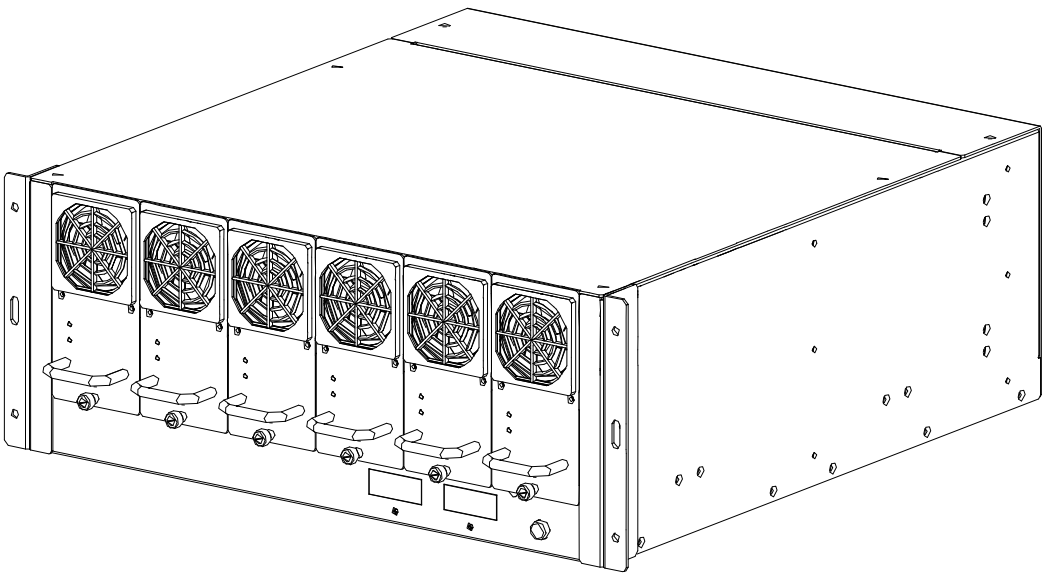
Chroma

Modular DC Power Supply
62000B Series
Operation Manual



Version 1.3
January 2008
P/N A11 001086

Legal Notices

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

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CHROMA ATE INC.
66 Hwa-Ya 1st Rd., Hwa-Ya Technical Park, Kuei-Shan Hsiang, Taoyuan Hsien, Taiwan

Warranty

All Chroma instruments are warranted against defects in material and workmanship for a period of one year after 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. Transportation to the factory or service center is to be prepaid by purchaser. Shipment should not be made without prior authorization by Chroma.

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

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Material Contents Declaration

A regulatory requirement of The People's Republic of China defined by specification SJ/T 11364-2006 mandates that manufacturers provide material contents declaration of electronic products, and for Chroma products are as below:

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls	Polybromodiphenyl Ethers
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
PCBA	×	O	O	O	O	O
CHASSIS	×	O	O	O	O	O
ACCESSORY	×	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

"O" indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

"×" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

1. Chroma is not fully transitioned to lead-free solder assembly at this moment; however, most of the components used are RoHS compliant.
2. The environment-friendly usage period of the product is assumed under the operating environment specified in each product's specification.

Disposal

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

www.chromaate.com Chroma

CE

Declaration of Conformity

For the following equipment :

DC Power Supply

(Product Name/ Trade Name)

62015b-xx (xx can be 15,30,60,80,150)

(Model Designation)

Chroma ATE Inc.

(Manufacturer Name)

66 Hwa-Ya 1st Rd., Hwa-Ya Technical Park, Kuei-Shan Hsiang, Taoyuan Hsien, 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 (89/336/EEC), and the Amendment Directive (92/31/EEC), Low-voltage Directive (73/23/EEC) and the Amendment Directive (93/68/EEC). For the evaluation regarding the Directives, the following standards were applied :

IEC 61010-1:2001

EN 61326:1997+A1:1998+A2:2001 Class A

EN 61326:1997+A1:1998+A2:2001 (industrial locations)

IEC 61000-4-2:1995+A1:1998+A2:2000;

IEC 61000-4-3:1995+A1:1998+A2:2000; IEC 61000-4-4:2004; IEC 61000-4-5:1995+A1:2000;

IEC 61000-4-6:1996+A1:2000; IEC 61000-4-8:1993+A1:2000 ; IEC 61000-4-11:2004

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

Chroma ATE Inc.

(Company Name)

66 Hwa-Ya 1st Rd., Hwa-Ya Technical Park, Kuei-Shan Hsiang, Taoyuan Hsien, Taiwan.

(Company Address)

Person responsible for this declaration:

Mr. Benjamin Huang

Benjamin Huang

(Name, Surname)

T & M BU / R&D Director

(Position/Title)

Taiwan	**2007.08.01**	
(Place)	(Date)	(Legal Signature)

Safety Summary

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

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

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

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

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

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the instrument in the presence of flammable gases or fumes.

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.

DO NOT OPERATE UNDER HUMID CONDITION

DO NOT TOUCH THE EXPOSED CIRCUIT BOARD

☞ **WARNING**

1. Hazardous voltage outputs for 15V, 30V, 60V, 80V &150V.
2. Touching the connected circuit or output terminal on the front or rear panel when power is on may result in death.

Safety Symbols

	**DANGER** – High voltage.
	**Explanation:** To avoid injury, death of personnel, or damage to the instrument, the operator must refer to an explanation in the instruction manual.
	**Protective grounding terminal:** To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground before operation of equipment.
☞ **WARNING**	The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.
↯ **CAUTION**	The **CAUTION** sign denotes a hazard. It may result in personal injury or death if not noticed timely. It calls attention to procedures, practices and conditions.

Revision History

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

Date	Version	Revised Sections
Sep. 2006	1.0	Complete this manual.
Aug. 2007	1.1	Add "*Material Contents Declaration*". Modify the following sections: – "*Specification*", "*Function Keys*" in the chapter of "*Overview*". – "*Setting for Mainframe and Power Module*" in the chapter of "*System Operation & Usage*". – "*Program Message Terminator (<PMT>)*", "*Commands of DC Power Supply*" and "*CAN BUS Configuration*" in the chapter of "*Communication Protocols*". Add the following sections: – "*Dimension Layout*" in the chapter of "*Overview*". – "*Installation in Rack*" in the chapter of "*Installation*". – "*Setting Over Voltage Protection*" and "*Application & Control Method for 62000B Series DC Power Supply*" in the chapter of "*System Operation & Usage*". – "*Rule for Setting 62000B CAN BUS Parameter (Slave)*", "*Rule for Setting CAN Adapter Parameter (Master)*", "*Description of CAN Packet*" and "*Example Program*" in the chapter of "*Communication Protocols*".
Nov. 2007	1.2	Modify the following sections – "*Rear Panel*" in the chapter of "*Overview*" to add *"Local or Remote Setting*". – "*Maintenane & Cleaning*" in the chapter of "*Installation*". – "*Setting Over Voltage Protection*" in the chapter of "*System Operation & Usage*".
Jan. 2008	1.3	Add the following section: – *"Notices When Connecting Conductive Load*" in the chapter of "*System Operation & Usage*".

Table of Contents

1. Overview

1.1 Introduction to System

Chroma 62000B Series DC Power Supply is a modular power system specially designed for burn-in use. It has 5 kinds of power output modules - Chroma 62015B-15-90 (15V/90A), 62015B-30-50 (30V/50A), 62015B-60-25 (60V/25A), 62015B-80-18 (80V/18A) and 62015B-150-10 (150V/10A) to output 12V, 24V, 48V, 72V and 110V DC power based on the module integrated. A system is able to install up to 6 power modules and they can be paralleled to output power within a Mainframe.

1.2 System Function

1.2.1 Operating Mode

(1) Manual Control: It is operated by the output ON/OFF button and VR on the front panel.
(2) Remote Control: It is operated via CANBUS for remote control.

1.2.2 Protection

It has the protection of input voltage over or under, over current or current limit, over temperature and cooling fan fail, etc.

1.3 Specification

Key Features:

1. Power System Ideal for Burn-in Applications
2. Higher Density (464mW/cm^3)
3. HOTSWAP CAPABLE
4. Cost-Effective for Burn-in Utility
5. Remote Sense, 3V Line Loss Compensation
6. Graphic Soft Panel Control and Monitor
7. Remote ON/OFF Signal
8. Remote CAN Bus Interface Control
9. DC OK Signal Output

The specifications of 62000B Series DC Power Supplies are shown in the table below. (Test condition: 25 ± 5°C and under resistance load.)

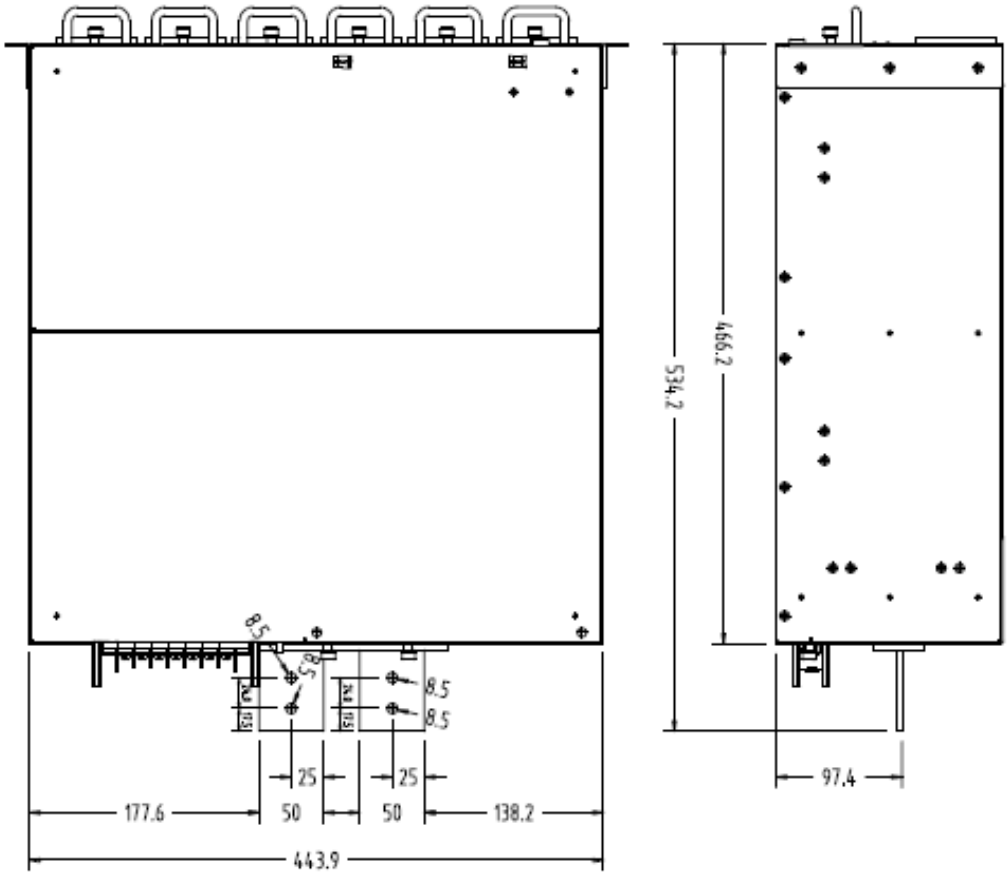
SPECIFICATIONS					
Model	**62015B-15-90**	**62015B-30-50**	**62015B-60-25**	**62015B-80-18**	**62015B-150-10**
Electrical Specifications					
Output Ratings					
Output Power	1350W	1500W	1500W	1440W	1500W
Output Voltage	1~15V	1~30V	1~60V	1~80V	1~150V
Voltage Setting (Factory Default)	12V	24V	48V	72V	110V
Output Current	90A	50A	25A	18A	10A
Line Regulation	0.1% FS				
Load Regulation[1]	1% FS				
Programming Accuracy	1% FS				
Measurement Accuracy	1% FS				
Output Noise (20MHz)					
Voltage Noise (P-P)	100mV	100mV	200mV	200mV	400mV
Voltage Ripple (rms)	30mV	30mV	50mV	50mV	100mV
Current Ripple (rms)	0.9A	0.5A	0.25A	0.18A	0.1A
Efficiency	**>87%@ Full load**	> 88% @ full load (typical)			
Turn on over shoot voltage[2]	5% of nominal output				
Transient Response Time[3]	< 5 ms				
AC Input Voltage					
Six Position Mainframe	187 ~ 250Vac (3 Phase 4 Wire, Δ Connection) or 323 ~ 437Vac (3 Phase 5 Wire, Y Connection)/45 ~ 65 Hz				
Three Position Mainframe	187 to 250Vac (single phase) / 45 ~ 65 Hz				
Input Power Factor	> 0.98@ full load				
Protection Function					
OVP	Automatically shuts down at 115% of set value				
OCP	Current limit (0~100%) / OCP Shutdown at 115% of FS				
OTP	Automatically shuts down if internal limit is reached				
I/O Signal					
Remote ON/OFF (I/P)	Dry contact (closed = enabled), vice versa.				
AUX Voltage	4 ~ 24V/0.5A at mainframe(by trimmer adjust voltage)				
DC OK Signal Type (O/P)	Dry contact (closed = enabled) (Error : OVP/OCP/OTP/AC Fault)				
Programming Response Time[4] **(Typical)**					
Rise Time (Full Load)	For a programmed 5% to 95% step in output voltage : 100ms				
Rise Time (No Load)	For a programmed 5% to 95% step in output voltage : 100ms				
Fall Time (Full Load)	For a programmed 95% to 5% step in output voltage : 40ms				
Fall Time (No Load)	For a programmed 95% to 5% step in output voltage : 5s				
Vout Setting	CAN Bus send command to DC module receiver : 1s				
Measurement V & I	Under CAN command using fetch : 100ms				
Delay Time	For output ON/OFF enable and disable (under CAN command) : 5s(Single Mainframe)				
General Specifications					
Remote Sensing	3V max. line loss compensation				
Parallel Operation	Current Sharing (+/-5%)				
Operating Temperature	0~50°C				
Humidity Range	0~90% RH. Non-condensing				
Remote Interface	CAN Bus (optional)				
Safety & EMC	CE				

