYNamic:HIGH:DWELl?

Return Parameters: < NR2>

[SOURce:]CURRent:DYNamic:LOW

This command is used the low-level loading current in dynamic mode.

Command Syntax: [SOURce:] DYNamic:LOW[:LEVel] <NRf+>

Parameters: 0 ~ MAX| MINimum | MAXimum

Unit: A

Reset Value: 0

Example: CURR:DYN:LOW 1

Query Syntax: [SOURce:] DYNamic:LOW[:LEVel]?

Return Parameters: < NR2>

[SOURce:]CURRent:DYNamic:LOW:DWELl

This command is used to set the dwelling time of the low-level loading current in dynamic mode.

Command Syntax: [SOURce:] DYNamic:LOW:DWELl <NRf+>

Parameters: 0.00002 ~ 0.999 | MINimum | MAXimum

Unit: s

Reset Value: 0.00002

Example: CURR:DYN:LOW:DWEL 10

Query Syntax: [SOURce:] DYNamic:LOW:DWELl?

Return Parameters: < NR2>

[SOURce:]CURRent:DYNamic:SLEW

This command is used to set the same current rising and falling slew rate in dynamic mode.

Command Syntax: [SOURce:] DYNamic:SLEW <NRf+>

Parameters: MIN ~ MAX | MINimum | MAXimum

Unit: A/s

Reset Value: MAX

Example: CURR:DYN:SLEW 30000

Query Syntax: [SOURce:] DYNamic:SLEW?

Return Parameters: < NR2>

[SOURce:]CURRent:DYNamic:SLEW:RISE

This command is used to set the current rising slew rate in dynamic mode.

Command Syntax: [SOURce:] DYNamic:SLEW:RISE <NRf+>
Parameters: MIN ~ MAX | MINimum | MAXimum
Unit: A/s
Reset Value: MAX
Example: CURR:DYN:SLEW 30000
Query Syntax: [SOURce:] DYNamic:SLEW:RISE?
Return Parameters: < NR2>

[SOURce:]CURRent:DYNamic:SLEW:FALL

This command is used to set the current falling slew rate in dynamic mode.

Command Syntax: [SOURce:] DYNamic:SLEW:FALL <NRf+>
Parameters: MIN ~ MAX | MINimum | MAXimum
Unit: A/s
Reset Value: MAX
Example: CURR:DYN:SLEW:FALL 30000
Query Syntax: [SOURce:] DYNamic:SLEW:FALL?
Return Parameters: < NR2>

[SOURce:]CURRent:DYNamic:MODE

This command is used to set the working mode in dynamic mode.

Command Syntax: [SOURce:] DYNamic:MODE <mode>
Parameters: CONTinuous | PULSe | TOGGle
Reset Value: CONTinuous
Example: CURR:DYN:MODE PULS
Query Syntax: [SOURce:] DYNamic:MODE?
Return Parameters: <CRD>

LED:VOLTage

This command is used to set LED Vo.

Command Syntax: LED:VOLTage <Nrf+>
Parameters: 0.001~MAX
Example: LED:VOLT 18
Query Syntax: LED:VOLT？
Return Parameters: <NR2>

LED:CURRent

This command is used to set LED Io.

Command Syntax: LED:CURRent <Nrf+>
Parameters: 0~MAX
Example: LED:CURR 0.35
Query Syntax: LED:CURR？
Return Parameters: <NR2>

LED:RCOeff

This command is used to set LED Rd Coeff.

Command Syntax: LED:RCOeff <Nrf+>
Parameters: 0.001~1
Example: LED:RCO 0.2

Query Syntax: LED:RCO?

Return Parameters: <NR2>

5.6. Measure Command

MEASure:VOLTage?

This command is used to read the average voltage.

Command Syntax: MEASure[:SCALar]:VOLTage[:DC]?

Example: MEAS:VOLT?

Return Parameters: <NR2>

MEASure:VOLTage:MAXimum?

This command is used to read the peak voltage Vp+.

Command Syntax: MEASure[:SCALar]:VOLTage:MAXimum?

Example: MEAS:VOLT:MAX?

Return Parameters: <NR2>

MEASure:VOLTage:MINimum?

This command is used to read the valley voltage Vp-.

