D750

DC Power Supply

User Manual

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DELTA

User Manual

D750

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Guarantee

THE SCOPE OF RIGHT:

1. Delta Electronics Co., Ltd. guarantees the quality of all sales of products in Taiwan, and is responsible for fault repair, to safeguard the interests of your company.
2. When encountered fault conditions in need of services, please contact the Taiwan presence or Delta Electronics.
3. The failure of the product you are buying, if not in the place of your original purchase, you can use the global network service. You may contact the global Delta electronic branch, each branch will be according to the charge system to provide product maintenance and service.

PRODUCTS ASSURANCE THE SCOPE:

However, any one of the following items, It is not the Company's warranty. Still need replacement and repair parts replacement and repair parts costs charged in accordance with company policy. If because of the severe damage caused can not be repaired, the repair services have declined:

1. Change specifications or additional items arising from the failure and damage caused by the failure and damage, because the user (or commissioned) changes, overhaul, modification products or attach other objects.
2. Force majeure or failure caused by improper use.
   (1) Due to natural disasters to change (such as earthquake, typhoon, fire, lightning, abnormal voltage ... etc.) and environmental factors (such as sulfur gas, chemical, oil, rodents, pests, ... etc.) force majeure natural disaster caused by the damage or malfunction.
   (2) (External damage, such as people, animals, etc., are not used in accordance with the provisions of the supply voltage, the error operation after installation on their own handling ... etc.) caused by the failure or damage.
   (3) Appearance because of the use of natural dirt or old.
3. Consumable parts and accessories.
4. If the following circumstances require service, without a free service:

To exceed the Warranty Period:

(1) Use within the warranty period after the Company sent a free guide or instructions, still can not adjust, and the request for service

(2) Ensure that the contents of the record book, and now the items are inconsistent.

ASSURANCE AND SERVICE TIME:

Regardless of guarantee after the expiry of the period or duration, the Company's maintenance services in the basic maintenance of the award determined by the time of deduction of the Central Personnel Administration holidays, national holidays and traditional ethnic festivals, Monday to Friday from 9 am to afternoon five o'clock

Safety Instructions

CAUTION

The following safety precaution must be observed during all phases of operation, service and repair of this equipment. Failure to comply with the safety precautions or warnings in this document violates safety standards of design, manufacture and intended use of this equipment and may impair the built-in protections within.
Delta shall not be liable for user' s failure to comply with these requirements.

INSTALLATION CATEGORY

The D750 A has been evaluated to INSTALLATION CATEGORY II. Installation category (over voltage category) II: local level, appliances, portable equipment etc.. With smaller transient over voltage than Installation Category (over voltage category) III.

GROUNDING

This product is a Safety Class 1 instrument. To minimize shock hazard, the instrument chassis must be connected to an electrical ground. The instrument must be connected to the AC power supply mains through a three conductor power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet.
For instruments designed to be hard-wired to the supply mains, the protective earth terminal must be connected to the safety electrical ground before another connection is made. Any interruption of the protective ground conductor, or disconnection of the protective earth terminal will cause a potential shock hazard that might cause personal injury.

WARNING

OUTPUT TERMINAL GROUNDING

There is a potential shock hazard at the RS232/485 and the IEEE ports when using power supplies with rated or combined voltage greater than 400V and the Positive Output of the Power Supply is grounded. Do Not connect the Positive Output to ground when using the RS232/485 or IEEE.

FUSES

Fuses must be changed by authorized Delta service personnel only. For continued protection against risk of fire, replace only with the same type and rating of fuse.

INPUT RATINGS

Do not use AC supply which exceeds the input voltage and frequency rating of this instrument. The input voltage and frequency rating of the D750 is: 100-200V~, 50/60Hz.For safety reasons, the mains supply voltage fluctuations should not exceed +/-10% of nominal voltage.

LIVE CIRCUITS

Operating personnel must not remove the instrument cover. No internal adjustment or component replacement is allowed by non-Delta qualified personnel. Never replace components with power cable connected. To avoid injuries, always disconnect power, discharge circuits and remove external voltage source before touching components.

PARTS SUBSTITUTIONS & MODIFICATIONS

Parts substitutions and modifications are allowed by authorized Delta service personnel only. For repairs or modifications, the instrument must be returned to Delta service facility.

ENVIRONMENTAL CONDITIONS

The D750 safety approval applies to the following operating conditions:

*Indoor use
*Ambient temperature: 0℃ to 50℃
*Maximum relative humidity: 90% (no condensation)
*Altitude: up to 3000m
*Pollution degree 2

	CAUTION Risk of Electrical Shock.
	Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual.
	Indicates hazardous voltage.
	Protective Ground Conductor Terminal
	Off (Supply)
	On (Supply)
	Indicates ground terminal.
WARNING	The WARNING sign denotes a hazard. An attention to a procedure is called. Not following procedure correctly could result in personal injury. AWARNING sign should not be skipped and all indicated conditions must be fully understood and met.
CAUTION	The CAUTION sign denotes a hazard. An attention to a procedure is called. Not following procedure correctly could result in damage to the equipment. Do not proceed beyond a CAUTION sign until all indicated conditions are fully understood and met.

Chapter1 General Information

1.1 User Manual Content

This user's manual contains the operating instructions, installation instructions and specifications of the D750 power supplies. The instructions refer to the standard power supplies, including the built-in RS232/485/IEEE serial communication.

1.2 Introduction

1.2.1 General description

D750 high performance programmable DC power supplies. The D750 is power factor corrected and operates from worldwide AC voltage range continuously. Output voltage and current are continuously displayed and LED indicators show the complete operating status of the power supply. The Front panel controls allow the user to set the output parameters, the protection levels (Over-Voltage protection, Under-Voltage limit and Foldback) and preview the settings. The rear panel includes the necessary connectors to control and monitor the power supply operation by remote analog signals or by the built-in serial communication (RS232/485). GPIB programming and Analog programming/monitoring

1.2.2 Features and options

* Constant Voltage / Constant Current with automatic crossover.
* Active Power Factor correction.
* Universal Input Voltage 85~265Vac, continuous operation.
* Embedded Microprocessor Controller.
* Built in RS232/485 Interface.
* Voltage & Current high resolution adjustment by digital encoders.
* High accuracy programming/readback-16 bit.
* Software Calibration (no internal trimmers / potentiometers).
* Last Setting Memory.
* Independent Remote ON/OFF and Remote Enable/Disable.
* Parallel operation (Master/Slave) with Active current sharing.
* Remote sensing to compensate for voltage drop of power leads.
* External Analog Programming and Monitoring standard (0-5V or 0-10V, user selectable).
* Cooling fan speed control for low noise and extended fan life.
* Zero stacking-no ventilation holes at the top and bottom surface of the power supply.
* GPIB interface (SCPI compatible).

1.2.3 Multiple output power system

D750 can be configured into a programmable power system of up to 31 units using the built-in RS232/RS485 communication port in the power supply and the RS485 linking cable provided with each power supply.

In a GPIB system, each power supply can be controlled using the GPIB controller.

1.2.4 Control via the serial communication port

The following parameters can be programmed via the serial communication port:

1. Output voltage setting.
2. Output current setting.
3. Output voltage measurement.
4. Output on/off control.
5. Output current measurement.
6. Foldback protection setting.
7. Over-voltage protection setting and readback.
8. Under-Voltage limit setting and readback.
9. Power-supply start up mode (last setting or safe mode)

1.2.5 Analog voltage programming and monitoring

Analog inputs and outputs are provided at the rear panel for analog control of the power supply. The output voltage and the current limit can be programmed by analog voltage or by resistor, and can be monitored by analog voltage. The power supply output can be remotely set to On or Off and analog signals monitor the proper operation of the power supply and the mode of operation (CV/CC).

1.2.6 Parallel operation

D750 of the same output voltage and current rating can be paralleled in master-slave configuration with automatic current sharing to increase power available.

1.2.7 Output connections

Float outputs shall not more than +/-300VDC above/below chassis ground. Contact factory for assistance with higher float voltage applications. Local or remote sense may be used. In remote sense, the voltage drop on the load wires should be minimized. Refer to the specifications for the maximum voltage drop value.

1.2.8 Cooling and mechanical construction

D750 is cooled by internal fans. At the installation, care must be taken to allow free air flow into the power supply via the front panel and out of the power supply via the rear panel. D750 have a compact and lightweight package which allows easy installation and space saving in the application equipment.

1.3 Specification

OUTPUT RATING	
Max. Rated output voltage(*1)	300V
Max. Rated output current(*2)	2.5A
Rated output power	750W
INPUT CHARACTERISTICS	
Input voltage/freq(*3)	1-Phase, 85~265Vac continuous, 47~63Hz
Input current	10.5A (100Vac), 5A (200Vac)
Power Factor (Typ)	1-Phase: 0.98@100/200Vac, rated output power.
Efficiency(*4)	83%(100Vac), 87%(200Vac)
Inrush current at 100/200V	Less than 25A
CONSTANT VOLTAGE MODE	
Max. Line regulation(*5)	0.01% of rated output voltage +2mV
Max. Load regulation(*6)	0.01% of rated output voltage +2mV
Ripple and noise (p-p , 20MHz)(*10)	150mV
Ripple r.m.s., 5Hz~1MHz(*10)	25mV
Temperature coefficient	100PPM/ºC from rated output voltage, following 30 minutes warm-up with room temperature.
Temperature drift	0.05% of rated Vout over 8hrs interval following 30 minutes warm-up. Constant line, load & temp with room temperature.
Rem. sense compensation/wire	5V
Up-prog. Response time, 0~Vomax(*9)	150ms
Down-prog. Response time: rated output current(*8)	150ms
No load(*10)	2500ms
Transient response time	Time for the output voltage to recover within 0.5% of its rated output for a load change 10~90% of rated output current. Output set-point: 10~100%. 2ms or less
Hold-up time	20ms Typical. Rated output power.
CONSTANT CURRENT MODE	
Max. Line regulation(*5)	0.01% of rated output current +2mA

Max. Load regulation(*7)	0.02% of rated output current +5mA
Ripple r.m.s., 5Hz~1MHz(*8)	13mA
Temperature coefficient	100PPM/ ºC from rated output current, following 30 minutes warm-up with room temperature.
Temperature drift	0.05% of rated Iout over 8hrs interval following 30 minutes warm-up. Constant line, load & temp with room temperature.
Warm up drift	Less than 0.1% rated output current over 30 minutes following power on or output voltage change or load current change.
ANALOG PROGRAMMING AND MONITORING	
Vout voltage programming	0~100%, 0~5V or 0~10V, user select. Accuracy and linearity: +/-0.5% of rated Vout.
Iout voltage programming	0~100%, 0~5V or 0~10V, user select. Accuracy and linearity: +/-1% of rated Iout.
Vout resistor programming	0~100%, 0~5/10Kohm full scale, user select. Accuracy and linearity: +/-1% of rated Vout.
Iout resistor programming	0~100%, 0~5/10Kohm full scale, user select. Accuracy and linearity: +/-1.5% of rated Iout.
On/off control	By electrical Voltage 2~15V or open circuit, user selectable logic.
Output current monitor	0~5V or 0~10V, user selectable. Accuracy: +/-(1%+0.4% F.S.)
Output voltage monitor	0~5V or 0~10V, user selectable. Accuracy :+/-(1%+0.4% F.S.)
Power supply OK signal	4~5V-OK, 0V-Fail.500ohm series resistance.
Parallel operation	Possible, up to 4 units in master/slave mode with two wire current balance connection.
Series operation	Possible (with external diodes), up to 2 units. 600Vdc max. from chassis ground.
CV/CC indicator	Open collector. CV: Off CC: On, Maximum voltage: 30V sink current: 10mA.
Enable/Disable	Dry contact. Open: off, Short: on. Max. voltage at Enable/Disable in: 6V.
Local/Remote analog control	Short: Remote, Open: Local.
Local/Remote analog indicator	Local: Open, Remote: on

PROGRAMMING AND READBACK (RS232/485, IEEE Interface)	
Vout programming accuracy	0.05% of actual output voltage +0.05% of rated output voltage
Iout programming accuracy	0.1% of actual output current +0.2% of rated output current
Vout programming resolution	0.012% of full scale
Iout programming resolution	0.012% of full scale
Vout readback accuracy	0.1%+0.1% of rated output voltage
Iout readback accuracy	0.1%+0.3% of rated output current
Vout readback resolution	0.012% of full scale
Iout readback resolution	0.012% of full scale
PROTECTIVE FUNCTIONS	
Foldback protection	Output shut-down when power supply change from CV to CC User presetable.
Over-voltage protection (OVP)	Inverter shut-down, manual reset by AC input recycle or by OUT button or by communication port command.
Over-voltage trip point	5~330V
Output under voltage limit (UVL)	Preset by front panel or communication port. Prevents from adjusting Vout bellow limit. Dose not affect analog programming.
Over temperature protection	Latched
FRONT PANEL	
Control functions	Vout/Iout manual adjust by separate encoders (coarse and fine adjustment).
	OVP/UVL manual adjust by Vout. Adjust encoder.
	Address selection by Voltage Adjust encoder. No of addresses: 31.
	Go to local control.
	Output on/off
	AC on/off
	Front panel Lock
	Foldback control
	Baud rate selection: 1200, 2400, 4800, 9600 and 19200.