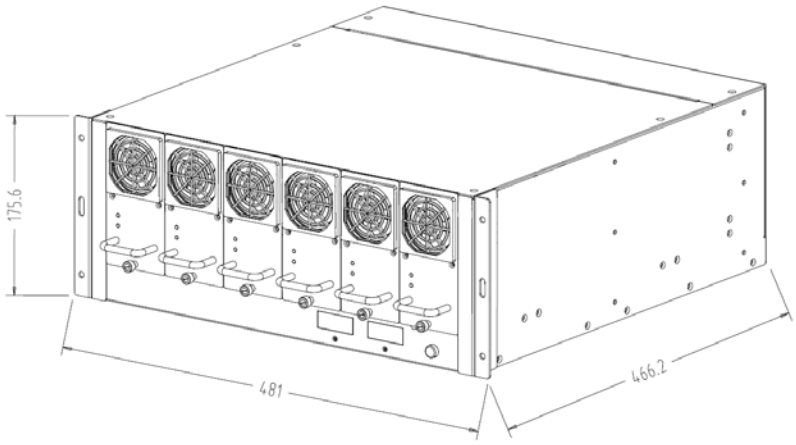
All specifications are subject to change without prior notice.

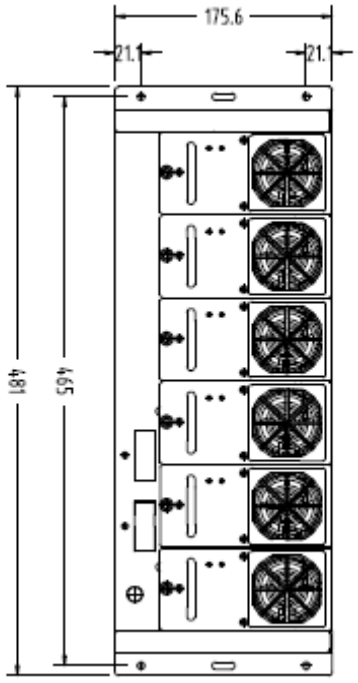
Note 1: For 50% step load variation with remote sense at maximum output voltage
Note 2: Based on rise time of 100ms
Note 3: Time for the output voltage to recover within 1% of its rated for a load changed of 25%
Note 4: Six Position Mainframe through CAN
Note 5: OVP Protection, see 3.3.1 *Setting Over Voltage Protection.*
Note 6: Typical efficiency at 250VAC input voltage and full output power.

1.3.1 Dimension Layout

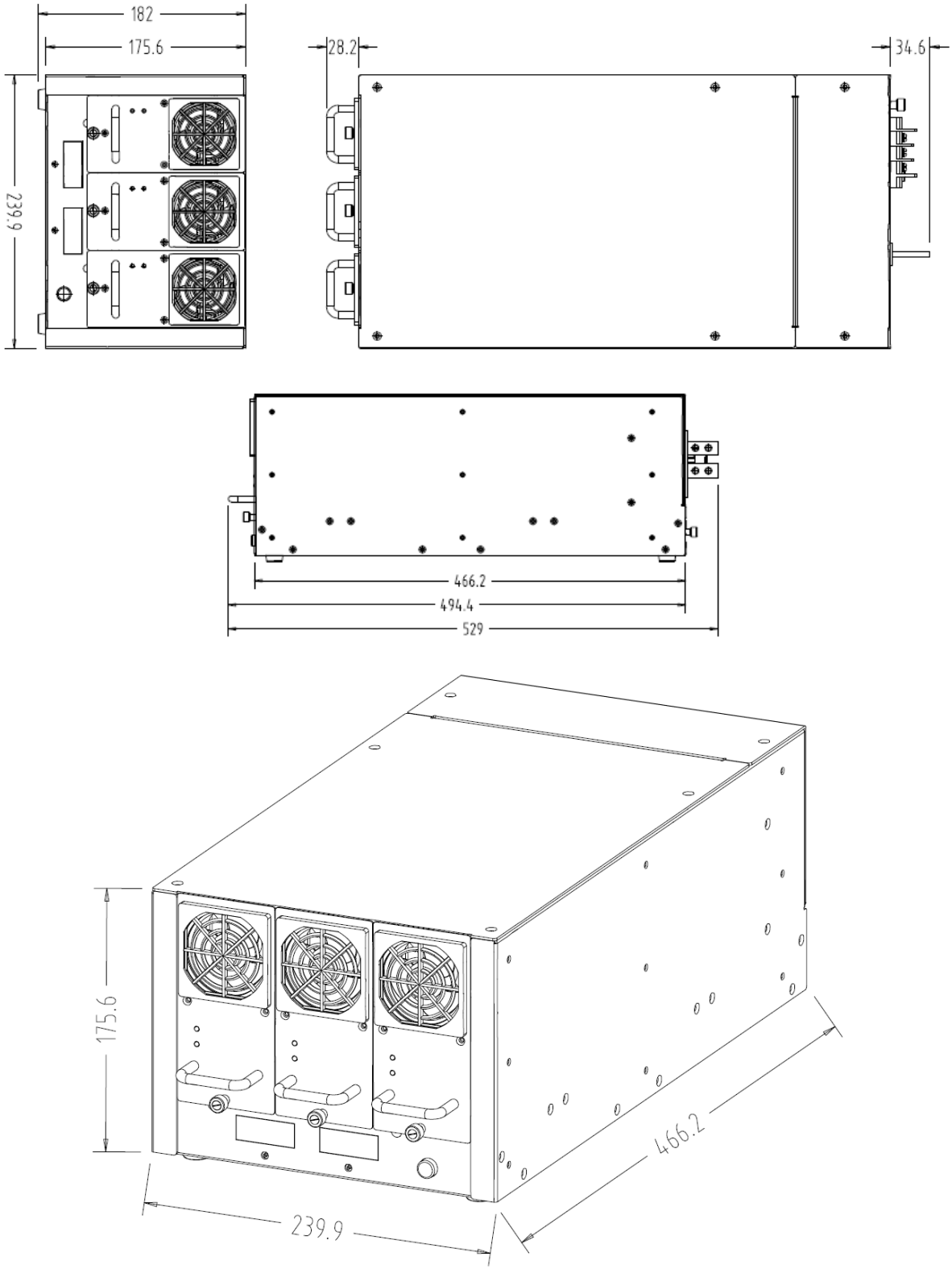
Mainframe: 62000B-6-1 (Weight: 14Kg or 30.8 lbs)



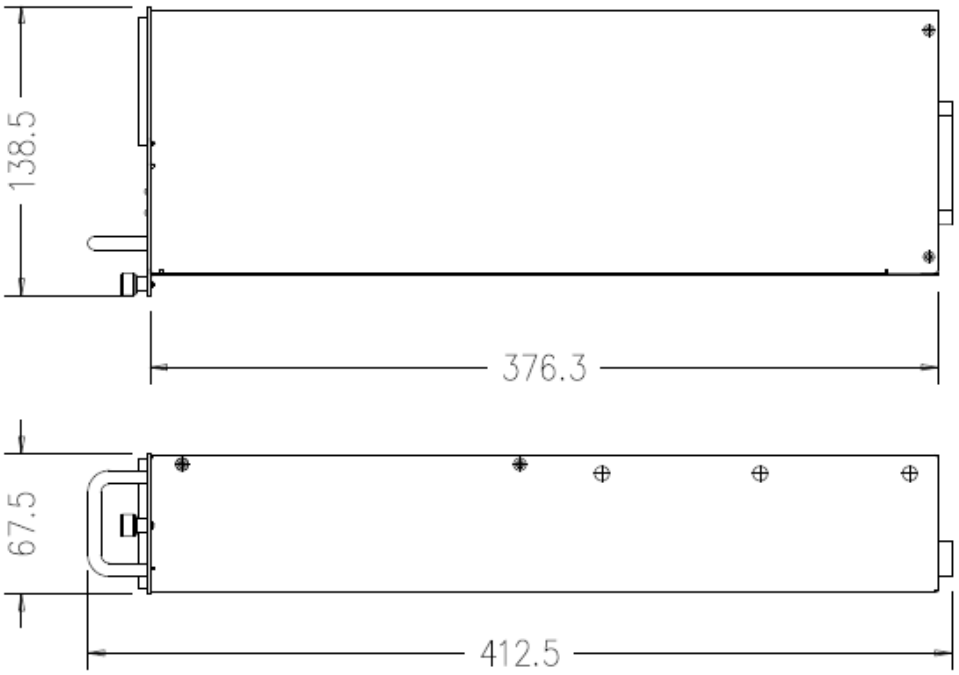


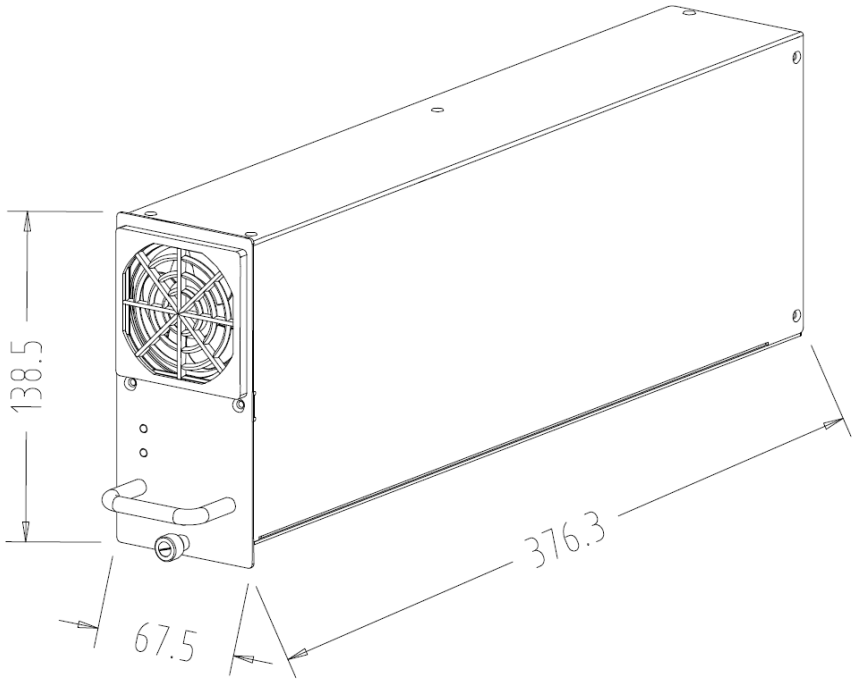


Mainframe: 62000B-3-1 (Weight: 8Kg or 17.6 lbs)



Module: 62015B (Weight: 4Kg or 8.8 lbs)