Command Syntax: MEASure[:SCALar]:VOLTage:MINimum?

Example: MEAS:VOLT:MIN?

Return Parameters: <NR2>

MEASure:VOLTage:PTPeak?

This command is used to read the peak to peak voltage Vpp.

Command Syntax: MEASure[:SCALar]:VOLTage:PTPeak?

Example: MEAS:VOLT:PTP?

Return Parameters: <NR2>

MEASure:CURRent?

This command is used to read the average current.

Command Syntax: MEASure [:SCALar]:CURRent[:DC]?

Example: MEAS:CURR?

Return Parameters: <NR2>

MEASure: CURRent:MAXimum?

This command is used to read the peak current Vp+.

Command Syntax: MEASure[:SCALar]:CURRent:MAXimum?

Example: MEAS:CURR:MAX?

Return Parameters: <NR2>

MEASure: CURRent:MINimum?

This command is used to read the valley current Vp-.

Command Syntax: MEASure[:SCALar]:CURRent:MINimum?

Example: MEAS:CURR:MIN?

Return Parameters: <NR2>

MEASure:CURRent:PTPeak?

This command is used to read peak to peak current Ipp.

Command Syntax: MEASure[:SCALar]:CURRent:PTPeak?

Example: MEAS:CURR:PTP?

Return Parameters: <NR2>

MEASure:POWer?

This command is used to read average power.

Command Syntax: MEASure [:SCALar]:POWer[:DC]?
Example: MEAS:POWer?
Return Parameters: <NR2>

MEASure:RESistance?

This command is used to read equivalentresistance.
Command Syntax: MEAS[:SCALar]:RESistance[:DC]?
Example: MEAS:RESistance?
Return Parameters: <NR2>

5.7. OCP Test Command

OCP[:STATe]

This command is used to start or stop OCP test.
Command Syntax: OCP[:STATe] <bool>
Parameters: 0 | 1 | OFF | ON
Example: OCP ON
Query Syntax: OCP[:STATe]?
Return: 0 | 1

OCP:ISTart

This command is used to set the starting current of the OCP test.
Command Syntax: OCP:ISTart <NRf+>
Parameters: 0 ~ MAX
Unit: A
Example: OCP:IST 3
Query Syntax: OCP:ISTart?
Return: < NR2>

OCP:IEND

This command is used to set the ending current of the OCP test.
Command Syntax: OCP:IEND <NRf+>
Parameters: 0 ~ MAX
Unit: A
Example: OCP:IEND 6
Query Syntax: OCP:IEND?
Return: < NR2>

OCP:STEP

This command is used to set the current rising steps of the OCP test.
Command Syntax: OCP:STEP <NR1>
Parameters: 1 ~ 1000
Example: OCP:STEP 500
Query Syntax: OCP:STEP?
Return: <NR2>

OCP:DWELl

This command is used to set the single step dwelling time of the OCP test.
Command Syntax: OCP:DWELl <NRf+>
Parameters: 0.00001 ~ 0.99999
Unit: S
Example: OCP:DWEL 0.01 or OCP:DWEL 10ms

Query Syntax: OCP:DWEL?
Return: < NR2>

OCP:VTRig

This command is used to set the trigger voltage level of the OCP test.

Command Syntax: OCP:VTRig <NRf+>
Parameters: 0 ~ MAX
Unit: V
Example: OCP:VTR 11.8
Query Syntax: OCP:VTRig?
Return: < NR2>

OCP:RESult[:OCP]

This command is used to query the current at OCP point.

Command Syntax: OCP:RESult[:OCP]?
Parameters: <NRf+>
-1 means the test has not finished yet.
-2 means the voltage of the measured power supply doesn't drop to the Vtrig, i.e. OCP isn't initiated.
Unit: A
Example: OCP:RES?
Return: 4.68

OCP:RESult:PMAX

This command is used to query Pmax point.

Command Syntax: OCP:RESult:PMAX?
Parameters: < NR2>，< NR2>，< NR2>
Unit: W，V，A
Example: OCP:RES:PMAX?
Return: 55.34，11.8，4.69

Means the maximum power at Pmax point is 55.34W and the voltage and current at Pmax point is 11.8V & 4.69A respectively.

5.8. OVP Test Command

OVP[:STATe] This command is used to start or stop OVP test.