	Re-start modes (automatic restart, safe mode).
Display	Vout: 4 digits, accuracy: 0.5% of rated output voltage +/-1 count.
	Iout: 4 digits, accuracy: 0.5% of rated output current +/-1 count.
Indications	VOLTAGE, CURRENT, ALARM, FINE, PREVIEW, FOLDBACK, REMOTE (RS232, RS485, IEEE), OUTPUT ON, FRONT PANEL LOCK.
ENVIRONMENTAL CONDITIONS	
Operating temperature	0~50 ºC, 100% load.
Storage temperature	-20~70 ºC
Operating humidity	30~90% RH (no condensation).
Storage humidity	10~95% RH (no condensation).
Altitude	Maximum 3000m (10000ft). Derate output current by 2%/100m above 2000m. Alternatively maximum ambient temperature by 1ºC/100m above 2000m.
MECHANICAL	
Cooling	Forced air cooling by internal fans.
Weight	4.5kg
Dimensions (WxHxL)	W: 214mm, H: 43.6mm, L: 436.7mm (Refer to Outline drawing).
Vibration	TEST CONDITIONS: a. NON-OPERATING b. SINUSOIDAL c. ACCELERATION: 0.5G (5Hz), 0.94G (10~150Hz) d. Duration: 30 minutes for each three axis (X, Y, Z)
Shock	TEST CONDITIONS: a. NON-OPERATING b. HALF SINUSOIDAL c. NUMBER OF SHOCK: 6 SHOCKS FOR EACH DIRECTION. d. VELOCITY CHANGE: 1.32 m/s e. PULSE DURATION: 2ms

SAFETY/EMC		
Applicable standards:	Safely	CE Mark, EN61010 listed Output is hazardous
	EMC	EN55011
Withstand voltage		Input-Outputs (SELV): 3.0KVrms 1min, Input-Ground: 1.5KVrms 1min.
Insulation resistance		More than 100Mohm at 25 ºC, 70% RH.
Conducted emission		EN 55011:2009+A1:2010, Group I, Class A
Radiated emission		EN 55011:2009+A1:2010, Group I, Class A

NOTES:

*1: Minimum voltage is guaranteed to maximum 0.2% of the rated output voltage.

*2: Minimum current is guaranteed to maximum 0.4% of the rated output current.

*3: At 100-240Vac (50/60Hz) input voltage, with rate output power.

*4: 在 100/200V 输入电压和最大输出功率

*5: At 85~265Vac or 170~265Vac, constant load.

*6: From No-load to Full-load, constant input voltage Measured at the sensing point in Remote Sense.

*7: 负载电压变化范围为电源额定电压，输入电压恒定。

*8: 纹波在输出电压为 10-100%和输出下测得

*9: For load voltage change, equal to the unit voltage rating, constant input voltage.

*10: 额定电阻负载。

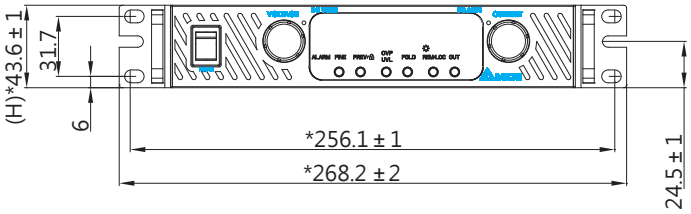
1.4 Supplemental Characteristics

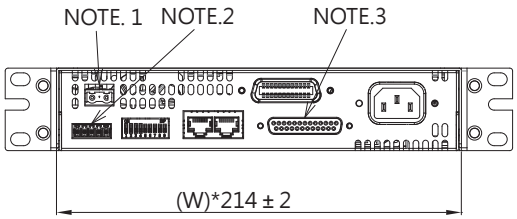
The supplemental characteristics give typical but non-warranted performance characteristics. The supplemental characteristics are useful in assessing applications for the power supply. Several kinds of supplemental characteristics are listed below.

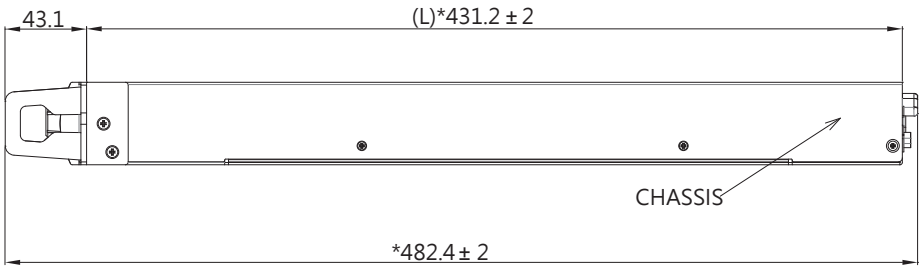
1. Evaluation Data: Typical performance of the power supply.
2. Reliability Data: Reliability performance of the power supply.
3. EN61000 Data: Performance of the power supply under EN61000 test conditions.
4. EMI Data: Typical EMI (conducted and radiated) performance of the power supply.

The supplemental characteristics data is held in each DELTA sales and service facility. For further details please contact the DELTA office nearest you.

1.5 D750 Power Supplies Outline Drawings







NOTE :
1. Mating plug Phoenix GIC2.5/4-ST-7.62
2. Mating plug Phoenix MC1.5/5-ST-3.81
3. Mating plug AMP D25PHPKPC(749809-9)

Chapter2 Installation

2.1 General

This chapter contains instructions for initial inspection, preparation for use and repackaging for shipment. Connection to PC, setting the communication port and linking D750 are described in Chapter 4.

NOTE

D750 generate magnetic fields which might affect the operation of other instruments. If your equipment is susceptible to magnetic fields, do not position it adjacent to the power supply.

2.2 Preparation For Use

In order to be operational the power supply must be connected to an appropriate AC source. The AC source voltage should be within the power supply specification. Do not apply power before reading, Section 2.5 and 2.6.

Table 2-1 below, describes the basic setup procedure. Follow the instructions in Table 2-1 in the sequence given to prepare the power supply for use.

Table 2-1: Basic setup procedure

Step no.	Item	Description	Reference
1	Inspection	Initial physical inspection of the power supply	Section 2.3
2	Installation	Installing the power supply, Ensuring adequate ventilation.	Section 2.4
3	AC source	AC source requirements Connecting the power supply to the AC source.	Section 2.5 Section 2.6
4	Test	Turn-on checkout procedure.	Section 2.7
5	Load connection	Wire size selection. Local/Remote sensing. Single or multiple loads.	Section 2.8
6	Default setting	The power supply setting at shipment.	Section 4.2.2.1

2.3 Initial Inspection

Prior to shipment this power supply was inspected and found free of mechanical or electrical defects. Upon unpacking of the power supply, inspect for any damage which may have occurred in transit.

The inspection should confirm that there is no exterior damage to the power supply such as broken knobs or connectors and that the front panel and meters face are not scratched or cracked. Keep all packing material until the inspection has been completed. If damage is detected, file a claim with carrier immediately and notify the Delta sales or service facility nearest you.

2.4 Location, Mounting And Cooling

This power supply is fan cooled. The air intake is at the front panel and the exhaust is at the rear panel. Upon installation allow cooling air to reach the front panel ventilation inlets. Allow minimum 10cm (4Inch) of unrestricted air space at the front and the rear of the unit.

The power supply should be used in an area that the ambient temperature does not exceed +50ºC.

2.5 AC Source Requirements

The D750 can be operated from a nominal 85V to 265V, single phase, 47~63Hz. The input voltage range and current required for each model is specified in Chapter 2. Ensure that under heavy load, the AC voltage supplied to the power supply does not fall below the specifications described in Section 1.3.

2.6 AC Input Power Connection

CAUTION

Connection of this power supply to an AC power source should be made by an electrician or other qualified personnel.

WARNING

There is a potential shock hazard if the power supply chassis (with cover in place) is not connected to an electrical safety ground via the safety ground in the AC input connector.

WARNING

Some components inside the power supply are at AC voltage even when the On/Off switch is in the "Off" position. To avoid electric shock hazard, disconnect the line cord and load and wait two minutes before removing cover.

2.6.1 AC Input Connector

The rear panel can be connected to AC power through AC and Euroblocks, and the ground wire must be connected to ground for safe grounding.

2.6.2 AC Input Cord

WARNING

The AC input cord and ground wire size must be No. 12 AWG or larger. The AC input cord must be no longer than 3m.

2.7 Turn-on Checkout Procedure

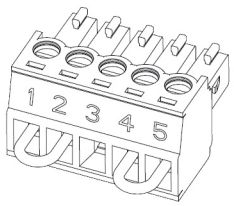
2.7.1 General

The following procedure ensures that the power supply is operational and may be used as a basic incoming inspection check. Refer to Fig.3-1 and Fig.3-2 for the location of the controls indicated in the procedure.

2.7.2 Prior to Operation

1. Ensure that the power supply is configured to the default setting:
   -AC On/Off switch at Off position.
   -Dip switch: All positions at Down (" Off") position.
   -Sense connector: Configured to Local Sense as shown in Fig.2-1:

1 Remote (+) sense
2 Local (+) sense
3 Not connected (Phoenix)
4 Local (-) sense5 Remote (-) sense



PLUG PN:Dinkle EC381V-05P

Fig.2-1: Sense connector default connection

2. Connect the unit to an AC source as described in section 2.6.
3. Connect a DVM with appropriate cables for the rated voltage to the output terminals.
4. Turn the front panel AC power switch to On.

2.7.3 Constant Voltage Check

1. Turn on the output by pressing OUT pushbutton so the OUT LED illuminates.
2. Observe the power supply VOLT display and rotate the Voltage encoder. Ensure that the output voltage varies while the VOLT encoder is rotated. The minimum control range is from zero to the maximum rated output for the power supply model. Compare the DVM reading with the front panel VOLT display to verify the accuracy of the VOLT display. Ensure that the front panel VOLT LED is on.
3. Turn off the front panel AC power switch.

2.7.4 Constant Current Check

1. Ensure that the front panel AC power switch is a Off position and the DVM connected to the output terminals shows zero voltage.
2. Connect a DC shunt across the output terminals. Ensure that the shunt and the wires' current ratings are higher than the power supply rating. Connect a DVM to the shunt.

3. Turn the front panel AC power switch to On position.
4. Turn on the output by pressing OUT pushbutton so the OUT LED illuminates.
5. Observe the power supply CURRENT display and rotate the CURRENT encoder. Ensure that the output current varies while the CURRENT encoder is rotated. The minimum control range is from zero to the maximum rated output for the power supply model. Compare the DVM reading with the front panel CURRENT display to verify the accuracy of the CURRENT display. Ensure that the front panel CURRENT LED is on.
6. Turn off the front panel AC power switch.
7. Remove the shunt from the power supply output terminals.