1.4 Function Keys

1.4.1 Front Panel

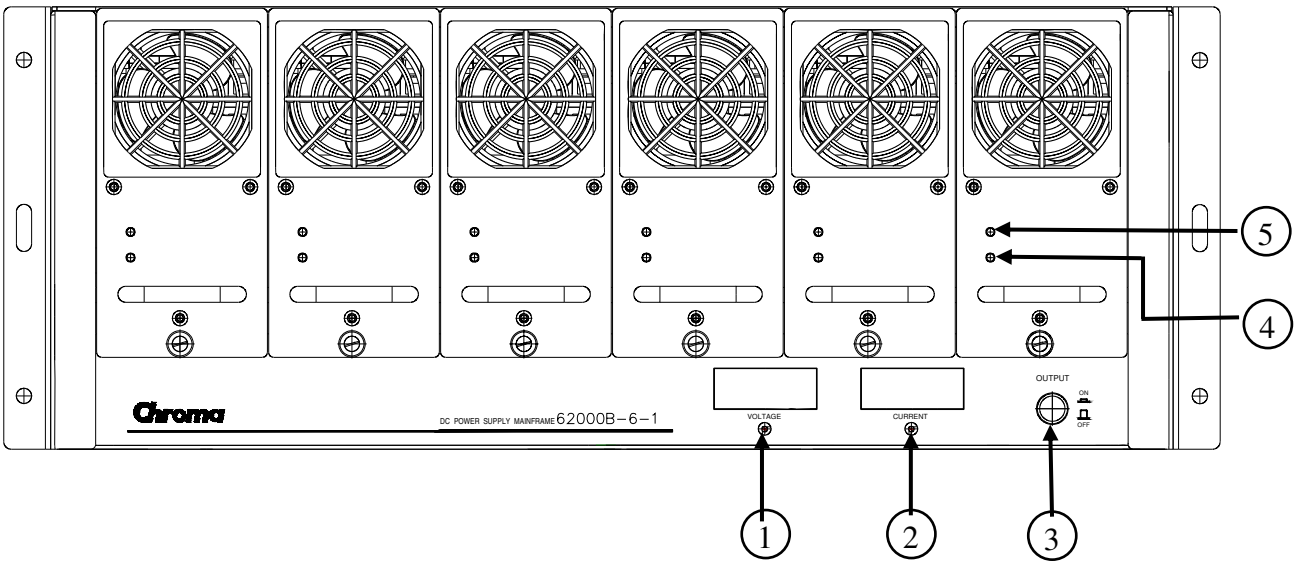


Figure 1-1 Front Panel of 62000B-6-1

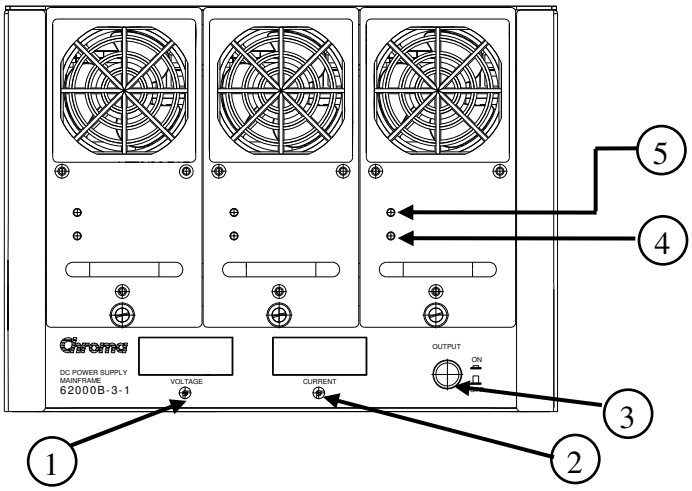


Figure 1-2 Front Panel of 62000B-3-1

Item	Name	Description
1	Voltage V_SET	It adjusts the output to set voltage. (The setting is completed after the LED blinked 3 times during adjustment.)
2	Current I_SET	It adjusts the output to set current limit. (The setting is completed after the LED blinked 3 times during adjustment.)
3	DC ON/OFF	It sets DC Output ON/OFF.
4	Fault	It appears when the voltage of Mainframe is abnormal or the DC Module is in protection mode (the red LED is always on.)
5	Output	It indicates the device is running normally (the green LED is always on.)

Table 1-1 Description of Front Panel (items of 62000B-6-1 & 62000B-3-1 are the same)

1.4.2 Rear Panel

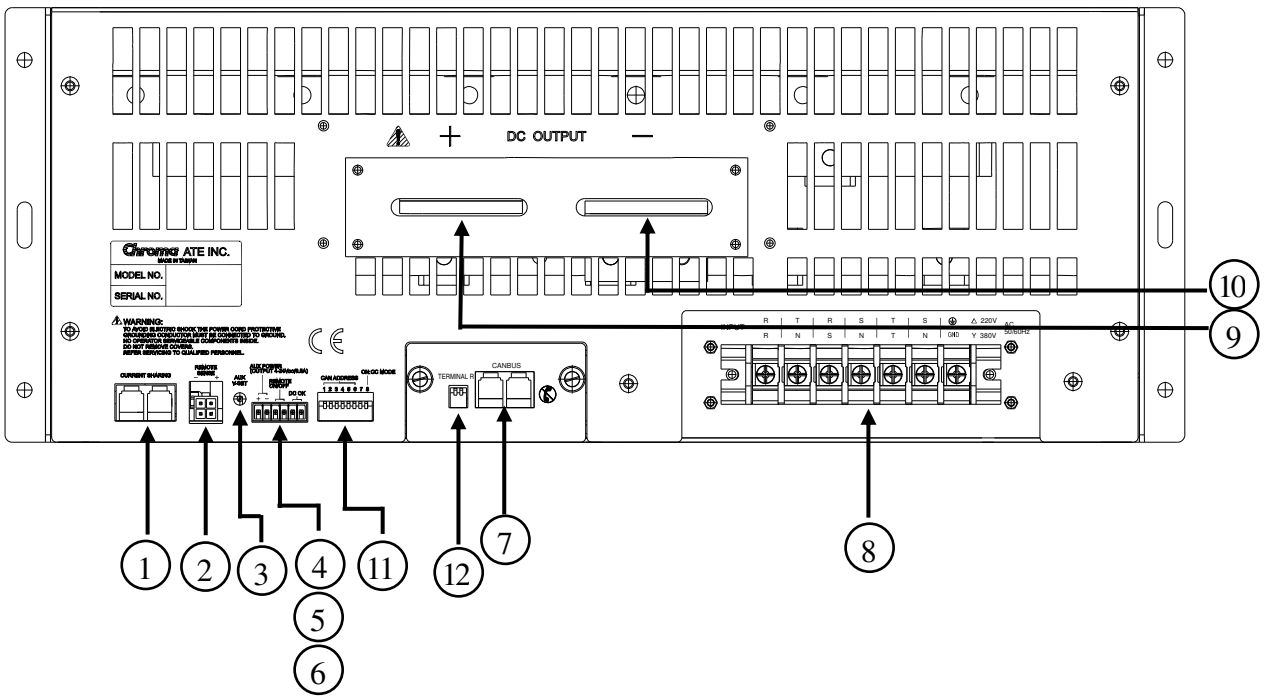


Figure 1-3 Rear Panel of 62000B-6-1

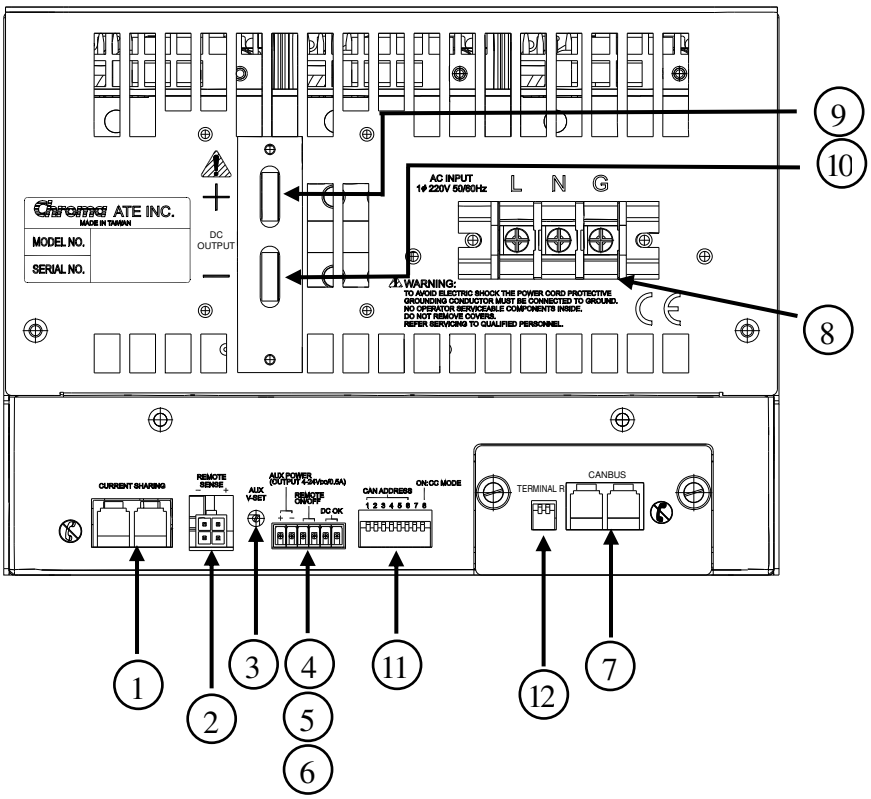


Figure 1-4 Rear Panel of 62000B-3-1

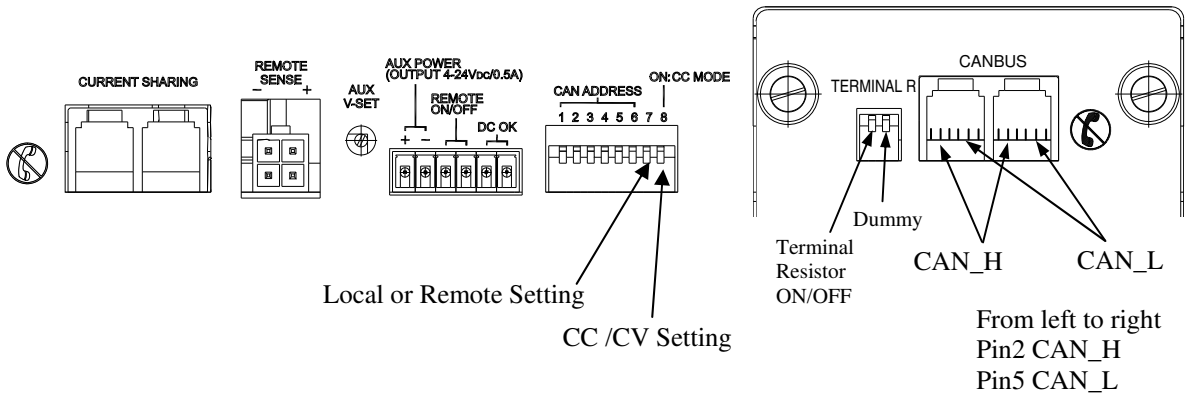


Figure 1-5 Communication Contacts on the Rear Panel

Item	Name	Description
1.	Current Sharing	It is the connection of Current Sharing in between Main Frames.
2.	Remote Sense	It connects to the compensated voltage of load.
3.	AUX V-SET	It adjusts the AUX Power Output voltage clockwise from low to high 4~24V (MAX 0.5A)
4.	AUX Power (Output 4~24V VDC)	It is the AUX Power voltage output contact.
5.	Remote ON/OFF	It is the external trigger connector on the Main Frame rear panel that connects to normal switch.
6.	DC OK	It is the DC MODULE normal output dry contact (24Vdc or 120Vac 1A).
7.	CANBUS	It is the CANBUS remote interface connected to PC. The power on or off is controlled by PC.
8.	AC INPUT	It is the input connector of AC power cable.
9.	Positive DC Out	It is the positive output terminal.
10.	Negative DC Out	It is the negative output terminal.
11.	CAN ADDRESS & CC/CV Mode Local or Remote Setting	It sets the Mainframe communication address in binary. It sets CC/CV mode to on, see Figure 1-5 for CC Limit. OFF : Local Setting ON : Remote setting
12.	TERMINAL R	CANBUS Terminal Resistor is only required for the devices with the longest distance at the end of CANBUS. Set it to ON if there is one 62000B Mainframe terminal resistor. If there are two or more 62000B Mainframes, set the terminal resistor of the farthest 62000B to ON and the rest 62000B Mainframe terminal resistors are set to OFF as Figure 1-5 shows.

Table 1-2 Description of Rear Panel (items of 62000B-6-1 & 62000B-3-1 are the same)

NOTE:
Do not insert or remove the **CAN BUS Remote Interface** into or from the rear panel when the power module is working normally or it may cause error on power module. (It is necessary to turn off the AC power source before inserting/removing the interface.)