Command Syntax: OVP[:STATe] <bool>
Parameters: 0 | 1 | OFF | ON
Example: OVP ON
Query Syntax: OVP[:STATe]?
Return: 0 | 1

OVP:VTRig This command is used to set OVP trigger level.

Command Syntax: OVP:VTRig <NRf+>
Parameters: 0 ~ MAX
Unit: V
Example: OVP:VTR 4
Query Syntax: OVP:VTRig?
Return: < NR2>

OVP:RESult[:OVP] This command is used to query the voltage value at OVP point.

Command Syntax: OVP:RESult[:OVP]?

Return Parameters: <NRf+>
-1 means the test has not been finished yet.
-2 means OVP test has not been started yet.
Unit: V
Example: OVP:RES?
Return: 6.68

OVP:RESult:TIME This command is used to query tovp
Command Syntax: OVP:RESult:TIME?
Return Parameters: < NR2>
Unit: S
Example: OVP:RES:TIME?
Return: 0.126

5.9. Timing Measurement Command

TIMing[:STATe]

This command is used to start or stop Timing Measurement.
Command Syntax: TIMing[:STATe] <bool>
Parameters: 0 | 1 | OFF | ON
Example: TIM ON
Query Syntax: TIMing[:STATe]?
Return: 0 | 1

TIMing:LOAD:SETTing

This command is used to confirm if the load setup is changed in timing measurement.
命令语法 TIMing:LOAD:SETTing <bool>
参数 0 | 1 | OFF | ON
ON means when the timing measurement is started, the load setup will be changed according to the setup in TIMing:LOAD and when the timing measurement is finished, the load input will be off.
OFF means the load setup will not be changed when the timing measurement is started or finished.
例子 TIM:LOAD:SETT OFF
查询语法 TIMing:LOAD:MODE?
返回 <mode>

TIMing:LOAD:MODE

This command is used to set the loading mode of the timing measurement
Command Syntax: TIMing:LOAD:MODE <mode>
Parameters: CURR | VOLT | POW | RES | OFF
Example: TIM:LOAD:MODE CURR
Query Syntax: TIMing:LOAD:MODE?
Return: <mode>
Related Command: If there is the command ***TIM:LOAD:SETT OFF***, then the command ***TIMing:LOAD:MODE*** can be ignored.

TIMing:LOAD:VALue

This command is used to set the loading parameters of the timing measurement.
Command Syntax: TIMing:LOAD:VALue <Nrf+>

Parameters: A / V / W / ohm, depends on TIMing:LOAD:MODE
Example: TIM:LOAD:VAL 1
Query Syntax: TIMing:LOAD:VALue?
Return: <NR2>
Related Command: If there is the command ***TIM:LOAD:SETT OFF***, then the command ***TIMing:LOAD:MODE*** can be ignored.

TIMing:TSTart:SOURce

This command is used to set the trigger source of the start-up test.
Command Syntax: TIMing:TSTart:SOURce <source>
Parameters: VOLT | CURR | EXT
Example: TIM:TST:SOUR VOLT
Query Syntax: TIMing:TSTart:SOURce?
Return: <source>

TIMing:TSTart:EDGE

This command is used to set the trigger edge of the start-up test.
Command Syntax: TIMing:TSTart:EDGE <edge>
Parameters: RISE | FALL
Example: TIM:TST:EDGE RISE
Query Syntax: TIMing:TSTart:EDGE?
Return: <edge>

TIMing:TSTart:LEVel

This command is used to set the trigger voltage level of the start-up test.
Command Syntax: TIMing:TSTart:LEVel <Nrf+>
Parameters: depends on the start-up trigger source, that is, Timing:TSTart:SOURce
Example: TIM:TST:LEV 1
Query Syntax: TIMing:TSTart:LEVel?
Return: <NR2>

TIMing:TEND:SOURce

This command is used to set the trigger source of ending the test.
Command Syntax: TIMing:TEND:SOURce <source>
Parameters: VOLT | CURR | EXT
Example: TIM:TEND:SOUR VOLT
Query Syntax: TIMing:TEND:SOURce?
Return: <source>

TIMing:TEND:EDGE

This command is sued to the trigger edge of ending the test.
Command Syntax: TIMing:TEND:EDGE <edge>
Parameters: RISE | FALL
Example: TIM:TEND:EDGE RISE
Query Syntax: TIMing:TEND:EDGE?
Return: <edge>

TIMing:TEND:LEVel

This command is used to set the trigger voltage level of ending the test.
Command Syntax: TIMing:TEND:LEVel <Nrf+>
Parameters: depends on the trigger source, that is Timing:TEND:SOURce
Example: TIM:TEND:LEV 1

Query Syntax: TIMing:TEND:LEVel?