2.7.5 OVP Check

Refer to Section 3.2.3 for explanation of the OVP function prior to performing the procedure below.

1. Turn the front panel AC power switch to On position and turn on the output by pressing OUT push button.
2. Using the VOLT encoder, adjust the output voltage to approx. 10% of the unit voltage rating.
3. Momentarily press the OVP/UVL button so that the CURRENT display shows “OUP”. The VOLTAGE display will show the last setting of the OVP level.
4. Rotate the VOLT encoder CCW to adjust the OVP setting to 50% of the unit voltage rating.
5. Wait a few seconds until the VOLT display returns to show the output voltage.
6. Adjust the output voltage to ward it’ s maximum and check that the output voltage can not be increased more than the OVP setting.
7. Adjust OVP limit to the maximum by repeating step 3 and rotating the VOLT encoder CW.

2.7.6 UVL Check

Refer to Section 3.2.4 for explanation of the UVL function prior to performing the procedure below.

1. Press the OVP/UVL button TWICE so that the CURRENT display shows "UUL". The VOLTAGE display will show the last setting of the UVL level.
2. Rotate the VOLT encoder to adjust the UVL level to approx.10%of the unit voltage rating.
3. WaitafewsecondsuntiltheVOLTdisplayreturnstoshowtheoutputvoltage.
4. Adjust the output voltage toward it’ s minimum and check that the output voltage can not be decreased below the UVL setting.
5. Adjust the UVL limit to the minimum by repeating step1 and rotating the VOLT encoder CW.

2.7.7 Foldback Check

WARNING

Shorting the output may expose the user to hazardous voltages. Observe proper safety procedures.

Refer to Section 3.2.5 for explanation of the FOLD function prior to performing the procedure below.

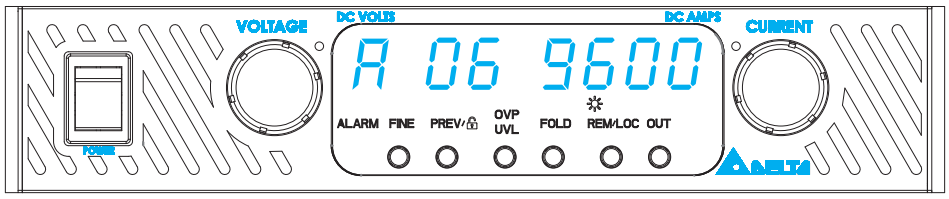
1. Ensure that the output voltage is set to approx. 10% of the unit rating.
2. Adjust the CURRENT encoder to set the current limit to approx. 10% of the unit rating.
3. Momentarily press the FOLD button. Ensure that the FOLD LED illuminates. The output voltage remains unchanged.
4. Short the output terminals momentarily (approx. 0.5 sec.). Ensure that the output voltage falls to zero, the VOLT display shows "FB" and the ALARM LED blinks.
5. Press the FOLD button again to cancel the protection. The output voltage remains zero.
6. Press OUT button. Ensure that the output voltage returns to it's last setting.
7. Turn the output off by pressing OUT button. Ensure that the VOLT display shows "OFF".

2.7.8 Address Setting

1. Press and hold the REM/LOC button for approx. 3sec. The VOLT display will show the communication port address.
2. Using the VOLT adjust encoder, check that the address can be set within the range of 0 to 30.

2.7.9 Baud Rate Setting

1. Press and hold the REM/LOC button for approx. 3sec. The CURRENT display will show the communication port Baud Rate.
2. Using The CURRENT adjust encoder, check that the Baud Rate can be set to 1200, 2400, 4800, 9600 and 19200.



2.8 Connecting The Load

WARNING

Turn off the AC input power before making or changing any rear panel connection. Ensure that all connections are securely tightened before applying power. There is a potential shock hazard when using a power supply with a rated output greater than 40V.

2.8.1 Load Wiring

The following considerations should be made to select wiring for connecting the load to the power supply:

*Current carrying capacity of the wire (refer to 2.8.2)
  *Insulation rating of the wire should be at least equivalent to the maximum output voltage of the power supply.
*Maximum wire length and voltage drop (refer to 2.8.2)
*Noise and impedance effects of the load wiring (refer to 2.8.4).

2.8.2 Current Carrying Capacity

Two factors must be considered when selecting the wire size:

1. Wires should be at least heavy enough not to overheat while carrying the power supply load current at the rated load, or the current that would flow in the event the load wires were shorted, whichever is greater.
2. Wire size should be selected to enable voltage drop per lead to be less than 1.0V at the rated current. Although units will compensate for up to 5V in each load wire, it is recommended to minimize the voltage drop (1V typical maximum) to prevent excessive output power consumption from the power supply and poor dynamic response to load changes. Please refer to Tables 2-2 and 2-3 for maximum wire length to limit voltage drop in American and European dimensions respectively.

Table 2-2: Maximum wire length for 1V drop on lead (in feet)

Wire size AWG	Resistivity Ohm/100 0ft	Maximum length in Feet to limit voltage drop to 1V or less				
		5A	10A	20A	50A	150A
14	2.526	80	40	20	8	2
12	1.589	120	60	30	12	3.4
10	0.9994	200	100	50	20	6
8	0.6285	320	160	80	32	10
6	0.3953	500	250	125	50	16
4	0.2486	800	400	200	80	26
2	0.1564	1200	600	300	125	40
0	0.0983	2000	1000	500	200	68

Table 2-3: Maximum wire length for 1V drop on lead (in meters)

Cross sect. area (mm2)	Resistivity Ohm/Km	Maximum length in meters to limit voltage drop to 1V or less				
		5A	10A	20A	50A	150A
2.5	8.21	24.0	12.0	6.0	2.4	0.8
4	5.09	39.2	18.6	9.8	4.0	1.4
6	3.39	59.0	29.4	14.8	5.8	2.0
10	1.95	102.6	51.2	25.6	10.2	3.4
16	1.24	160.0	80.0	40.0	16.0	5.4
25	0.795	250.0	125.0	62.0	25.2	8.4
35	0.565	354.0	177.0	88.0	35.4	11.8

For currents not shown in Table 2-2 and 2-3, use the formula:
Maximum length=1000/ (current x resistivity)
where current is expressed in Amperes and resistivity in ohms/km or ohms/1000ft.

2.8.3 Wire termination

The wires should be properly terminated with terminals securely attached. DO NOT use unter-minated wires for load connection at the power supply.

CAUTION

When local sensing, a short from +LS or +S to -V or -S or -LS, will cause damage to the power supply. Reversing the sense wires might cause damage to the power supply in local and remote sensing. (Do not connect –S to +V or +S to -V.)

2.8.4 Noise and Impedance Effects

To minimize the noise pick up or radiation, the load wires and remote sense wires should be twisted-pairs to the shortest possible length. Shielding of sense leads may be necessary in high noise environments. Where shielding is used, connect the shield to the chassis via a rear panel Grounds crew. Even if noise is not a concern, the load and remote sense wires should be twisted-pairs to reduce coupling, which might impact the stability of power supply. The sense leads should be separated from the power leads.

Twisting the load wires reduces the parasitic inductance of the cable which could produce high frequency voltage spikes at the load and the output of power supply, because of current variation in the load itself.

The impedance introduced between the power supply output and the load could make the ripple and noise at the load worse than the noise at the power supply rear panel output. Additional filtering with bypass capacitors at the load terminals may be required to bypass the high frequency load current.

2.8.5 Inductive loads

Inductive loads can produce voltage spikes that may be harmful to the power supply. A diode should be connected across the output. The diode voltage and current rating should be greater than the power supply maximum output voltage and current rating. Connect the cathode to the positive output and the anode to the negative output of the power supply.

Where positive load transients such as back EMF from a motor may occur, connect a surge suppressor across the output to protect the power supply. The breakdown voltage rating of the suppressor must be approximately 10% higher than the maximum output voltage of the power supply.

2.8.6 Connecting single loads, local sensing (default).

Fig.2-2 shows recommended load and sensing connections for a single load. The local sense lines shown are default connections at the rear panel J2 sense connector. Local sensing is suitable for applications where load regulation is less critical.

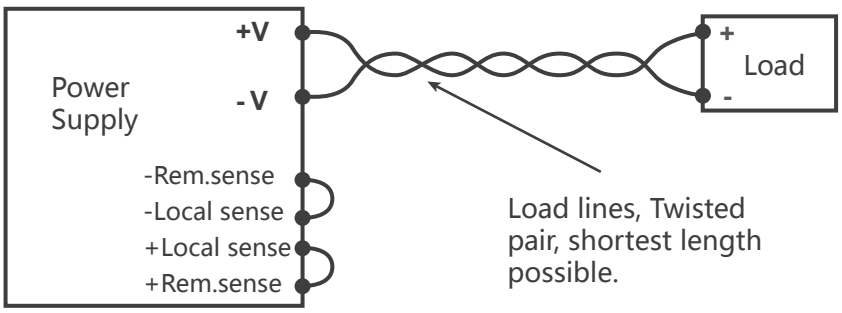


Fig.2-2: Single load connection, local sensing

2.8.7 Connecting single loads, remote

Fig.2-3 shows recommended remote sensing connection for single loads. Remote sensing is used when, in Constant Voltage mode, the load regulation is important at the load terminals. Use twisted or shielded wires to minimize noise pick-up. If shielded wires are used, the shield should be connected to the ground at one point, either at the power supply chassis or the load ground. The optimal point for the shield ground should be determined by experimentation.

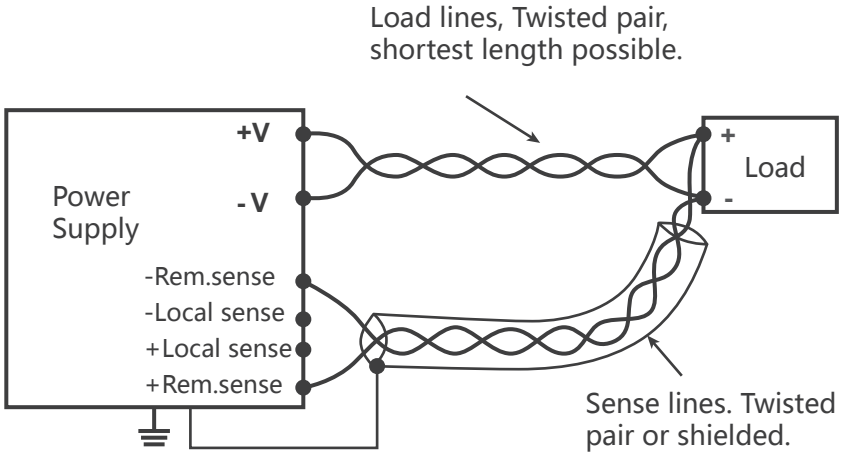


Fig.2-3: Remote sensing, single load

2.8.8 Connecting multiple loads, radial distribution method

Fig.2-4 shows multiple loads connected to one supply. Each load should be connected to the power supply' s output terminals using separate pairs of wires. It is recommended that each pair of wires will be as short as possible and twisted or shielded to minimize noise pick-up and radiation. The sense wires should be connected to the power supply output terminals or to the load with the most critical load regulation requirement.

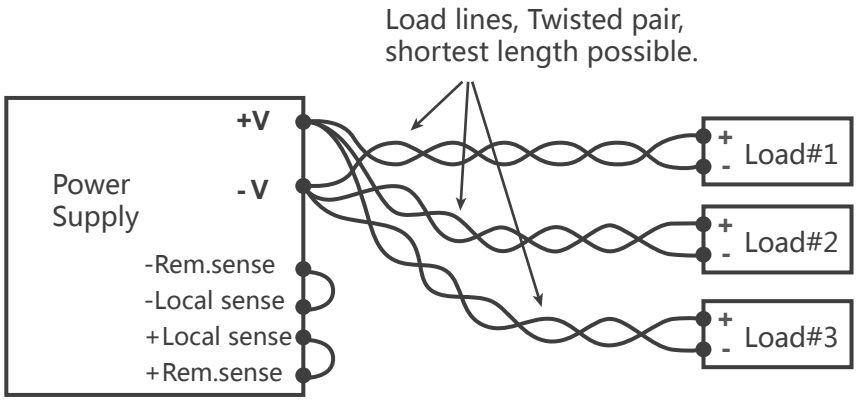


Fig.2-4: Multiple loads connection, radial distribution, local sense

2.8.9 Multiple load connection with distribution terminals

If remotely located output distribution terminals are used, the power supply output terminals should be connected to the distribution terminals by a pair of twisted and/or shielded wires. Each load should be separately connected to the remote distribution terminals (see Fig.2-5). If remote sensing is required, the sensing wires should be connected to the distribution terminals or at the most critical load.