2. Installation

2.1 Checking the Package

(1) Check if there is any damage or any missing accessories after unpacking it.
(2) Should any damage it found, contact “Chroma RMA” immediately to request return shipment.

The machine package is shown as below.

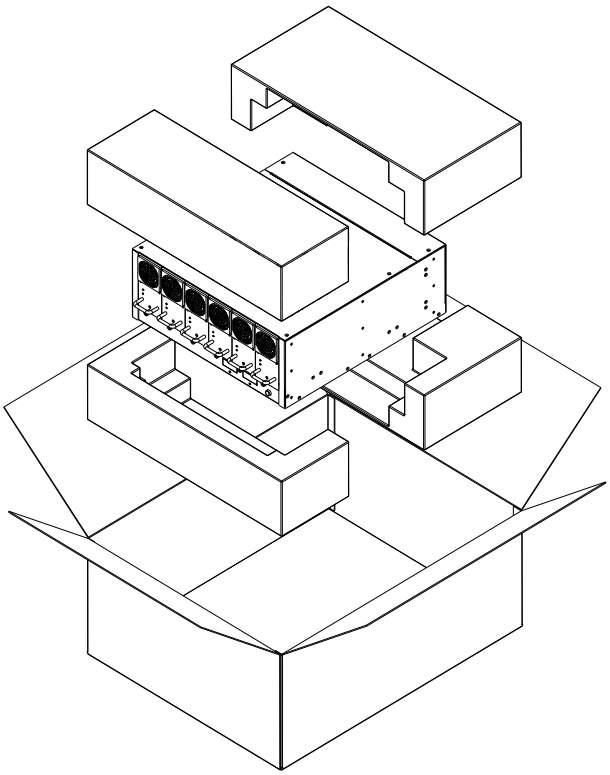


Figure 2-1

ⓘ NOTICE
1. Please keep all of the packing materials in case the device has to be returned for repair.
2. Do not return the instrument to the factory without obtaining prior RMA acceptance from Chroma.

2.1.1 Maintenance & Cleaning

Remove all connected wires and cables on the instrument before cleaning. The fan filter of power supply module has to be cleaned every **3 months**. Use a brush to clean the dust on it and if there are stains on the chassis that cannot be removed by brush, wipe it with volatile liquid (such as Cleaning Naphtha). Do not use any corrosive liquid to avoid damaging the chassis. Use a damp cloth with soap water or soft detergent to clean the LCD front panel.

For internal cleaning, use a low-pressure air gun the dust inside or send it back to our agent for cleaning.

2.2 Preparation for Use

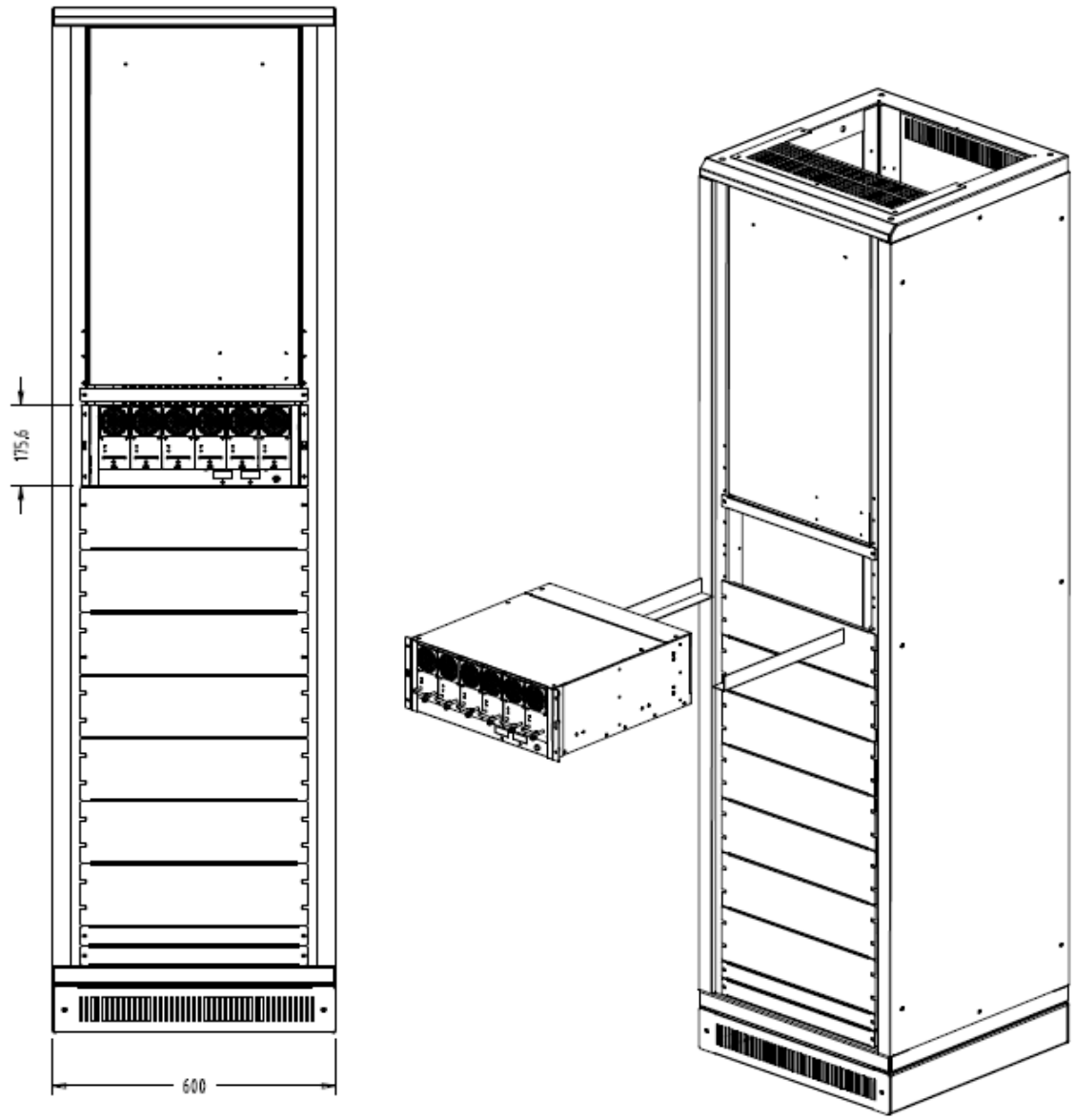
(1) Be sure the Power Supply is connected to the AC line input that meets the specification.
(2) The instrument must be installed in an air-circulated area to avoid the internal temperature getting too high.
(3) The ambient temperature does not exceed 50°C.

2.2.1 Common Environment Conditions

(1) In door use.
(2) Altitude up to 2000m.
(3) Temperature 0°C to 50°C.
(4) Maximum relative humidity 90% for temperature up to 40°C, decreasing linearity relative humidity to 50% at 50°C.
(5) Input AC supply voltage fluctuations can up to +-15% of the rated voltage.
(6) Transient over voltage is impulse withstand CAT II.
(7) Pollution degree II.