Return: <NR2>

TIMing:RESult

This command is used to query the result of the Timing measurement.

Command Syntax: TIMing:RESult?

Unit: S

Example: TIM:RES?

Return: <NR2>

5.10. Peak Test Command

Peak command can be used to read the maximum/ minimum value and clear the Peak Value Record automatically when the test is started.

PEAK[:STATe] This command is used to start or stop the peak value test.

Command Syntax: PEAK[:STATe] <bool>

Example: PEAK ON

PEAK:CLEar This command is used to clear the peak value record.

Command Syntax: PEAK:CLEar

Example: PEAK:CLE

PEAK:VOLTage:MAXimum? This command is used to read the maximum voltage.

Command Syntax: PEAK:VOLTage:MAXimum?

Example: PEAK:VOLT:MAX?

Return Parameters: <NR2>

PEAK:VOLTage:MINimum? This command is used to read the minimum voltage.

Command Syntax: PEAK:VOLTage:MINimum?

Example: PEAK:VOLT:MIN?

Return Parameters: <NR2>

PEAK:CURRen:MAXimum? This command is used to read the maximum current.

Command Syntax: PEAK:CURRent:MAXimum?

Example: PEAK:CURR:MAX?

Return Parameters: <NR2>

PEAK:CURRent:MINimum? This command is used to read the minimum current.

Command Syntax: PEAK:CURRent:MINimum?

Example: PEAK:CURR:MIN?

Return Parameters: <NR2>

5.11.TWaveform Transient Waveform Grab Command

TWAVeform This command can be used to grab the transient voltage and current waveform when the current changes from Ia to Ib.

TWAVeform[:STATe] This command is used to start or stop the transient waveform grab.

Command Syntax: TWAVeform[:STATe] <bool>

Example: TWAV ON

TWAVeform:IA This command is used to set Ia.

Command Syntax: TWAVeform:IA <Nrf+>

Example: TWAV:IA 1

TWAVeform:IB This command is used to set Ib.

Command Syntax: TWAVeform:IB <Nrf+>

Example: TWAV:IA 3

TWAVeform:TINTval This command is used to set the sampling interval. Range: 10us ~ 1ms.

Command Syntax: TWAVeform:TINTval <Nrf+>

Example: TWAV:TINT 0.00001 Sampling interval: 10us

TWAVeform:POINts This command is used to set the number of the sampling points. Range: 2~4096

Command Syntax: TWAVeform:POINts <Nrf+>

Example: TWAV:POIN 100 No. of sampling points: 100 points.

TWAVeform:VOLTage? This command is used to read the voltage waveform data.

Command Syntax: TWAVeform:VOLTage?

Example: TWAV:VOLT?

TWAVeform:CURRent? This command is used to read the current waveform data.

Command Syntax: TWAVeform:CURRent?

Example: TWAV:CURR?

Certification & Guarantee

JT632xA series programmable DC electronic load meet its published specifications at time of shipment from the factory.

Warranty

This instrument product is warranted against defects in material and workmanship for a period of one year from date of delivery.

Maintenance Service

This product must be returned to maintenance department designated by our company for repairing. Customer shall prepay shipping charges (and shall pay all duty and taxes) for products returned to the supplier for warranty service. Except for products returned to customer from another country, supplier shall pay for return of products to customer.

Limitation of Warranty

The foregoing warranty shall not apply to

1. Defects resulting from improper or inadequate maintenance by the Customer,

2. Unauthorized modification or misuse,

3. Operation outside of the environmental specifications for the product, or improper site preparation and maintenance.

4. Defects resulting from the circuit installed by clients themselves

Attention

No inform will be given for any changes in the content of the user's guide. Jartul Electronics company reserves the right to interpret.