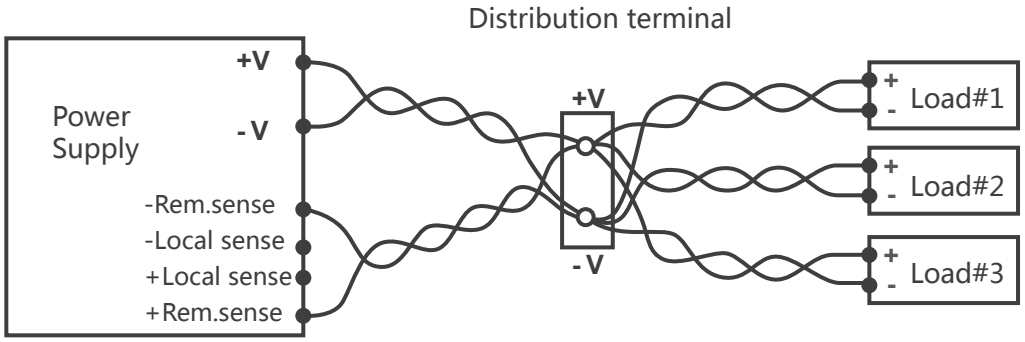


Fig.2-5: Multiple loads connection with distribution terminal

2.8.10 Grounding outputs

Either the positive or negative output terminals can be grounded. To avoid noise problems caused by common-mode current flowing from the load to ground, it is recommended to ground the output terminal as close as possible to the power supply chassis ground.

Always use two wires to connect the load to the power supply regardless of how the system is grounded.

WARNING

Models > 60VDC

Rated Output shall not float outputs more than +/-600VDC above/below chassis ground.

WARNING

OUTPUT TERMINAL GROUNDING

There is a potential shock hazard at the RS232/485 and the IEEE ports when using power supplies with rated or combined voltage greater than 400V with the Positive Output of the power supplies is grounded. Do not connect the Positive Output to ground when using the RS232/485 or IEEE under the above conditions.

2.9 Local And Remote Sensing

The rear panel J2 sense connector is used to configure the power supply for local or remote sensing of the output voltage. Refer to Fig.2-6 for sense connector location.

2.9.1 Sense wiring

WARNING

There is a potential shock hazard at the sense connector when using a power supply with a rated output voltage greater than 40V. Local sense and remote sense wires should have a minimum insulation rating equivalent or greater than the maximum output voltage of the power supply. Ensure that the connections at the load end are shielded to prevent accidental contact with hazardous voltages.

2.9.2 Local sensing

The power supply is shipped with the rear panel J2 sense connector wired for local sensing of the output voltage. See Table 2-4 for J2 terminals assignment. With local sensing, the output voltage regulation is made at the output terminals. This method does not compensate for voltage drop on the load wires, therefore it is recommended only for low load current applications or where the load regulation is less critical.

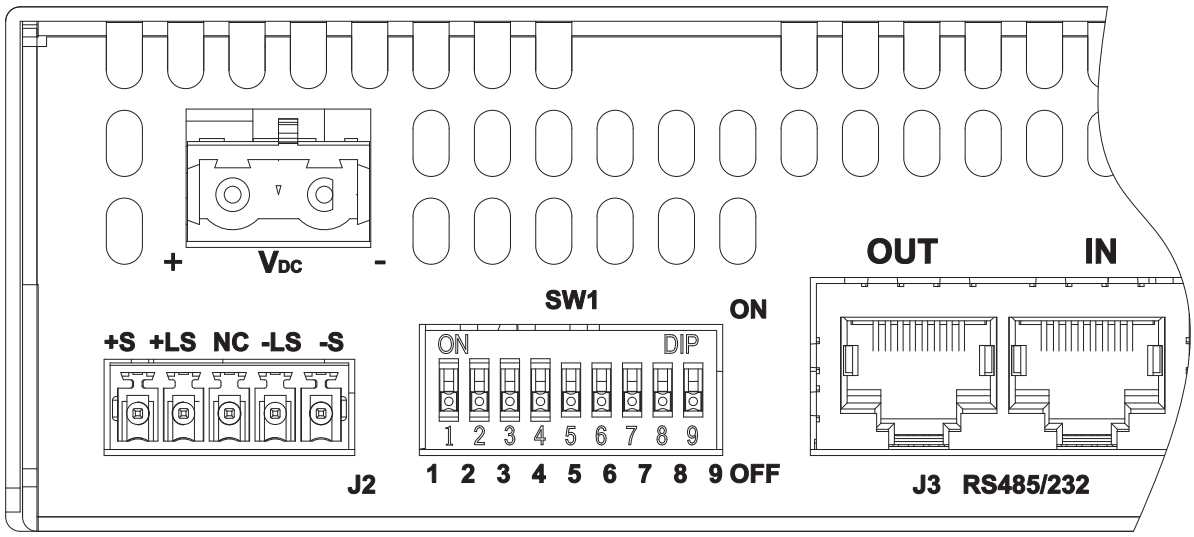


Fig.2-6: Sense connector location

Table 2-4: J2 terminals

Terminal	Function
J2-1	Remote positive sense (+S).
J2-2	Local positive sense. Connected internally to the positive output terminal (+LS).
J2-3	Not connected (NC).
J2-4	Local negative sense. Connected internally to the negative output terminal (-LS).
J2-5	Remote negative sense (-S).

2.9.3 Remote sensing

WARNING

There is a potential shock hazard at the sense point when using power supply with a rated output voltage greater than 40V. Ensure that the connections at the load end are shielded to prevent accidental contact with hazardous voltages.

CAUTION

When using shielded sense wires, ground the shield in one place only. The location can be the power supply chassis or one of the output terminals.

Use remote sense where the load regulation at the load end is critical. In remote sense, the power supply will compensate for voltage drop on the load wires. Refer to the power supply specifications for the maximum voltage drop on load wires. The voltage drop is subtracted from the total voltage available at the output. Follow the instructions below to configure the power supply for remote sensing:

1. Ensure that the AC On/Off is in the Off position.
2. Remove the local sense jumpers from J2.
3. Connect the negative sense lead to terminal J2-5 (-S) and the positive sense lead to terminal J2-1(+S) of the J2 mating connector. Ensure that the J2 mating connector is plugged securely into the rear panel sense connector, J2.
4. Turn On the power supply.

Notes:

1. If the power supply is operated without the remote sense lines or local sense jumpers, it will continue to work, but the output voltage regulation will be degraded. Also, the OVP circuit may activate and shut down the power supply.

2.9.4 J2 sense connect or technical information

-J2 connector type: MC 1.5/5-G-3.81, Phoenix.
-Plug type: MC1.5/5-ST-3.81, Phoenix.
-Wire AWG; 28 up to16.
-Stripping length: 7mm.
-Tightening torque: 1.95-2.21Lb-Inch. (0.22-0.25Nm)

2.10 Repackaging For Shipment

To ensure safe transportation of the instrument, contact the DELTA sales or service facility near you for Return Authorization and shipping information. Please attach a tag to the power supply describing the problem and specifying the owner, model number and serial number of the power supply. Refer to Warranty Information for further instructions.

Chapter 3 Local Operation

3.1 Front And Rear Panel Controls And Connectors

3.1.1 Introduction

The D750 has a full set of controls, indicators and connectors that allow the user to easily setup and operate the unit. Before starting to operate the unit, please read the following sections for explanation of the functions of the controls and connectors terminals.

-Section 3.1.2: Front panel controls and indicators.
-Section 3.1.3: Rear panel .

3.1.2 Front Panel Controls And Indicators

See Fig.3-1 to review the controls, indicators and meters located on the power supply front panel.

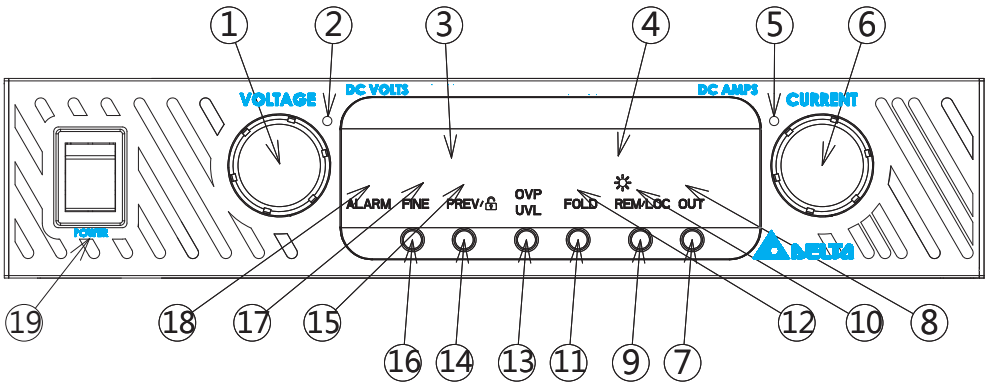


Fig.3-1: Front panel controls and indicators

Table 3-1: Front Panel controls and indicators

Number	Control/Indicator	Description	Section
1	VOLTAGE control	High resolution rotary encoder for adjusting the Output Voltage. Also adjusts the OVP/UVL levels and selects the Address.	3.2.2.1 3.2.3.1 3.2.4.1 4.2.2.2
2	VOLTAGE indicator	Green LED, lights for Constant-Voltage mode operation.	
3	VOLTAGE display	4 digit, 7-segment LED display. Normally displays the output voltage. When the PREV button is pressed, the display indicates the programmed setting of the output voltage. When the OVP/UVL button is pressed, the Voltage display indicates the OVP/UVL setting.	

4	CURRENT display	4 digit, 7-segment LED display. Normally displays the output current. When the PREV button is pressed, the display indicates the programmed setting of output current.	
5	CURRENT indicator	Green LED, lights for Constant-Current mode operation.	
6	CURRENT control	High resolution rotary encoder for adjusting the Output Current. Also selects the Baud-Rate of the communication port.	3.2.2.2 4.2.2.4
7	OUT button	Main function: Output ON/OFF control. Press OUT to set the output On or Off. Press to reset and turn On the output after OVP or FOLD alarm events have occurred.	3.2.6 3.2.11
8	OUT indicator	Green LED, lights when the DC output is enabled.	
9	REM/LOC button	Main function: Go to local. Press REM/LOC to put the unit into Local (REM/LOC button is disabled at Local Lockout mode). Auxiliary function: Address and Baud Rate setting. Press and hold REM/LOC for 3sec. to set the Address with the VOLTAGE encoder and the Baud Rate with the CURRENT encoder.	4.2.2.5 4.2.2.2 4.2.2.4
10	REM/LOC indicator	Green LED, lights when the unit is in Remote mode.	
11	FOLD button	Foldback protection control. -Press FOLD to set Foldback protection to On. -To release Foldback alarm event, press OUT to enable the output and re-arm the protection. -Press FOLD again to cancel the Foldback protection.	3.2.5
12	FOLD indicator	Green LED, lights when Foldback protection is On.	
13	OVP/UVL button	Over Voltage Protection and Under Voltage limit setting. -Press once to set OVP using VOLTAGE encoder (the current display shows “OUP”) -Press again to set the UVL using VOLTAGE encoder (the current display shows “UUL”).	3.2.3 3.2.4

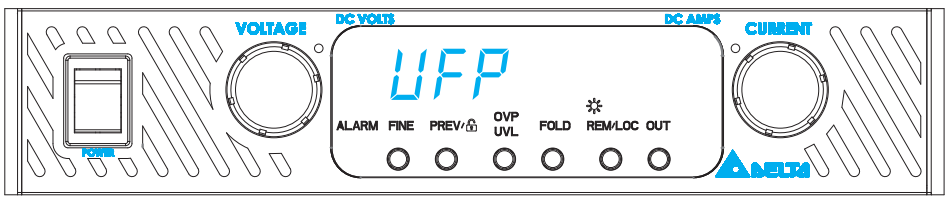
14	PREV/ button	Main function: Press PREV to display the output voltage and current limit setting. For 5 sec. the display will show the setting and then it will return to show the actual output voltage and current. Auxiliary function: Front Panel Lock. Press and hold PREV button to toggle between "Locked front panel" and "Unlocked front panel". The display will cycle between "LFP" and "UFP". Releasing the PREV button while one of the modes is displayed, selects that mode.	3.1.3
15	PREV indicator	Green LED, lights when PREV button is pressed.	
16	FINE button	Voltage and Current Fine/Coarse adjustment control. Operates as a toggle switch. In Fine mode, the VOLTAGE and CURRENT encoders operate with high resolution and in Coarse mode with lower resolution (approx. 6 turns). Auxiliary function: Advanced Parallel Operation Mode setting.	3.4.2.2
17	FINE indicator	Green LED, lights when the unit is in Fine mode.	
18	ALARM indicator	Red LED, blinks in case of fault detection. OVP, OTP Foldback, Enable and AC fail detection will cause the ALARM LED to blink.	
19	AC Power switch	AC On/Off control.	