2.3 Installation in Rack

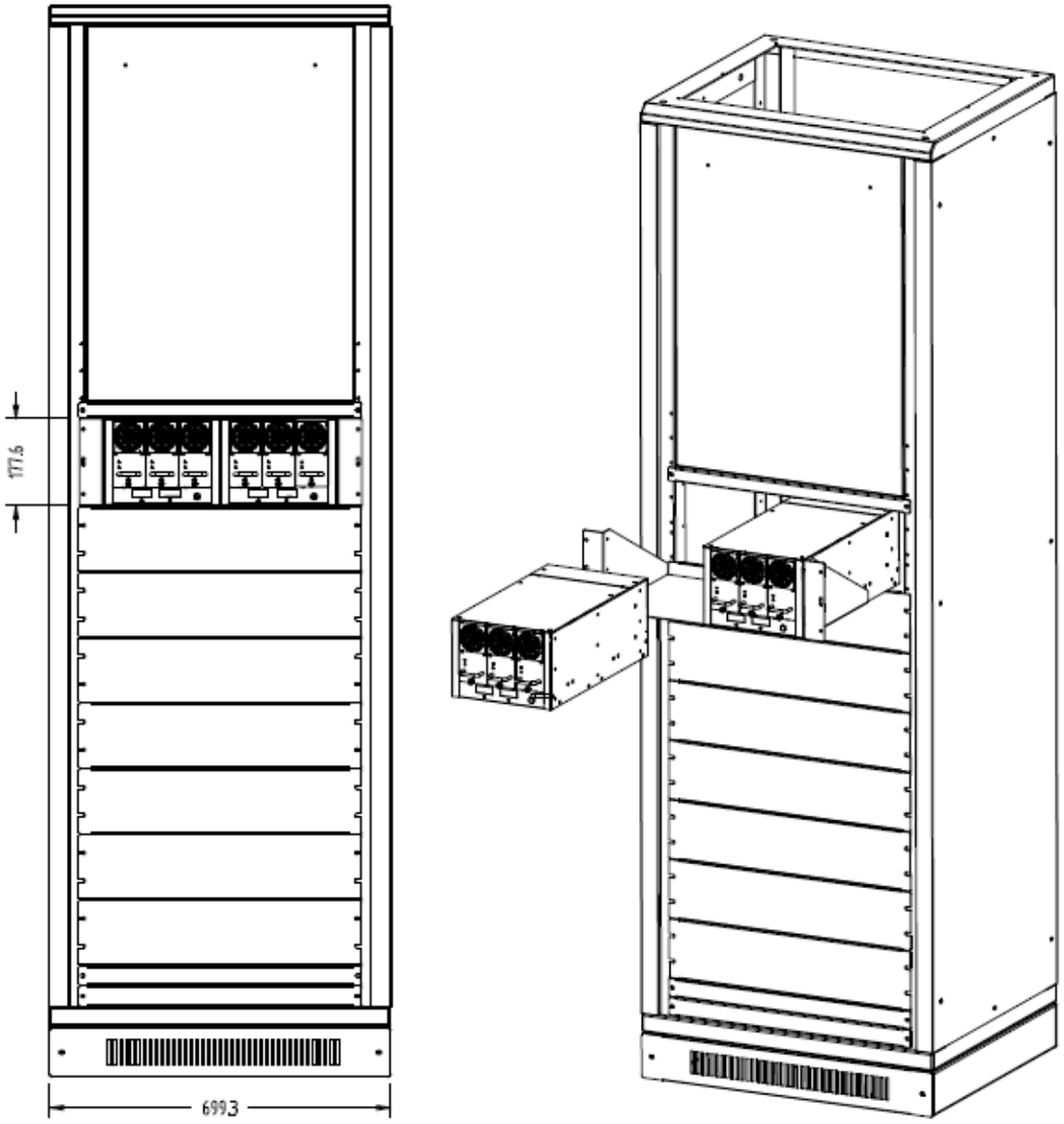
2.3.1 62000B-6-1



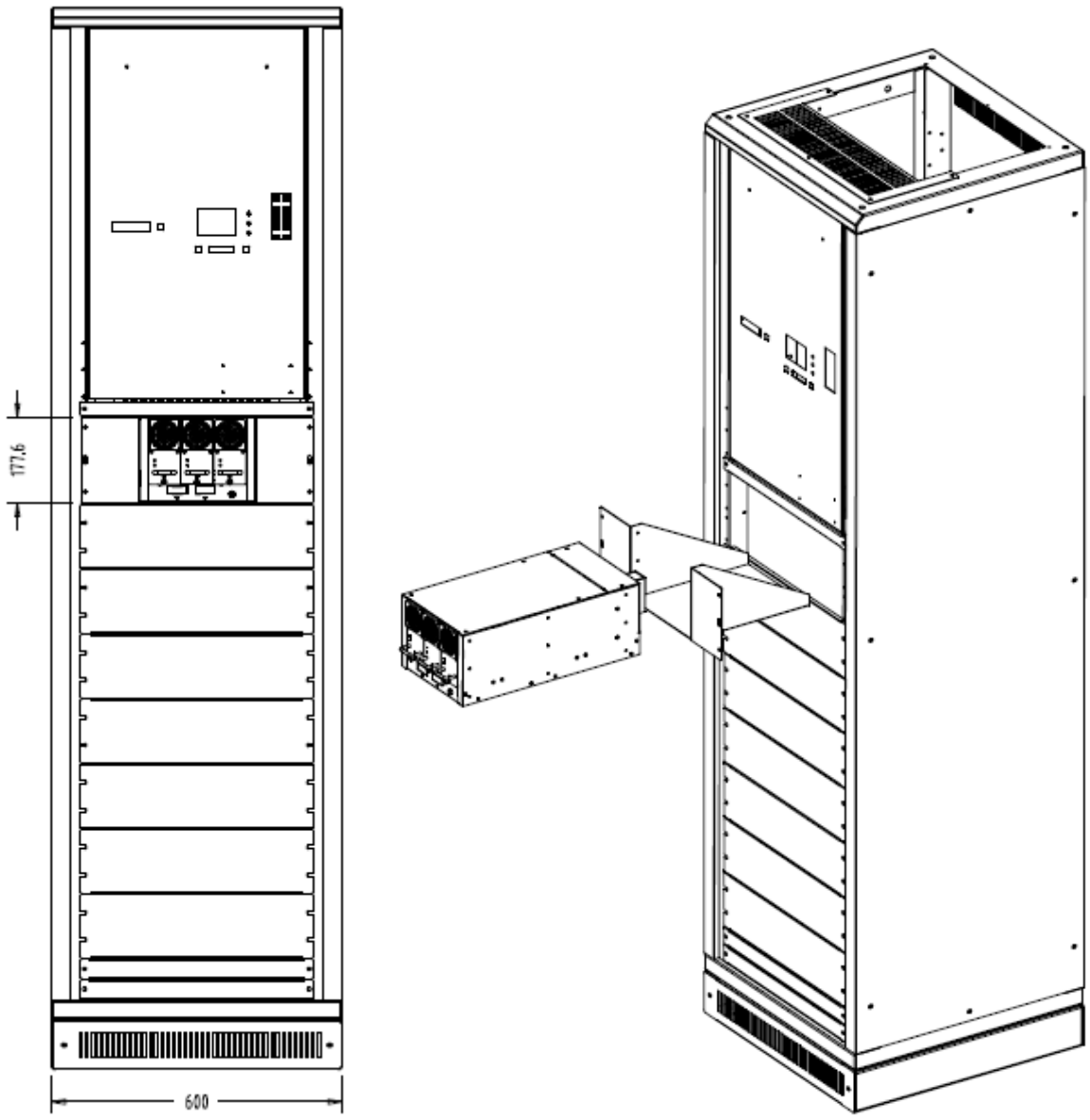
For 19” rack each 4U can place one 62000B-6-1

PS: It is suggested to use the support angle of 1.6 mm (SPCC/SECC) for rack mount of 4UH.
SECC: Steel - Electrogalvanized - ColdRolled - Coil
SPCC: Steel Plate Cold rolled Commercial

2.3.2 62000B-3-1



For 23” rack each 4U can assemble 2 sets of 62000B-3-1



For 19” rack each 4U can place once 62000B-3-1

3. System Operation & Usage

3.1 Connecting the Input

(1) The input connector is located at the right side of the rear panel.
(2) The power cord must be at least 85°C rated.
(3) The thickness of power cord must be between 12AWG to10AWG.
(4) See Figure 3-1 and follow the steps below for the assembly:
   a. Remove the safety cover of input terminal from the DC Power Supply rear panel.
   b. Remove the cable sleeve on the tip for 1cm and tin it.
   c. Plug in the power terminal and secure it with Phillips Screwdriver.
   d. Lock the safety cover to avoid electric shock.
   e. Tighten the latch on safety cover to prevent the power cord from falling or exposing the charged terminal.

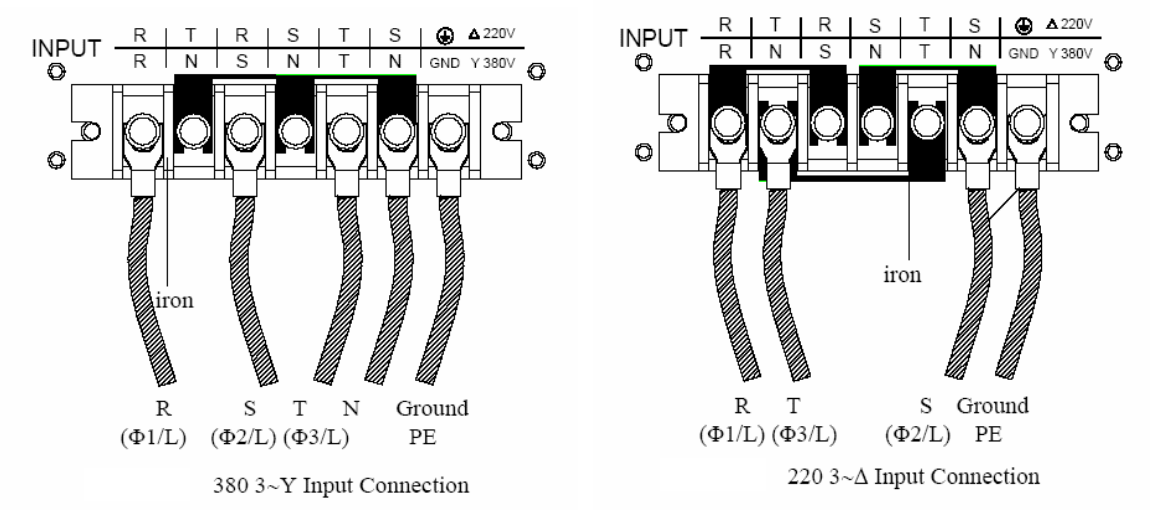


Figure 3-1 Connecting AC INPUT Wires for 62000B-6-1

NOTE: There is no Breaker or Switch for the system input; therefore it activates when power is input. As to output, it is determined by front panel switch.

To cope with the various requirements from customers, the 62000B Series Power Supply has 3 kinds of on/off operating modes based on the interface used. All of them can operate the system via 1. Manual on/off, 2. External trigger on/off and 3. Remote on/off. Customers can choose to use one of it with the following precautions in mind.

1. In initial state the DC power output is determined by the ON/OFF Switch on the MAINFRAME front panel.
2. If the ON/OFF Switch on the Mainframe front panel is ON but the DC Output is OFF, it is necessary to turn the Mainframe ON/OFF Switch to OFF then ON again to switch the DC Output to ON.

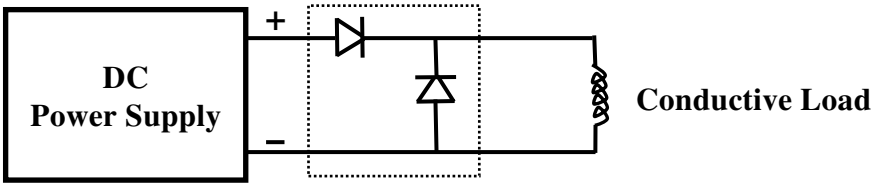
3.2 Notices When Connecting Output

(1) It is necessary to ensure the withstand current of output cable is larger than the maximum current of LOAD.
(2) To prevent the output cable from damage or over-shoot generated by cable inductance, following method can be applied:

Use large diameter cable with shortened length and tightly twisted positive/negative wires.

3.2.1 Notices When Connecting Conductive Load

Conductive load may generate surge voltage and cause the DC Power Supply to be damaged. It is suggested to add a protection diode as the figure shows below when conductive load is in use. (The specification of diode voltage in the following figure must be larger than the voltage/current specification of counter-electromotive force and the maximum output current of DC Power Supply.)



3.2.2 Setting for Mainframe and Power Module

- The voltage range for 62015B-15-90 is 1V~15V and the current range is 1A~546A.
- The voltage range for 62015B-30-50 is 1V~30V and the current range is 1A~306A.
- The voltage range for 62015B-60-25 is 1V~60V and the current range is 1A~156A.
- The voltage range for 62015B-80-18 is 1V~80V and the current range is 1A~114A.
- The voltage range for 62015B-150-10 is 1V~150V and the current range is 1A~66A.

3.3 Manual Power On/Off Procedure & Setting Voltage/Current

This procedure is to use the Main Frame front panel switch directly to control the ON or OFF of power.

1. Power On Procedure:
   a. Input the AC 3-phase 380V/220V.
   b. Turn the MAINFRAME ON/OFF switch to ON.
   c. Ensure the module's power output voltage is correct.

2. Setting Voltage (CV MODE):
   Use a small flat screwdriver to turn the Voltage V_SET, the 7-segment display shows the adjusted voltage and the setting is done after it blinked 3 times.

3. Setting Current (CC MODE):
   Use a small flat screwdriver to turn the Current I_SET, the 7-segment display shows the adjusted current and the setting is done after it blinked 3 times.

4. Power Off Procedure:
   a. Turn the MAINFRAME ON/OFF switch to OFF.
   b. Set the AC Input to OFF.

3.3.1 Setting Over Voltage Protection

Module	Description
62015B-15-90	1 ~ MAX SET VALUE 115% OF SET VALUE
	MAX OVP POINT 16V
62015B-30-50	1 ~ MAX SET VALUE 115% OF SET VALUE
	MAX OVP POINT 31V
62015B-60-25	5 ~ MAX SET VALUE 115% OF SET VALUE (1~5 V set voltage + 0.75V)
	MAX OVP POINT 65V
62015B-80-18	5 ~ MAX SET VALUE 115% OF SET VALUE (1~5 V set voltage + 0.75V)
	MAX OVP POINT 83V
62015B-150-10	5 ~ MAX SET VALUE 115% OF SET VALUE (1~5 V set voltage + 0.75V)
	MAX OVP POINT 155V
Note: The hardware protection MAX OVP POINT is prior to the software OVP point that is 115% of set value.	

3.4 External Trigger Power On/Off Procedure

This procedure is to connect the external trigger connector on the Mainframe rear panel to a common switch and use the external switch to control the ON or OFF of power. It is applicable for remote operation.

1. Power On Procedure:
   a. Input the AC3-phase 380V/220V.
   b. Turn the external switch to ON. (Use Open/ Short SW to activate Remote ON/OFF as Figure 3-2 shows.)
   c. Ensure the module's power output voltage is correct.

2. Power Off Procedure:
   a. Turn the external switch to OFF------ see Figure 3-2.
   b. Set the AC Input to OFF.

3.5 Remote Sensing

3.5.1 Correct Usage

1. Correct connecting the remote sensing wire can ensure the output voltage is the set voltage. The DC Module can compensate the line voltage drop up to 3V under the condition of not exceeding maximum system output voltage plus 1V.
2. Figure 3-2 shows the connection of Remote Sensing. Using two cables to connect the load positive/negative connector and the Remote Sensing Connector on the rear panel. The cable diameter has to be larger than 30AWG and the withstand voltage should be within specification.
3. Though the Remote sensing function is able to compensate 3V voltage drop, the maximum output power of this series DC power supply is the rated power (which is the sum of voltage multiplies the current on the output terminal), the power that goes beyond the DC Module can supply will not be compensated with the line voltage drop up to 3V.

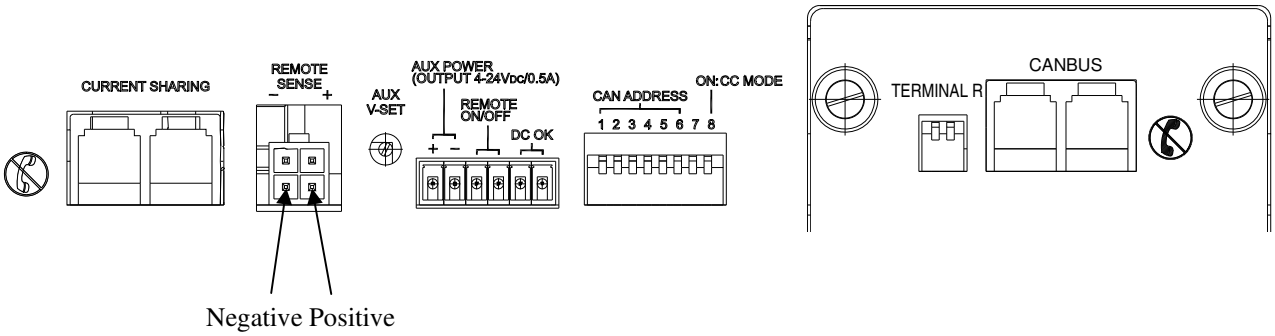


Figure 3-2

3.5.2 When Connecting Remote Sensing Wire Polarity Reversely

As Figure 3-2 shows the polarity of Remote Sensing Wire must be connected correctly, that is the "+" terminal should connect to the "+" of output terminal or its extended cable, and so is for "—" terminal.

If the polarity is connected reversely, the DC Module still works normally but unable to provide the function of voltage compensation.