3.1.3 Front Panel Locking

The front panel controls can be locked to protect from accidental power supply parameter change. Press and hold PREV button to toggle between "Locked front panel" and "Unlocked front panel". The display will cycle between "LFP" and "UFP". Releasing the PREV button while one of the modes is displayed, selects that mode.

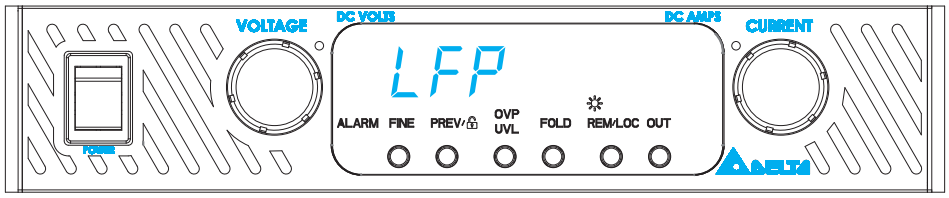
3.1.3.1 Unlocked front panel

In this mode, the front panel controls are enable to program and monitor the power supply parameters.



3.1.3.2 Locked front panel

In this mode the following front panel controls are disabled:
-VOLTAGE and CURRENT encoders.
-FOLD button.
-OUT button.
The power supply will not respond to attempts to use these controls. The VOLT display will show "LFP" to indicate that the front panel is locked.



OVP/UVL button is active to preview the OVP and UVL setting.
Use PREV button to preview the output voltage and current setting or to unlock the front panel.

3.1.4 Rear Panel

See Fig.3-2 to review the connections and controls located on the power supply rear panel. Refer to Table 3-2 for explanations about the rear panel connections and controls.

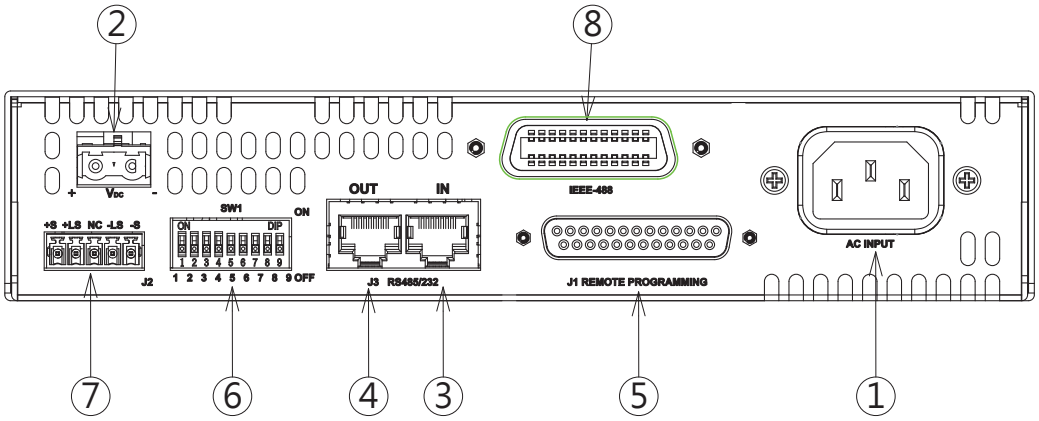


Fig.3-2: Rear panel connections and controls

Table 3-2: Rear panel connections and controls

Number	Item	Description	Section
1	AC input connector	Header with a screw plug connector.	
2	DC output	Wire clamp connector.	

3	Remote-In connector	RJ-45 type connector, use for connecting power supplies to Remote-In RS232 or RS485 port of computer for remote control purposes. When using several power supplies in a power system, the first unit Remote-In is connected to the computer and the remaining units are chained, Remote-In to Remote-Out.	4.2.3 4.2.4
4	Remote Out connector	RJ-45 type connector, used for chaining power supplies to forma serial communication bus.	4.2.3 4.2.4
5	Programming and Monitoring connector	Connector for remote analog interface. Includes output voltage and current limit programming and monitoring signals, Shut-off control (electrical signal), Enable/ Disable control (dry-contact), power supply ok (PS_ OK) signal and operation mode (CV/CC) signal.	3.1.6.1
6	SW1 Setup switch	Nine position DIP switch for selecting remote programming and monitoring modes for Output Voltage, Current Limit and other control functions.	3.1.5 3.1.5.1 3.1.5.2
7	Remote sense connector	Connector for making remote sensing connections to the load for regulation of the load voltage and compensation of load wire drop.	2.7.2 2.9.2 2.9.3
8	IEEE connector	IEEE connector for units equipped with IEEE programming.	

3.1.5 Rear Panel Sw1 Setup Switch

The SW1 Setup switch (see Fig.3-3) is a 9-position DIP switch that allows the user to choose the following:

-Internal or remote programming for Output Voltage and Current Limit.
-Remote voltage or resistive programming of Output Voltage and Output Current limit.
-Select range of remote voltage and resistive programming.
-Select range of Output Voltage and Output Current monitoring.
-Select the Remote Shut-Off control logic.
-Select between RS232 or RS485 communication interface.
-Enable or disable the rear panel Enable/Disable control (dry contact).

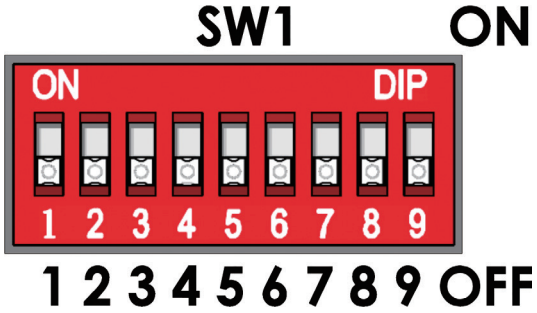


Fig.3-3: SW1 setup DIP switch

3.1.5.1 SW1 position functions

Refer to Table 3-3 for description of SW1 position functions. The factory default setting is Down for all positions.

Table 3-3: SW1 positions functions

Position	Function	Down (Factory default)	Up
SW1-1	Output Voltage Remote analog programming	Output Voltage Programmed by Front Panel	Output Voltage Programmed by remote analog External Voltage or External Resistor
SW1-2	Output Current Limit Remote analog programming	Output Current Limit Programmed by Front Panel	Output Current Limit Programmed by remote analog External Voltage or External Resistor
SW1-3	Programming range select (Remote voltage/resistive)	0-5V / (0-5Kohm)	0-10V / (0-10Kohm)
SW1-4	Output Voltage and Current Monitoring range	0-5V	0-10V
SW1-5	Shut Off logic select	On: Open Off: Short	On: Short Off: Open
SW1-6	RS232/485 select	RS232 interface	RS485 interface
SW1-7	Output Voltage Resistive programming	Output Voltage Programmed by External Voltage	Output Voltage Programmed by External Resistor
SW1-8	Output Current Limit Resistive programming	Output Current Limit Programmed by External Voltage	Output Current Limit Programmed by External Resistor
SW1-9	Enable/Disable control	Rear panel Enable/ Disable control is not active	Rear panel Enable/ Disable control is active

3.1.5.2 Resetting the SW1 switch

Before making any changes to the SW1 switch setting, disable the power supply output by pressing the front panel OUT button. Ensure that the output voltage falls to zero and OUT LED is off, then use any small flat-bladed screwdriver to change the SW1 switch setting.

3.1.6 Rear Panel J1 Programming And Monitoring Connector

The J1 Programming and Monitoring connector is a DB25 subminiature connector located on the power supply rear panel. Refer to Table 3-4 for description of the connector functions. The power supply default configuration is Local operation which does not require connections to J1. For remote operation using J1 signals use the plug provided with power supply or equivalent type. It is essential to use plastic body plug to conform with Safety Agency requirements. If a shield is required for J1wires, connect the shield to a power supply chassis ground screw.

3.1.6.1 Making J1 connections

- J1 connector type: Coxoc, P/N: 205AE25FGTBBB3
- J1 plug description: AMP, P/N: 745211-7
- Wire dimension range: AWG26-22

Before making any connection, turn the AC On/Off switch to the Off position and wait until the front panel display has turned Off.

CAUTION

Terminals 12, 22 and 23 of J1 are connected internally to of the power supply. Do not attempt to bias any of these terminals relative to the negative sense. Use the Programming interface option to allow control from a programming source at a different potential relative to the power supply negative

CAUTION

To prevent ground loops and to maintain the isolation of the power supply when programming from J1, use an ungrounded programming source.

WARNING

There is a potential shock hazard at the output when using a power supply with rated output greater than 40V. Use wires with minimum insulation rating equivalent to the maximum output voltage of the power supply.

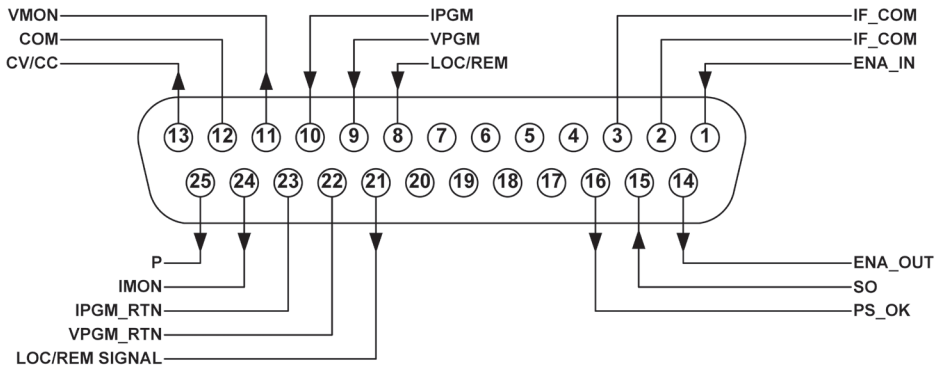


Fig.3-4: J1 connector terminals and functions

Table 3-4: J1 connector terminals and functions

J1 contact	Signal name	Function	Reference
J1-1	ENA_IN	Enable /Disable the power supply output by dry-contact (short/open) with ENA_OUT.	Sec. 3.2.8
J1-2 J1-3	IF_COM	Return for the SO control, PS_OK signal and for the optional IEEE interface.	Sec. 3.2.7, 3.2.10
J1-4~7	N/C	No Connection	
J1-8	LOCAL/ REMOTE	Input for selecting between Local or Remote analog programming of output voltage and output current.	Sec. 4.1.2
J1-9	VPGM	Input for remote analog voltage/resistance programming of the Output Voltage.	Sec. 4.1.1~4.1.5
J1-10	IPGM	Input for remote analog voltage/resistance programming of the Output Current.	Sec. 4.1.1~4.1.5
J1-11	VMON	Output for monitoring the power supply Output Voltage.	Sec. 4.1.6
J1-12	COM	Control Common. Return for VMON, IMON, CV/CC, LOC/REM.	
J1-13	CV/CC	Output for Constant-Voltage / Constant-Current mode indication.	Sec. 3.2.9
J1-14	ENA_OUT	Enable/Disable the power supply output by dry-contact(short/open) with ENA_IN.	Sec. 3.2.8
J1-15	SO	Input for Shut-Off control of the power supply output.	Sec. 3.2.7
J1-16	PS_OK	Output for indication of the power supply status.	Sec. 3.2.10
J1-17~20	N/C	No Connection.	