3.6 Mainframe Parallel Connection

When doing parallel connection, please be aware of the following as Figure 3-3 shows:

- The Current Sharing &Vense Connectors should be connected and the V Sense should connect to LOAD via cable for voltage compensation and current sharing.

- CANBUS Communication: It uses CANBUS Wire to connect to PC and requires setting the CAN ADDRESS to various positions (see Figure and Table 1-2.)

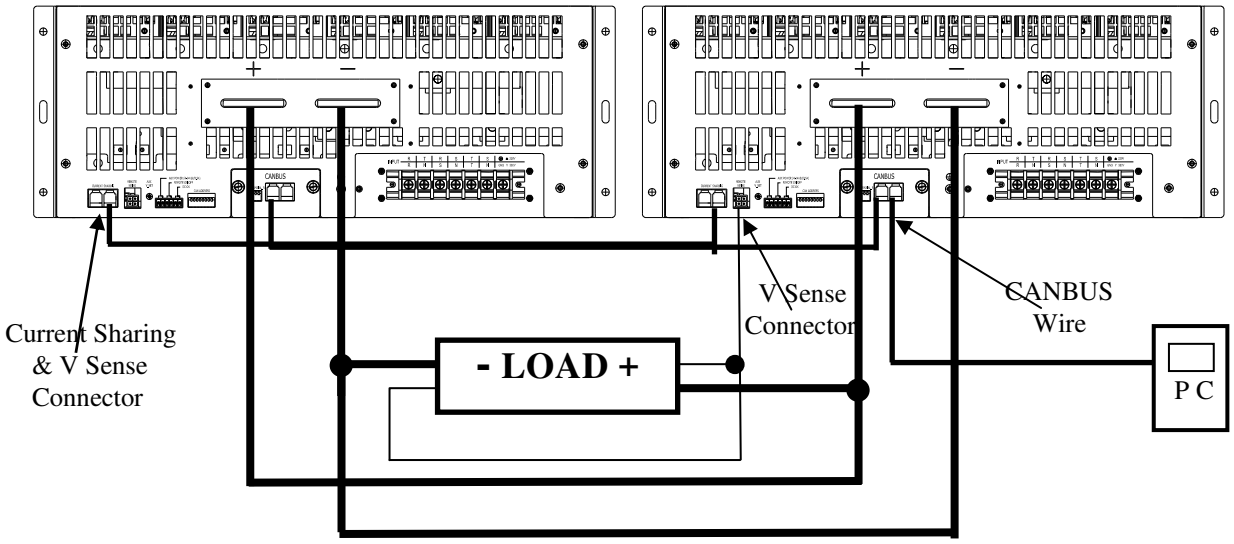


Figure 3-3

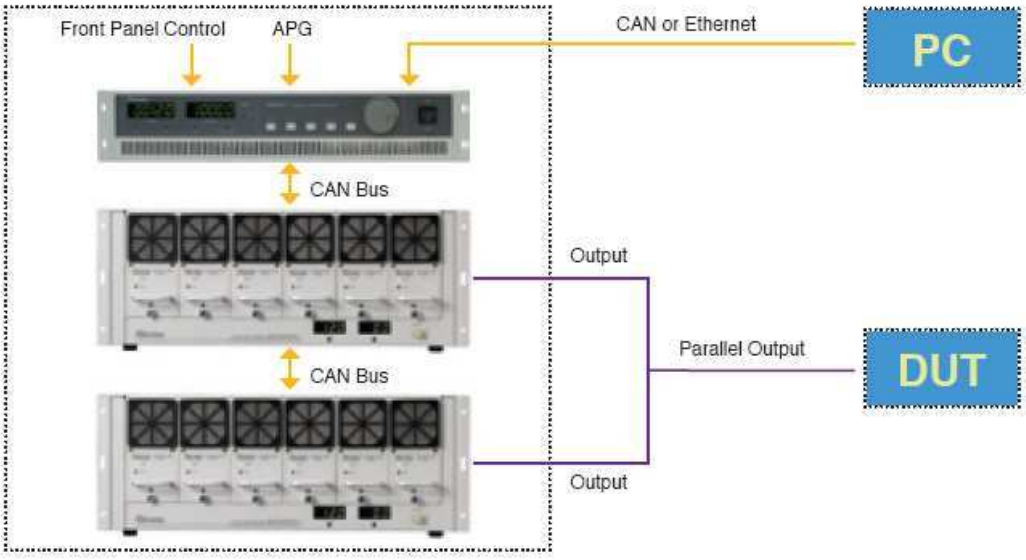
ⓘ NOTICE

The Remote Sensing Wire won't be damaged due to wrong polarity connection at this time. Just follow the steps below:

1. First shut down the device.
2. Connect the remote sensing wire correctly.
3. Reboot the device.
4. Remote Sense needs to be connected to hardware properly when DC Output is OFF. Do not remove or connect the Remote Sense in DC ON state, or it may cause the hardware to misjudge when doing voltage compensation and stop output after the DC Module Fault LED is on for alarm.
5. Do not insert the DC Module back to the Mainframe connector right away after removing it from the Mainframe connector in normal operation mode. It is necessary to wait until the Fault LED on the DC Module front panel is off to reinsert the DC Module.
6. Precautions when replacing the power module: Insert the power module accordingly without hesitate and wait until the Output and Fault LEDs are off. Now, the Output LED will blink and turn to always on to indicate the module is working normally. If the Output and Fault LEDs are always on from the beginning it means the power module is not inserted properly. Please take out the power module and reinsert it after the Fault LED is off.

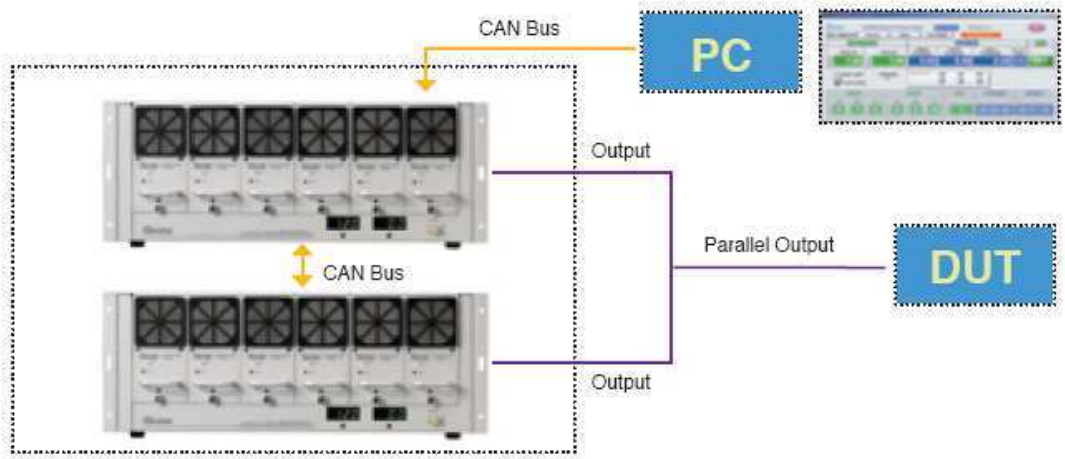
3.7 Application & Control Method for 62000B Series DC Power Supply

Type A - Control with CSU : User can control via APG, CAN Bus/ Ethernet, and front panel manual control for paralleled operation.



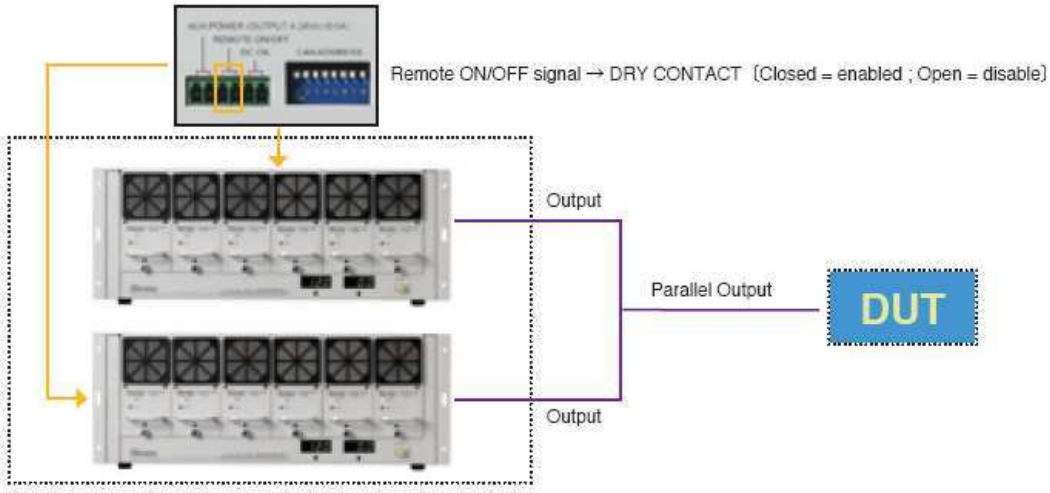
Type B - Control without CSU : User can only control via CAN Bus for paralleled operation.

Note: The SoftPanel can control four mainframes for paralleled operation.



Type C - Control without CSU or PC : User can only control via remote on/off signal for paralleled operation.

Note 1 : User can NOT adjust the output voltage when parallel the output.
Note 2 : The output voltage will fixed in factory default voltage.
Note 3 : If need to adjust the output voltage, please adjust when stand alone.
Note 4 : Time delay from output enable until output stable: 10s max.



4. Communication Protocols

4.1 Preface

The 62000B Series is the DC Power Supply that suitable for burn in test. The communication interface of physical layer is CAN BUS with the Standard Commands for Programmable Instruments (SCPI) applied.

4.2 Introduction to Editing

All commands and response messages should be transmitted in ASCII code format. Before sending out a new command, the response message must be read completely or the remaining response message will disappear and generate a query-interrupted error.

4.2.1 Conventions

The following table lists the conventions used in the command.

Angle brackets	< >	The item in angle brackets is the abbreviation of parameter.
Vertical line	|	The vertical line divides the replaceable parameter.
Square brackets	[ ]	The item in square brackets is an option. Ex: OUTP [:STATe] indicate STATe can be ignored.
Braces	{ }	The item in braces means the parameter can be repeated. The <A> {<, B>} mark indicates parameter "A" is necessary and parameter "B" can be ignored, input once or many times.

Table 4-1

4.2.2 Numerical Data Format

Table 4-2 lists the numerical data format the 62000B DC Power Supply receives. The numerical data can be appended at the end to distinguish the data.

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

Table 4-2

4.2.3 Basic Definition

4.2.3.1 Command Tree Structure

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

4.2.3.2 Program Headers

Program headers are key words that identify the command. The DC Power Supply accepts characters in both upper and lower case without distinguishing the difference. Program headers consist of two distinctive types, common command headers and instrument-controlled headers.

4.2.3.3 Common Command and Query Headers

The commands with a leading " * " are common commands.

4.2.3.4 Instrument-Controlled Headers

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

4.2.3.5 Program Header Separator (:)

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

4.2.3.6 Program Message

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

4.2.3.7 Program Message Unit

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

Example: VOLT?, OUTPut ON.

4.2.3.8 Program Message Unit Separator (;)

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

Example: VOLT 80; CURR 15<PMT>

4.2.3.9 Program Message Terminator (<PMT>)

A program message terminator represents the end of a program message. The new command line is a single byte 0Ah (line feed) in ASCII code. Meanwhile the 62000B response message will use 0Ah as the end.

4.2.4 Traversal of the Command Tree

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

Example:

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

4.2.5 Execution Order

The 62000B DC Power Supply executes program messages by the order received. Program message units except coupled commands are executed in order of reception. The execution of coupled commands is deferred until program message terminator is received.

4.3 Commands of DC Power Supply

This section describes the syntax and parameters of all commands for DC Power Supply.

(1) *CLS **Clear Status**

Type: Device status
Description: *CLS command acts the follows:
Clear Error Code and Reset Error Message.
Syntax: *CLS
Parameter: None
Example: *CLS

(2) *IDN? **Identification Query**

Type: System interface
Description: This query requests the 62000B to identify itself.
Query Syntax: *IDN?
Return Parameter: <aard>
Query Example: *IDN?

String	Description
CHROMA	Manufacturer
62015B	Model
01.00	Firmware version
2005/07/14	Date

Return Example: CHROMA 62015B-15-90,01.00,2005/07/14

(3) *RST **Reset Command**

Type: Device status
Description: Reset the system and all parameters are return to factory default.
Syntax: *RST
Parameter: None
Example: *RST

(4) *SAV **Save Command**

Description: It saves the settings of voltage/current and baudrate to EEPROM.
Syntax: *SAV
Parameter: None
Example: *SAV
Note: All parameters have to execute *SAV command to save to EEPROM, or it will return to the previous settings when the system is rebooted.