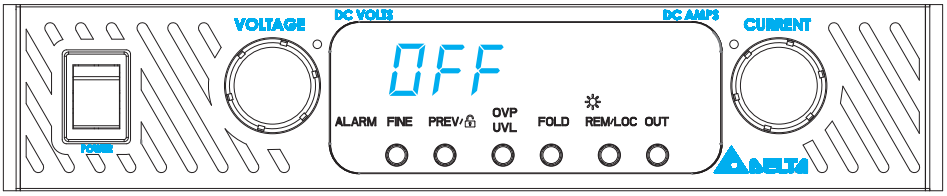
J1-21	LOC/ REMSIGNAL	Output for indicating if the unit is in Local or Remote analog programming mode.	Sec. 4.1.3
J1-22	VPGM_RTN	Return for VPGM input.	Sec. 4.1.1, 4.1.4, 4.1.5
J1-23	IPGM_RTN	Return for IPGM input.	Sec. 4.1.1, 4.1.4, 4.1.5
J1-24	IMON	Output for monitoring the power supply Output Current.	Sec. 4.1.6
J1-25	P	Output for current balance in parallel operation.	Sec. 3.4.2

3.2 Local Operation

3.2.1 Introduction

This Chapter describes the operating modes that are not involved in programming and monitoring the power supply via its serial communication port (RS-232/485) or by remote analog signals. Ensure that the REM/LOC LED on the front panel is Off, indicating Local mode. If the REM/LOC LED is On, press the front panel REM/LOC button to change the operating mode to local.

–For information regarding remote analog programming refer to sec. 4.1.
–For information regarding usage of the serial communication port refer to sec. 4.2.

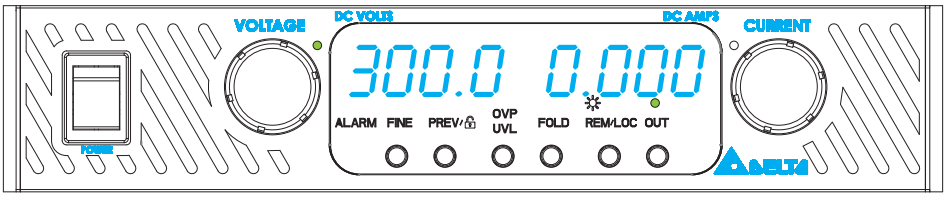


3.2.2 Standard Operation

The power supply has two basic operating modes: Constant Voltage Mode and Constant Current Mode. The mode in which the power supply operates at any given time depends on the output voltage setting, output current limit setting and the load resistance.

3.2.2.1 Constant Voltage Mode

1. Inconstant voltage mode, the power supply regulates the output voltage at the selected value, while the load current varies as required by the load.
2. While the power supply operates inconstant voltage mode, the VOLTAGE LED on the front panel illuminates.
3. Adjustment of the output voltage can be made when the power supply output is enabled (Output On) or disabled (Output Off).When the output is enabled, simply rotate the VOLTAGE encoder knob to program the output voltage. When the output is disabled, press the PREV button and then rotate the VOLTAGE encoder knob. The VOLTAGE meter will show the programmed output voltage for 5 seconds after the adjustment has been completed. Then the VOLTAGE meter will display "OFF".
4. Adjustment resolution can be set to coarse or fine resolution. Press FINE button to select between the lower and higher resolution. The FINE LED turns On when the resolution is set to FINE.



NOTE

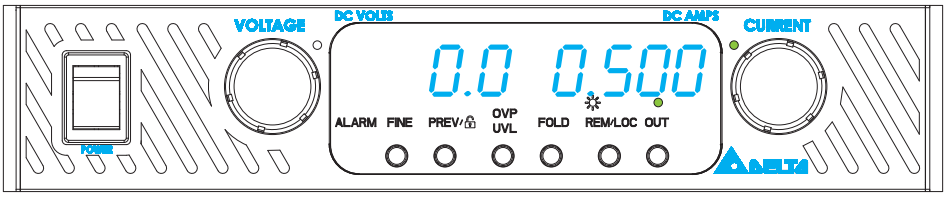
If after completing the adjustment, the display shows a different value than the setting, the power supply may be at current limit. Check the load condition and the power supply current limit setting.

NOTE

The maximum and minimum setting values of the output voltage are limited by the Over Voltage protection and Under Voltage limit setting. Refer to Sec. 3.2.3 and 3.2.4 for more details.

3.2.2.2 Constant Current Operation

1. In constant current mode, the power supply regulates the output current at the selected value, while the voltage varies with the load requirement.
2. While the power supply is operating in constant current mode, the CURRENT LED on the front panel illuminates.
3. Adjustment of the output current limit can be made when the power supply output is enabled (Output On) or disabled (Output Off).
   -Disabled output (Off): Press PREV button and then rotate the Current encoder knob. The CURRENT meter will show the programmed current limit for 5 seconds after the adjustment has been completed. Then the VOLTAGE meter will display "OFF".
   -Enabled output, power supply in Constant Voltage mode: Press the PREV button and then rotate the CURRENT encoder knob. The CURRENT meter will show the programmed current limit for 5 seconds after the adjustment has been completed, and then will return to show the actual load current.
   -Enabled output, power supply in Constant Current mode: Rotate the CURRENT encoder knob to adjust the current limit.
4. Adjustment resolution can be set to Coarse or Fine adjustment. Press the FINE button to select between the Coarse and Fine resolution. The FINE LED turns On when the resolution is set to FINE.



3.2.2.3 Automatic Crossover

If the power supply operates in Constant Voltage mode, while the load current is increased to greater than the current limit setting, the power supply will automatically switch to Constant Current mode. If the load is decreased to less than the current limit setting, the power supply will automatically switch back to Constant Voltage mode.

3.2.3 Over Voltage Protection (OVP)

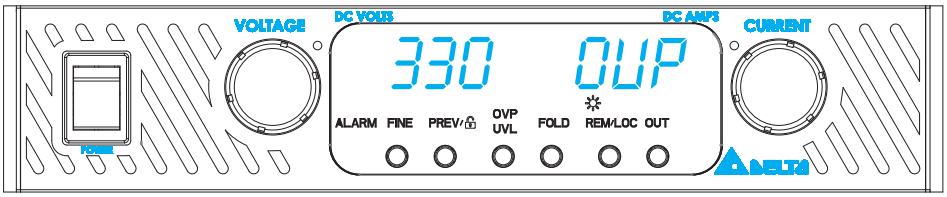
The OVP circuit protects the load in the event of a remote or local programming error or a power supply failure. The protection circuit monitors the voltage at the power supply sense points and thus providing the protection level at the load. Upon detection of an Over Voltage condition, the power supply output will shut down.

3.2.3.1 Setting the OVP level

The OVP can be set when the power supply output is Enabled (On) or Disabled (Off). To set the OVP level, press the OVP/UVL button, so that the CURRENT meter shows "OUP".

The VOLTAGE meter shows the OVP setting level. Rotate the VOLTAGE encoder knob to adjust the OVP level. The display will show "OUP" and the setting value for 5 seconds after the adjustment has been completed and then will return to it's previous state. Maximum OVP setting is 330.0V and Minimum is 5.0V.

To preview the OVP setting, press OVP/UVL Push button so that the CURRENT display will show "OUP". At this time, the VOLTAGE display will show the OVP setting. After 5 seconds, the display will return to it's previous state.



3.2.3.2 Activated OVP protection indications

When the OVP is activated the power supply output shuts down. The VOLTAGE display shows "OUP" and the ALARM LED blinks.

3.2.3.3 Resetting the OVP circuit

To reset the OVP circuit after it activates:
1. Reduce the power supply Output Voltage setting below the OVP set level.
2. Ensure that the load and the sense wiring is connected properly.
3. There are four method store set the OVP circuit.
   3.1 Press OUT button.

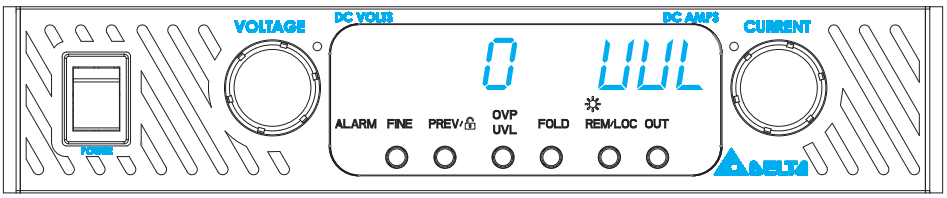
3.2 Turn the power supply Off using the AC On/Off switch, wait until the front panel display turns Off, then turn the power supply On using the AC On/Off switch.
3.3 Turn the power supply output Off and then On using the SO control (refer to sect. 3.2.7). In this method the power supply should be set to Auto-Restart mode
3.4 Send OUT 1 command via the RS-232/485 communication port.

3.2.4 Under Voltage Limit (UVL)

The UVL prevents adjustment of the output voltage below a certain limit. The combination of UVL and OVP functions, allow the user to create protection window for sensitive load circuitry.

3.2.4.1 Setting the UVL level

Setting the UVL can be made when the power supply output is Enabled (On) or Disabled(Off). To set the UVL level, press the OVP/UVL button TWICE, so that the CURRENT meter shows "UUL". The VOLTAGE meter shows the UVL setting level. Rotate the VOLTAGE encoder knob to adjust the UVL level. The display will show "UUL" and the setting value for 5 seconds after the adjustment has been completed and then will return to it' s previous state. UVL setting values are limited at the maximum level to approximately 95% of the Output Voltage setting. Attempting to adjust the UVL above this limit will result in no response to the adjustment attempt. The minimum UVL setting is zero.

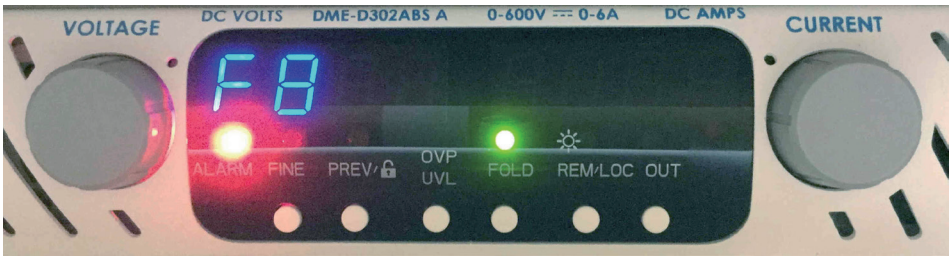


3.2.5 Foldback Protection

Foldback protection will shut down the power supply output if the load current exceeds the current limit setting level. This protection is useful when the load circuitry is sensitive to an over current condition.

3.2.5.1 Setting the Foldback protection

To arm the Foldback protection, the FOLD button should be pressed so that the FOLD LED illuminates. In this condition, transition from Constant Voltage to Constant Current mode will activate the Foldback protection. Activation of the Foldback protection disables the power supply output, causes the ALARM LED to blink and display "FB" on the VOLTAGE meter.



3.2.5.2 Resetting activated Foldback protection

There are four method store set an activated Foldback protection.