(5) CONFigure: OUTPut

Description: It sets the output voltage/current.
Syntax: CONFigure: OUTPut ON
CONFigure: OUTPut OFF
Parameter: ON/ OFF
Example: CONFigure: OUTPut ON The power supply starts output.
Query Syntax: CONFigure: OUTPut?
Return Parameter: <aard>

Query Example: CONF: OUTP?
Return Example: ON or OFF

(6) CONFigure: BAUDrate

Description: It sets the baudrate (default is 125000).
Syntax: CONFigure: BAUDrate <NR1>[suffix]
Parameter: 10000, 20000, 50000, 100000, 125000, 250000, 500000, 800000, 1000000
Example: CONFigure:BAUD 250000 It sets the baudrate to 250kbps.
Note: Once the 62000B DC Power Supply received this command, the baudrate will change immediately to the new setting. Therefore, users have to change it to new baudrate first for continuing monitoring the 62000B DC Power Supply.

(7) SOURce: VOLTage

Description: It sets the voltage output (volt.)
Syntax: SOURce: VOLTage <NRf+>[suffix]
Parameter: Refer to individual spec for valid numeric range.
Example: SOUR:VOLT 15 It sets the output voltage to 15 volt.
Query Syntax: SOUR:VOLT?
Return Parameter: <NR2> [Unit=Volt]
Query Example: SOUR:VOLT? It returns the voltage setting.
Return Example: 15.00

(8) SOURce: CURRent

Description: It sets the current output (ampere.)
Syntax: SOURce:CURRent <NRf+>[suffix]
Parameter: Refer to individual spec for valid numeric range.
Example: SOUR:CURR 60.00 It sets the output current to 60 amps.
Query Syntax: SOUR:CURR?
Return Parameter: <NR2> [Unit=Amp]
Query Example: SOUR:CURR? It returns the current setting.
Return Example: 60.0

(9) SOURce: VOLTage?

Description: It queries the minimum, maximum or default voltage setting.
Syntax: SOURce:CURRent? < NRf+>[suffix]
Parameter: MIN|MAX|DEF
Query Example: SOUR:VOLT? MAX It queries the maximum output voltage set.
Return Example: 15.00

(10) SOURce: CURRent?

Description: It queries the minimum, maximum or default current setting.
Syntax: SOURce:CURRent? < NRf+>[suffix]
Parameter: MIN|MAX|DEF
Query Example: SOUR:CURR? MAX It queries the maximum output current set.
Return Example: 546.00

(11) FETCh: VOLTage?

Description: It measures the output of power supply module and returns the measured voltage.
Query Syntax: FETCh: VOLTage?
Return Parameter: <NR2> [Unit=Volt]
Query Example: FETC:VOLT?
Return Example: 8.12

(12) FETCh: CURRent?

Description: It measures the output of power supply module and returns the measured current.
Query Syntax: FETCh:CURRent?
Return Parameter: <NR2> [Unit=Amp]
Query Example: FETC:CURR?
Return Example: 3.15

(13) FETCh: STATus?

Description: It returns the status code of power supply's state.
Query Syntax: FETCh:STATus?
Return Parameter: aard
Query Example: FETC:STAT?
Return Example: 4096, 0 (status flag, alarm flag), voltage output OK without alarm.

Status Flag

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Rsvd	Rsvd	S.W ON	PWR OK	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd

Bit 12 =1: Voltage outputs OK
Bit 12 =0: No voltage output or voltage is not stable yet.
Bit 13 =1: Send CONF:OUTP ON command or the panel switch is at ON.
Bit 13 =0: Send CONF:OUTP OFF command or the panel switch is at OFF.

Alarm Flag (1: Alarm beeps, 0: Normal)

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Alarm	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	Rsvd	OCP OFF	OVP SW	OVP HW	OCP	OTP SW	OTP HW	AC	FAN

Bit 0: Module FAN Fail
Bit 1: Mainframe AC Fail
Bit 2: Module OTP (Hardware)
Bit 3: Module OTP (Software)
Bit 4: OCP (CC Mode)
Bit 5: Module OVP (Hardware)
Bit 6: Module OVP (Software)
Bit 7: OCP Shutdown (CV Mode)
Bit 8: Reserved
Bit 9: Reserved
Bit 10: Reserved
Bit 11: Reserved
Bit 12: Reserved
Bit 13: Reserved
Bit 14: Reserved
Bit 15: Alarm Flag

(14) SYSTem: ERRor?

Description: It returns the error message and code of power supply.
Query Syntax: SYSTem:ERRor?
Return Parameter: aard
Query Example: SYST:ERR?
Return Example: -203, "Data out of range"

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

4.4 CAN BUS Configuration

CAN Bus is the abbreviation of Controller Area Network Bus, which is a distribution supported real-time control with highly secured serial transmission protocols. The transmission speed is up to 1 Mbits/s. Detail specification please refer to *CAN Specification 2.0*.

4.4.1 Limitations of Communication Protocol

Following are the limitations defined taking the entire system into consideration.

- Address: Though CAN BUS does not apply the concept of address it is used for explanation. The address of Master or Slave cannot be set to 0x00, 0xFF; also cannot be duplicated.
- The Master address cannot be the same as 62000B Power Supply module.
- Server/Client Structure: The power module of 62000B Series is Slave and it does not send message actively but use the way of question and answer.
- Broadcasting Message: The Slave executes the broadcasted message without responding it. The address is 0xFF.
- End code of Packet: The response packet of 62000B is end with 0x0a.
- Extended Frame: It limits the usage of 29Bit extended frame mode (CAN 2.0B).

4.4.2 Rule for Setting 62000B CAN BUS Parameter (Slave)

The initialization of a CAN device usually requires the following parameters: mode (2.0A or 2.0B), Acceptance Code, Acceptance Mask and Baudrate. Acceptance Code is like the address in general and Acceptance Mask is used to filter the message. For 62000B, the address set by DIP SWITCH and the conversion rule of Acceptance Code, Acceptance Mask are explained below:

Mode: 2.0B (29-bit identifier)
Baudrate: 125Kbps (default)
Acceptance Code:

ACC.28~ ACC.21	=0xNN	62000B DIP SWITCH Address
ACC.20~ ACC.13	=0x00	
ACC.12~ ACC.5	=0xFF	Broadcast Address
ACC.4~ ACC.0	=0x00	

Acceptance Mask:

ACM.28~ACM.21	=0x00	Filter Enable
ACM.20~ACM.13	=0xFF	Don't Care
ACM.12~ACM.5	=0x00	Filter Enable
ACM.4~ ACM.0	=0xFF	Don't Care

4.4.3 Rule for Setting CAN Adapter Parameter (Master)

Master has to set the parameter as the section described above. One thing needs to be aware of is that some definitions for Adapter to Acceptance Mask are different (0: Don't Care; 1: Filter Enable). Following explanation uses the PCI-7841 card of ADLINK Technology Inc.

Mode: 2.0B (29-bit identifier)
Baudrate: 125Kbps (default)
Acceptance Code:

ACC.28~ACC.21	=0xNN	PC Address (user define:1~254)
ACC.20~ACC.13	=0x00	
ACC.12~ACC.5	=0x00	
ACC.4~ ACC.0	=0x00	

Acceptance Mask:

ACM.28~ ACM.21	=0x00 or 0xFF	
ACM.20~ ACM.13	=0xFF	Don't Care
ACM.12~ ACM.5	=0x00 or 0xFF	
ACM.4~ ACM.0	=0x00 or 0xFF	

4.4.4 Description of CAN Packet

Figure 4-1 is an example of Adapter and 62000B CAN parameter setting when a PC is controlling multiple 62000B Power Supply Modules. Physically, it can have 109 CAN devices (not limit to 62000B DC Power Supply) connect to bus. The actual controllable power supply module is depending on the maximum address that can be set.

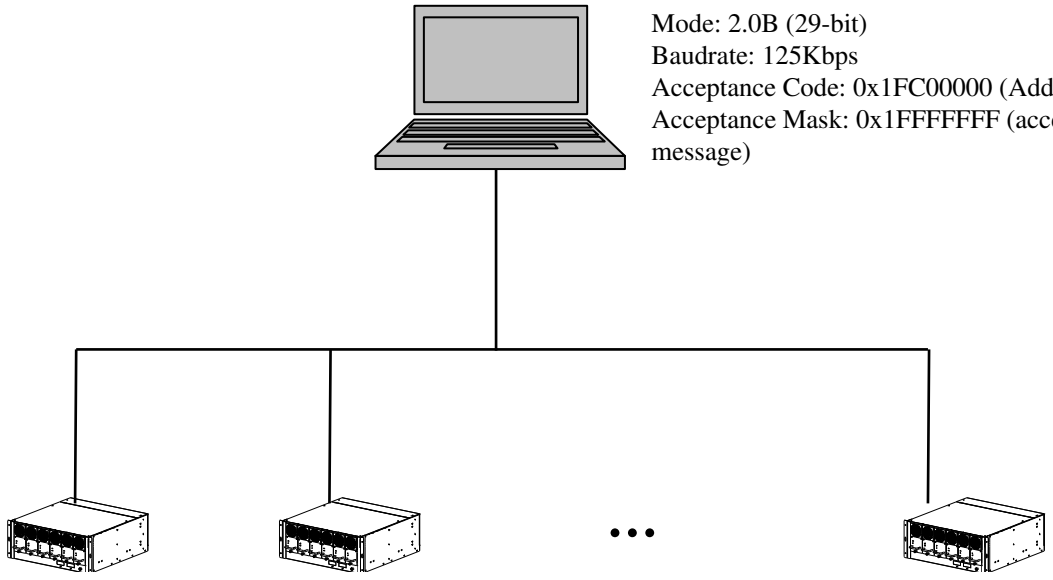


Figure 4-1

S O F	11-Bit Identifier ID28-ID18	S R R	I D E	18-Bit Identifier ID17-ID0	R T R	R 1	R 0	D L C	0-8 Bytes Data	C R C	A C K	E O F	I F S

Extended CAN: 29-Bit Identifier (CAN 2.0 B) Bit Fields

The above figure is the packet format of CAN 2.0B. Users can map it to the example below to understand the meaning of each column. To control the 62000B on Address, the ID column can be got by the following conversion formula, see also *CAN_Tx() Function* in section 4.4.5 *Example Program*:

ID = (PC_Address + (62000B_Address * (2 ^ 8))) * (2 ^ 13)
0x3FC000= (254 + (1 * (2 ^ 8))) * (2 ^ 13)

Example 1: SOUR:VOLT 12 →Change mainframe voltage to 12V (Address 1)
ID=00000001001000000xxxxxxxxxxxxxb
DCL=8
RTR=0
DATA= " SOUR:VOL" +0x0A

Destination Address: 1 (mainframe) | Source Address: 254 (PC) X: Don't care | RTR=0 (Data Packet) | DLC=8 (Data Length) | DATA=8 Bytes

SOF	0	0	0	0	0	0	0	1	1	1	1	SRR	IDE	1	1	1	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	R1	R0	8	'S'	'O'	'U'	'R'	':'	'V'	'O'	'L'	CRC	ACK	EOF	LFS

PC Tx Packet 1: Set mainframe voltage 12V, the first packet

ID=00000001001000000xxxxxxxxxxxxxb
DCL=5
RTR=0
DATA=" T 12" +0x0A

Destination Address: 1 (mainframe) | Source Address: 254 (PC) | RTR=0 (Data Packet) | DLC=5 (Data Length) | DATA=5 Bytes

SOF	0	0	0	0	0	0	0	1	1	1	1	SRR	IDE	1	1	1	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	R1	R0	5	'T'	' '	'1'	'2'	'A'	x	x	x	CRC	ACK	EOF	LFS

PC Tx Packet 2: Set mainframe voltage 12V, the second packet

Example 2: SOUR:VOLT 12 →Change all mainframe voltage to 12V (Broadcast)
ID=00000001001000000xxxxxxxxxxxxxb
DCL=8
RTR=0
DATA= " SOUR:VOL" +0x0A

Destination Address: 1 (mainframe) | Source Address: 254 (PC) X: Don't care | RTR=0 (Data Packet) | DLC=8 (Data Length) | DATA=8 Bytes

SOF	1	1	1	1	1	1	1	1	1	1	1	SRR	IDE	1	1	1	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	R1	R0	8	'S'	'O'	'U'	'R'	':'	'V'	'O'	'L'	CRC	ACK	EOF	LFS

PC Tx Packet 1: Set mainframe voltage 12V with broadcast, the first packet

ID=00000001001000000xxxxxxxxxxxxxb
DCL=5
RTR=0
DATA=" T 12" +0x0A

Destination Address: 1 (mainframe) | Source Address: 254 (PC) | RTR=0 (Data Packet) | DLC=5 (Data Length) | DATA=5 Bytes

SOF	1	1	1	1	1	1	1	1	1	1	1	SRR	IDE	1	1	1	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	R1	R0	5	'T'	' '	'1'	'2'	'A'	x	x	x	CRC	ACK	EOF	LFS

PC Tx Packet 2: Set mainframe voltage 12V with broadcast, the second packet

Example: FETC:CURR? → Fetch mainframe output current (Address 1)

ID=00000001001000000xxxxxxxxxxxxxb
DCL=8
RTR=0
DATA=" FETC:CUR " +0x0A

Destination Address: 1 (mainframe)	Source Address: 254 (PC) X: Don't care	RTR=0 (Data Packet)	DLC=8 (Data Length)	DATA=8 Bytes

SOF	0	0	0	0	0	0	0	1	1	1	1	SRR	IDE	1	1	1	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	R1	R0	8	'F'	'E'	'T'	'C'	':'	'C'	'U'	'R'	CRC	ACK	EOF	LFS

PC Tx Packet 1: Fetch mainframe output current, the first packet

ID=00000001001000000xxxxxxxxxxxxxb
DCL=3
RTR=0
DATA=" R? " +0x0A

Destination Address: 1 (mainframe)	Source Address: 254 (PC)	RTR=0 (Data Packet)	DLC=3 (Data Length)	DATA=3 Bytes

SOF	0	0	0	0	0	0	0	1	1	1	1	SRR	IDE	1	1	1	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0	R1	R0	3	'R'	'?'	'A'	x	x	x	x	x	CRC	ACK	EOF	LFS

PC Tx Packet 2: Fetch mainframe output current, the second packet

Destination Address: 254 (PC)	Source Address: 1 (Mainframe)	RTR=0 (Data Packet)	DLC=6 (Data Length)	DATA=6 Bytes

SOF	1	1	1	1	1	1	1	1	0	0	0	SRR	IDE	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1	R0	6	'6'	'0 '	'.'	'0'	'0'	A	x	x	CRC	ACK	EOF	LFS

PC Rx Packet: Mainframe responds packet

ID=11111110000000010000000000000b
DCL=6
RTR=0
DATA=" 60.00 " +0x0A

4.4.5 Example Program

The following example is a Visual Basic program code using Port 0 of PCI-7841 to control 62000B Power Supply Module.

```
Dim port0 As PORT_STRUCT
Dim handle0 as Integer
Dim port0status As PORT_STATUS
Dim can0 As CAN_PACKET
Dim PC_Address as Long
```

```
Dim TxBuf(128) As Byte
Dim message As String
‘CAN Port Status Define
Const RxBuffer = 1
Const DataOverrun = 2
Const TxBuffer = 4
Const TxEnd = 8
Const RxStatus = 16
Const TxStatus = 32
Const ErrorStatus = 64

Function Open_7841_CanPort 0( )              ' Open PCI_7841 Port 0
    handle0 = CanOpenDriver (0, 0)
    If handle0 = -1 Then
      MsgBox "No PCI-7841 Port Found!"
End Function

Function Configure_7841_CanPort0( )          'Configure PCI_7841 Port 0
    port0.mode = 1                           'CAN 2.0B（29 bit）
    port0.accCode = PC_Address * (2 ^ 21)    'Acceptance Code…Left Shift 21bit
    port0.accMask = &H1FFFFFFF               'Acceptance Mask Filter（Accept all message,filter
                                             function is disable）
    port0.baudrate = 4                       ' User defined baudrate
    CanConfigPort handle0, port0             ' Configure port 0
    CanEnableReceive (handle0)               ' Enable receive function
End Function

Function Set_Baudrate (baudrate As Long )    'Configure PCI_7841 Port 0 Baudrate
    Select Case (baudrate)
     Case 10000: ' 10K…….BTR0=0x31     BTR1=0x1C
            port0.sjw = 0
            port0.brp = &H31
            port0.sam = 0
            port0.tseg2 = 1
            port0.tseg1 = &HC
     Case 20000: ' 20K……. BTR0=0x18     BTR1=0x1C
            port0.sjw = 0
            port0.brp = &H18
            port0.sam = 0
            port0.tseg2 = 1
            port0.tseg1 = &HC
     Case 50000: ' 50K……. BTR0=0x09     BTR1=0x1C
            port0.sjw = 0
            port0.brp = &H9
            port0.sam = 0
            port0.tseg2 = 1
            port0.tseg1 = &HC
    Case 100000: ' 100K……. BTR0=0x04     BTR1=0x1C
            port0.sjw = 0
```

```
                port0.brp = &H4
                port0.sam = 0
                port0.tseg2 = 1
                port0.tseg1 = &HC
        Case 125000: ' 125K……. BTR0=0x03      BTR1=0x1C
                port0.sjw = 0
                port0.brp = &H3
                port0.sam = 0
                port0.tseg2 = 1
                port0.tseg1 = &HC
        Case 250000: ' 250K……. BTR0=0x01      BTR1=0x1C
                port0.sjw = 0
                port0.brp = &H1
                port0.sam = 0
                port0.tseg2 = 1
                port0.tseg1 = &HC
        Case 500000: ' 500K……. BTR0=0x00      BTR1=0x1C
                port0.sjw = 0
                port0.brp = &H0
                port0.sam = 0
                port0.tseg2 = 1
                port0.tseg1 = &HC
        Case 800000: ' 800K……. BTR0=0x00      BTR1=0x16
                port0.sjw = 0
                port0.brp = &H0
                port0.sam = 0
                port0.tseg2 = 1
                port0.tseg1 = &H6
        Case 1000000: ' 1000K……. BTR0=0x00      BTR1=0x14
                port0.sjw = 0
                port0.brp = &H0
                port0.sam = 0
                port0.tseg2 = 1
                port0.tseg1 = &H4
    End Select
End Function

Function Can_Tx(buf() As Byte, ByVal Length As Integer,_62000B_Address As Byte)
                ' Tx data
    Dim i As Byte
    Dim j As Byte
    Dim port As Integer

     j = 0
     For i = 0 To Length
         If j > 7 Then
             j = 0
         End If
         can0.data(j) = buf(i)
```

```
        j = j + 1
        If j = 8 Or i = Length Then
            If BroadcastCheck.value = 1 Then
               can0.CAN_ID = 65535 * (2 ^ 13)          'ID……Broadcast command
            Else
               can0.CAN_ID = ( PC_Address + (_62000B_Address * (2 ^ 8)) ) * (2 ^ 13)
            End If
            can0.rtr = 0                               'data packet
            can0.len = j                               'data length
            CanSendMsg handle0, can0                   'call PCI_7841 function CanSendMsg()
                                                       to send Packet
        End If
        CanGetPortStatus (handle0, port0status)        'read PCI_7841 Port0 status
        port = port0status.reg

        While (((port And TxEnd) = 0) Or (port And RxStatus))   'Wait for Port0 is ready for
                                                                Tx and Check Port0 is
            DoEvents                                            'receiving data or not
        Wend
    Next i
End Function

Function Can_Rx ( ) As String                          'Rx data
    Dim i As Integer

    message = ""
    CanGetRcvCnt (handle0)                             'call PCI_7841 function CanGetRcvCnt () to
                                                       get message size
    Do While (CanRcvMsg(handle0, can0) = 0)            'Check PCI_7841 Rx Buffer is empty or not
        For i = 0 To (can0.len - 1)
            If can0.data(i) = &HA Then                 'Mark terminal message Character 0x0A
                message = CANRXMessage + "\n"
            Else
               message = CANRXMessage + Chr(can0.data(i))
        Next
        i = 0
        Loop
    Can_Rx= message
End Function

Function Main ( )
    PC_Address=254                                     'Set PC Address as 254
    Open_7841_CanPort 0                                'Open PCI_7841 Port 0
    Set_Baudrate 12500                                 'Set baudrate 125kbps
    Configure_7841_CanPort0                            'Configure CAN Port 0
    TxBuf(0)= &H53      'S
    TxBuf(1)= &H4F      'O
    TxBuf(2)= &H55      'U
    TxBuf(3)= &H52      'R
```

```
TxBuf(4)= &H3A      ':
TxBuf(5)= &H56      'V
TxBuf(6)= &H4F      'O
TxBuf(7)= &H4C      'L
TxBuf(8)= &H54      'T
TxBuf(9)= &H20      '
TxBuf(10)= &H31     '1
TxBuf(11)= &H35     '5
TxBuf(12)= &HA      'line feed
Can_Tx TxBuf,13,1                   'Set voltage 15V for 62000B with address 1

TxBuf(0)= &H53      'S
TxBuf(1)= &H4F      'O
TxBuf(2)= &H55      'U
TxBuf(3)= &H52      'R
TxBuf(4)= &H3A      ':
TxBuf(5)= &H43      'C
TxBuf(6)= &H55      'U
TxBuf(7)= &H52      'R
TxBuf(8)= &H52      'R
TxBuf(9)= &H20      '
TxBuf(10)= &H39     '9
TxBuf(11)= &H30     '0
TxBuf(12)= &HA      'line feed
Can_Tx TxBuf,13,1                   'Set current 90A for 62000B with address 1

TxBuf(0)= &H43      'C
TxBuf(1)= &H4F      'O
TxBuf(2)= &H4E      'N
TxBuf(3)= &H46      'F
TxBuf(4)= &H3A      ':
TxBuf(5)= &H4F      'O
TxBuf(6)= &H55      'U
TxBuf(7)= &H54      'T
TxBuf(8)= &H50      'P
TxBuf(9)= &H20      '
TxBuf(10)= &H4F     'O
TxBuf(11)= &H4E     'N
TxBuf(12)= &HA      'line feed
Can_Tx TxBuf,13,1                   'Set Output On for 62000B with address 1

TxBuf(0)= &H46      'F
TxBuf(1)= &H45      'E
TxBuf(2)= &H54      'T
TxBuf(3)= &H43      'C
TxBuf(4)= &H3A      ':
TxBuf(5)= &H56      'V
TxBuf(6)= &H4F      'O
TxBuf(7)= &H4C      'L
```

```
    TxBuf(8)= &H54      'T
    TxBuf(9)= &H3F      '?
    TxBuf(10)= &HA      'line feed
    Can_Tx TxBuf,11,1                   'Fetch Output Voltage for 62000B with
                                        address 1
    Delayms                             'Delay for 62000B responds
    Can_Rx                              'Receive message
End Function
```

5. Self Test & Troubleshooting

5.1 Overview

Follow the actions described in this chapter to inspect the instrument and troubleshoot the problem first when the 62000B Series DC Power Supply is unable to operate normally. Please consult the sales agent or distributor of Chroma if the information provided in this manual is unable to resolve the problem.

5.2 Troubleshooting

Operation problems and suggestions for resolution:

Problem	Cause	Resolution
Bad measurement for V, I	Feature swings due to aged components.	Consult local sales agent for assistance.
Output is not within Accuracy SPEC.	Feature swings due to aged components.	Consult local sales agent for assistance.
Over Temperature Protection (OTP)	1. The ambient temperature is too high. 2. The vent is blocked.	1. Operate the instrument within the temperature of 0 ~ 50°C. 2. Clear the vent.
Over Current Protection (OCP)	The output current exceeds the spec. or OCP settings.	Remove the over load or enlarge the OCP settings.
Fan Fail Protection (FAN LOCK)	1. The fan is out of order. 2. The feedback circuit is abnormal.	Consult local sales agent if it is unable to reset the protection state.
Input Error Protection	The voltage of AC input line is either too low or too high.	Adjust the voltage if it exceeds the spec. when measuring the input voltage.
No output voltage	1. The output voltage feedback is abnormal. 2. The D/D power stage is damaged.	Consult local sales agent if it is unable to reset the protection state.
Over Voltage Protection (OVP)	The output voltage exceeds the spec. or OVP settings	1. Check the OVP settings. 2. Consult local sales agent if it is unable to reset the protection state.
Unable to control DC Module via CAN BUS	1. The address of 62000B Mainframe is incorrect. 2. The CAN BUS cable is loose and fallen at rear.	1. Update the Mainframe address at rear. 2. Check the CAN BUS interface and secure it with screws.
Power module is inserted improperly	The LEDs of power module Output and Fault are always on.	Take out the power module and wait until the Fault LED is off for reinsertion.