1. Press the OUT button. The power supply output isenabled and the Output Voltage and current will return to their last setting. In this method, the Foldback protection remains armed, therefore if the load current is higher than the current limit setting, the Foldback protection will be activated again.
2. Press the FOLD button to cancel the Foldback protection. The power supply output will be disabled and the VOLTAGE display will show “OFF”. Press the OUT button to enable the power supply output.
3. Turn the power supply output Off and then On using the SO control (refer to sect. 3.2.7). In this method The foldback protection remains armed, therefore if the load current is higher than the current limit Setting the Foldback protection will be activated.
4. Turn the power supply Off using the AC On/Off switch, wait until the front panel display turns Off, then turn the unit back ON again. The power supply output is enabled and the Output Voltage and Current will return to their last setting. In this method, the Foldback protection remains armed, therefore if the load current is higher than the current limit setting, the Foldback protection will be activated again.

3.2.6 Output On/Off Control

The Output On/Off enables or disables the power supply output. Use this function to make adjustments to either the power supply or the load without shutting off the AC power. The Output On/Off can be activated from the front panel using the OUT button or from the rear panel J1 connector. The OUT button can be pressed at any time to enable or disable the power supply output. When the output is disabled, the output voltage and current fall to zero and the VOLTAGE display shows “OFF”.

3.2.7 Output Shut-Off (SO) Control Via Rear Panel J1 Connector

Contacts 2, 3 and 15 of J1 (Fig.3-2, Item 5) serve as Output Shut-Off (SO) terminals. The SO terminals accept a Open-Short contact to disable or enable the power supply output. The SO function will be activated only when a transition from On to Off is detected after applying AC power to unit. (Thus, in Auto-Rest art mode, the output will been abled after applying AC power, even if SO is in Off level.). After On to Off transition is detected, the SO

will enable or disable the power supply output according to the signal level or the short/open applied to J1. This function is useful for connecting power supplies in a "Daisy-chain" (refer to section 3.4.3). The SO control can be used also to reset the OVP and Fold Protection. Refer to sect. 3.2.3 and 3.2.5 for details.

When the unit is shut-off by J1 signal, the VOLTAGE display will show "SO" to indicate the unit state. J1 contact 15 is the SO signal input and contacts 2 and 3, IF_COM, are the signal return (connected internally). The SO control logic can be selected by the rear panel SW1 Setup switch. Refer to Table 3-5 for SW1 setting and SO control logic.

Table 3-5: SO logic selection

SW1-5 setting	SO signal level J1-2(3), 15	Power supply output	Display
Down (default)	Open Short	On Off	Voltage/Current "SO"
Up	Open Short	Off On	"SO" Voltage/Current

3.2.8 Enable/Disable Control Via Rear Panel J1 Connector

Contacts 1 and 14 of J1 (Fig.3-2, Item 5) serve as Output Enable/Disable terminals by switch or relay. This function is enabled or disabled by the SW1 Setup switch position 9. Refer to Table 3-6 for Enable/Disable function and SW1 setting.

Table 3-6: Enable/Disable function and SW1 setting

SW1-9 setting	Enable/Disable inputs	Power supply output	Display	ALARM LED
Down (Default)	Open or Short	On	Voltage/Current	Off
Up	Open	Off	"ENA"	Blinking
	Short	On	Voltage/Current	Off

CAUTION

To prevent possible damage to the unit, do not connect any of the Enable/Disable inputs to the positive or negative output potential.

NOTE

Safe Start mode- If the Enable/Disable fault condition clears when units in safe start mode recovery is by pressing OUT button or by sending a 'OUT 1' serial command.
Auto Restart mode- The output will return back ON automatically when the Enable/Disable fault conditions clears.

3.2.9 CV/CC Signal

CV/CC signal indicates the operating mode of the power supply, Constant Voltage or Constant Current. Referenced to the COM potential at J1-12 (connected internally to the negative sense potential). When the power supply operates in Constant Voltage mode, CV/CC output is High (5V). When the power supply operates in Constant Current mode, CV/CC signal output is low (0V).

3.2.10 Ps_Ok Signal

PS_OK signal indicates fault condition in the power supply. PS_OK is a signal output at J1-16, referenced to IF_COM at J1-2, 3. When a fault condition occurs, PS_OK level is low (0V), when no fault condition occurs, PS_OK level is high (3.3V). The following faults will set the PS_OK to Fault state:

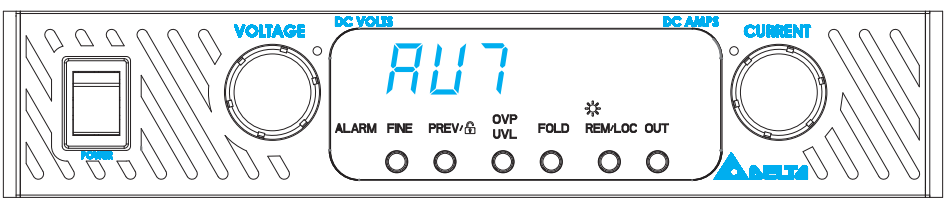
*OTP
*Enable/Disable open (Power supply is disabled)
*OVP
*SO (Rear panel Shut-Off -Power supply is shut off)
*Foldback
*AC fail
*Output Off

3.2.11 Safe Start And Auto-Restart Modes

When turning on the power supply AC On/Off, it can start to its last setting of Output Voltage and Current limit with the output enabled (Auto-restart) or start with the output disabled (Safe mode).Press and hold the OUT button to select between Safe start and Auto-restart modes. The VOLTAGE display will continuously cycle between "SAF" and "AU7″ every 3 seconds. Releasing OUT push button while one of the modes is displayed, selects that mode. The default setting at shipment is Safe mode.

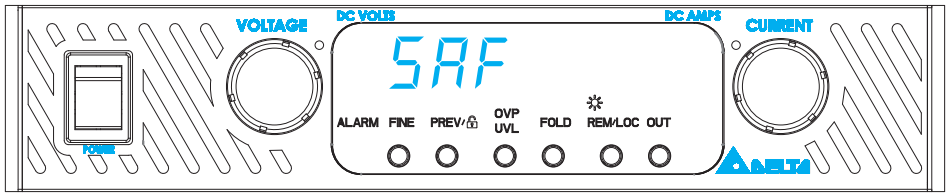
3.2.11.1 Automatic start mode (AU7)

In this mode, the power supply restores its last operation setting. Upon start-up, the output is enabled or disabled according to its last setting.



3.2.11.2 Safe start mode (SAF)

In this mode, the power supply restores its last operation setting and sets the Output to Off state. At start-up, the output is disabled and the output voltage and current are zero. To enable the output and restore the last output voltage and current limit values, momentarily press OUT button.



3.2.12 Over Temperature Protection (OTP)

The OTP circuit shuts down the power supply before the internal components can exceed their safe internal operating temperature. When an OTP shutdown occurs, the display shows "O7P" and the ALARM LED blinks. Resetting the OTP circuit can be automatic (non-latched) or manual (latched) depending on the Safe or Automatic restart mode.

1. Safe start mode: In Safe start mode, the power supply stays off after the over temperature. Condition has been removed. The display continue to shows "O7P" and the ALARM LED continues to blink. To reset the OTP circuit, press OUT button (or send OUTON command via the serial port).
2. Auto-restart mode: In Auto-restart mode, the power supply recovers to it's last setting automatically when the over temperature condition is removed.

3.3 Last Setting Memory

The power supply is equipped with Last Setting Memory, which stores power supply parameters at each AC turn-off sequence.

STOREDPARAMETERS:

1. OUT On or Off
2. Output voltage setting (PV setting)
3. Output current limit (PC setting)
4. OVP setting
5. UVL setting
6. FOLD setting
7. Start-up mode (Safe or Auto-restart)
8. Remote/Local: If the last setting was Local Lockout (latched mode), the supply will return to Remote mode (non-latched).

9. Address setting
10. Baud rate
11. Locked/Unlocked front panel (LFP/UFP) (Items8, 9, 10 are related to Remote digital control operation and explained in sec. 4.2)
12. Master/Slave setting

3.4 Remote Operation

Power supplies of the SAME MODEL can be connected in series to obtain increased output voltage. Split connection of the power supplies gives positive and negative output voltage.

CAUTION

Do not connect power supplies from different manufacturers in series or in parallel.

3.4.1 Series Operation

3.4.1.1 Series connection for increased output voltage

In this mode, two units are connected so that their outputs are summed. Set the current limit of each power supply to the maximum that the load can handle without damage. It is recommended that diodes be connected in parallel with each unit output to prevent reverse voltage during start up sequence or in case one of the units shuts down. Each diode should berated to at least the power supply rated output voltage and output current. Refer to Fig.3-5 and 3-6 for series operation with local and remote sensing.

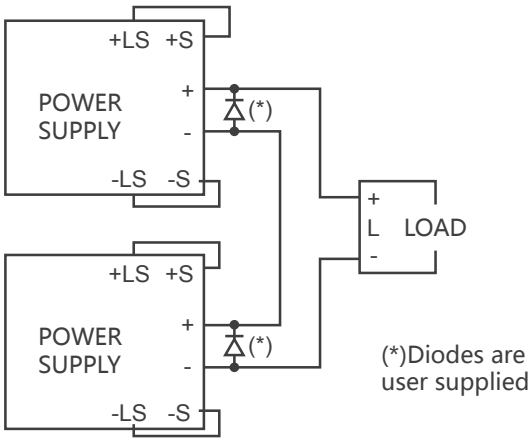


Fig.3-5: Series connection, local sensing

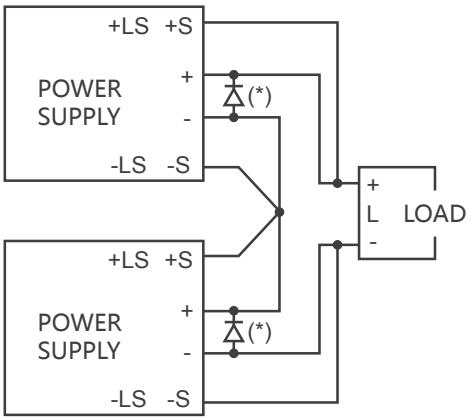


Fig.3-6: Series connection, remote sensing

Remote programming in series operation for increased output voltage:

1. Programming by external voltage: The analog programming circuits of this power supply are referenced to the negative Sense (-S) potential. Therefore, the circuits used to control each series connected unit must be separated and floated from each other.

2. Using the SO function and PS_OK signal: The Shut-Off and PS_OK circuits are referenced to the common, IF_COM (J1-2, 3). The IF_COM terminals of different units can be connected to obtain a single control circuit for the power supplies connected in series.
3. Programming by external resistor: Programming by external resistor is possible. Refer to section 4.1.5 for details.
4. Programming via the Serial Communication port (RS232/RS485): The power supplies connected in series can be chained using the Remote-In and Remote-Out connectors. Refer to sec. 4.2 for details.

3.4.1.2 Series connection for positive and negative output voltage

In this mode, two units are configured as a positive and negative output. Set the current limit of each power supply to the maximum that the load can handle without damage. It is recommended that diodes be connected in parallel with each unit output to prevent reverse voltage during start-up or incase one of the units shuts down. Each diode should be rated to at least the power supply rated output voltage and output current. Refer to Fig.3-7 for his operating mode.

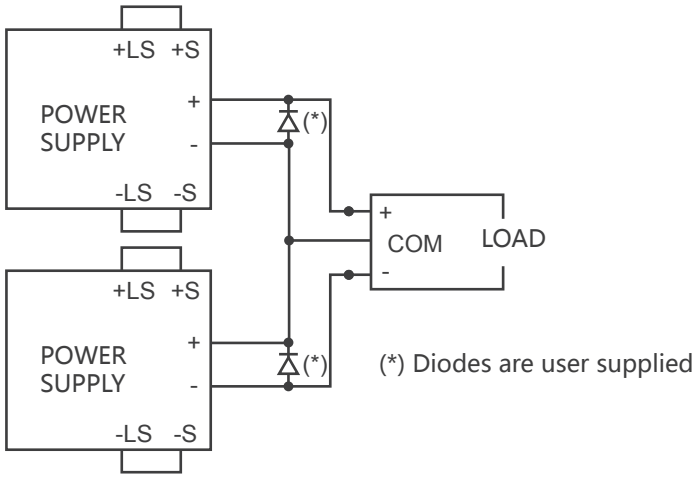


Fig.3-7: Series connection for positive/negative output voltages

Remote programming in series operation for positive and negative output voltage:

1. Programming by external voltage: The analog programming circuits of this power supply are referenced to the negative Sense potential. Therefore, the circuits used to control each series connected unit must be separated and floated from each other.
2. Using the SO function and PS_OK signal : The Shut-Off and PS_OK circuits are referenced to the common, IF_COM (J1-2,3). The IF_COM terminals of the units can be connected to obtain a single control circuit for the power supplies connected in series.

3. Programming by external resistor : Programming by external resistor is possible. Refer to section 4.1.5 for details.
4. Programming via the Serial Communication port (RS232/RS485): The power supplies connected in series can be chained using the Remote-In and Remote-Out connectors. Refer to sec. 4.2 for details.

3.4.2 Parallel Operation

Up to four units of the same VOLTAGE and CURRENT rating can be connected in parallel to provide up to four times the output current capability. One of the units operates as a master and the remaining units are slaves. The slave units are analog programmed by the master unit. In remote digital operation, only the master unit can be programmed by the computer. There are two methods, basic and advanced, to configure multiple supplies for parallel operation. Refer to Sec. 3.4.2.1 and to Sec. 3.4.2.2 for detailed explanation.

3.4.2.1 Basic parallel operation

In this method, setting the units as Master and Slaves is made by the rear panel J1 connections and the setup switch SW1. Each unit displays its own output current and voltage. To program the load current, the Master unit should be programmed to the total load current divided by the number of units in the system. Refer to the following procedure to configure multiple supplies for simple parallel operation.

1. Setting up the Master unit

   Set the master unit output voltage to the desired voltage. Program the current limit to the desired load current limit divided by the number of parallel units. During operation, the master unit operates in CV mode, regulating the load voltage at the programmed output voltage. Connect the sensing circuit to local or remote sensing as shown in Fig.3-8 or Fig.3-9.
2. Setting up the slave units

   -1. The output voltage of the slave units should be programmed 2%~5% higher than the output voltage of the master unit to prevent interference with the master unit's control. The current limit of each unit should be programmed to the desired load current limit divided by the number of parallel units.

   -2. Set the rear panel setup switch SW1 position 2 to it's up position.

   -3. Set the rear panel setup switch SW1 position 3 in the same position as SW1 position 4 of the master.

   -4. Connect short between J1-8 and J1-12 (refer to Table 4-4.)

-5. Connect J1 terminal 10(IPGM) of the slave unit to J1 terminal 25(P) of the master unit.
During operation the slave units operate as a controlled current source following the master output current. It is recommended that the power system is designed so that each unit supplies up to 95% of its current rating because of the imbalance which may be caused by cabling and connections voltage drop.

-6. Connect J1 terminal 23 (IPGM_RTN) of the slave unit to J1 terminal 12 (COM) of the master unit.

3. Setting Over Voltage protection

The master unit OVP should be programmed to the desired OVP level. The OVP of the slave units should be programmed to a higher value than the master OVP. When the master unit shuts down, it programs the slave unit to zero output voltage. If a slave unit shuts down (when its OVP is set lower than the master output voltage), only that unit would shut down and the remaining slave units would supply all the load current.

4. Setting Foldback protection

Foldback protection if desired, may only be used with the master unit. When the master unit shuts down it programs the slave units to zero output voltage.

5. Connection to the load

In parallel operation, power supplies can be connected in local or remote sensing. Refer to Fig.3-8 and 3-9 for typical connections of parallel power supplies. The figures show connection of two units, however the same connection method applies up to 4 units.

3.4.2.2 Advanced parallel operation

In this method, multiple supplies can be configured to parallel operation as a single power supply. The total load current and output voltage are displayed by the Master unit and can be read back from the Master unit. The Slave units display only their operating status (On, Off or Fault condition). Refer to the following procedure to configure multiple supplies for Advanced parallel operation.

1. Basic configuration

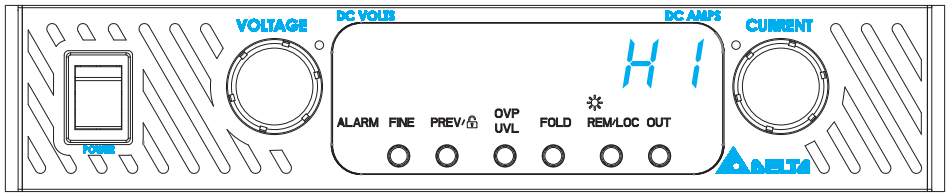
Repeat steps 1 to 6 in Sec. 3.4.2.1 (Basic parallel operation).

2. Setting the units as Master or Slave

a) Depress and hold the FINE button for 3 seconds. The Master/Slave configuration will be displayed on the Current Display. Rotate the CURRENT encoder to obtain the desired mode. Refer to Table 3-7 for the CURRENT display and modes of operation.

Table 3-7: Setting mode of operation

CURRENT Display	Operating Mode
H1	Single supply (default)
H2	Master supply with 1 Slave supply
H3	Master supply with 2 Slave supplies
H4	Master supply with 3 Slave supplies
S	Slave supply



b) When the desired configuration is obtained, depress and release the FINE button or wait approx. 5 seconds.

3. Master and Slave units default operation

a) When a unit is programmed to Slave mode it enters the Remote mode with Local Lockout. In this mode, the front panel controls are disabled to prevent accidental setting change (refer to Sec. 4.2.2.7 for details).

b) The Slave units parameters will automatically set the following:
*Programmed Current to zero.
*UVL to zero volts
*OVP to its maximum value
*AST On
*OUT On (After Resetting the power)
*Foldback protection Off

c) The Master and Slave modes are stored in the power supply EEPROM when the AC power is Turned off. The system will return to the Master/Slave mode upon re-application of AC power.

4. CURRENT display accuracy

In the advanced parallel mode, the total current is programmed and reported by the Master. In this method, the CURRENT display accuracy is 2%+/-1 count. In cases that higher accuracy is required, it is recommended to use the basic parallel operation mode.

5. To release units from Slave mode

Slave units can be released using the following procedure:

a) Depress FINE button for 3 seconds. The Master/Slave configuration will be displayed on the CURRENT display.

b) Select H1 mode using the CURRENT encoder.

c) Depress FINE button again or wait 5 seconds.

d) Turn the AC power Off to store the new setting.

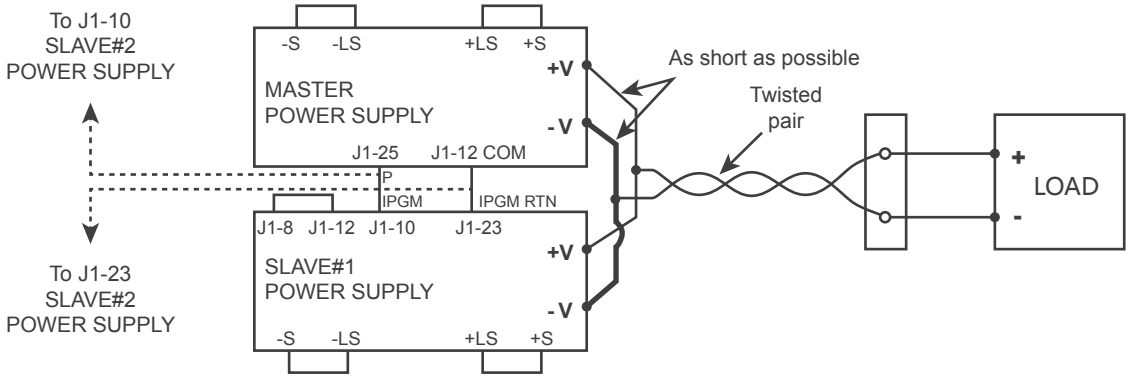


Fig.3-8: Parallel connection with local sensing

CAUTION

Make sure that the connection between -Vo terminals is reliable to avoid disconnection during operation. Disconnection may cause damage to the power supply.

NOTE

With local sensing it is important to minimize the wire length and resistance. Also the positive and negative wire resistance should be close as possible to each other to achieve current balance between power supplies.

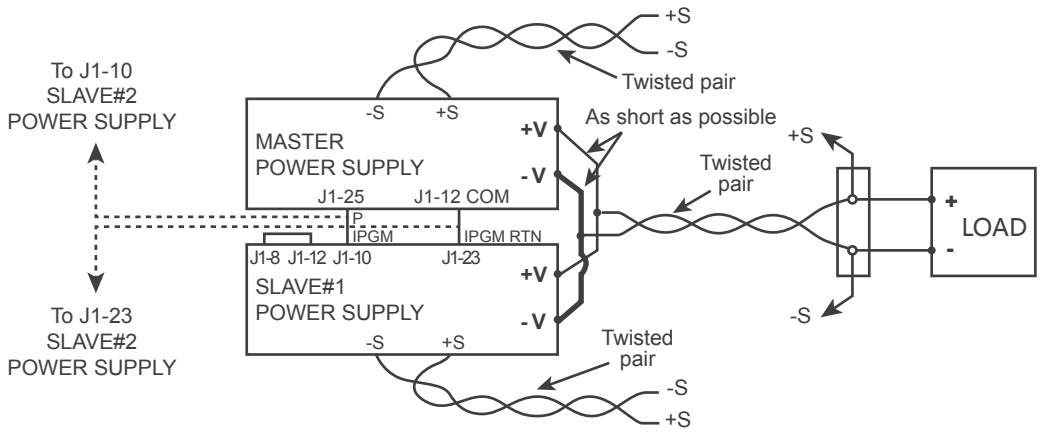


Fig.3-9: Parallel operation with Remote sensing

CAUTION

Make sure that the connection between –Vo terminals is reliable to avoid disconnection during operation. Disconnection may cause damage to the power supply.

3.4.3 Daisy-Chain Connection

It is possible to configure a multiple power supply system to shut down all the units when a fault condition occurs in one of the units. When the fault is removed, the system recovers according to its setting to Safe start mode or Automatic restart.

Setup switch SW1 position 5 should be set to its Down position to enable the Daisy-chain operation. Other SW1 positions can be set according to the application requirements.

If a fault occurs in one of the units its PS_OK signal will be set to low level and the display will indicate the fault. The other units will shut off and their display will indicate "SO" . When the fault condition is removed, the units will recover to their last setting according to their Safe start or Auto-restart setting. Fig.3-10 shows connection of three units, however the same connection method applies to systems with a larger number of units.

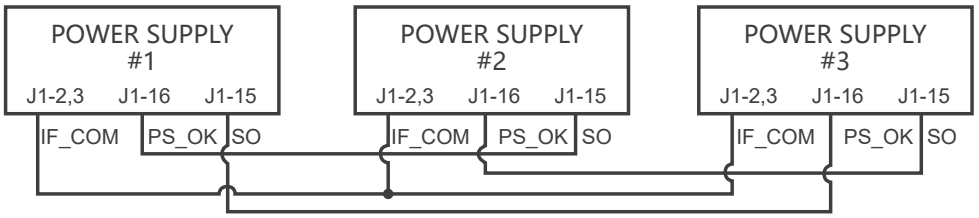


Fig.3-10: Daisy-chain connection

Chapter 4 Remote Operation

4.1 Remote Analog Programming

4.1.1 Introduction

The rear panel connector J1 allows the user to program the power supply output voltage and current limit with an analog device. J1 also provides monitoring signals for output voltage and output current. The programming range and monitoring signals range can be selected between 0-5V or 0-10Vusing the setup switch SW1. When the power supply is in Remote Analog programming, the serial communication port is active and can be used to read the power supply parameters.

CAUTION

COM (J1-12), VPGM_RTN (J1-22) and IPGM_ RTN (J1-23) terminals of J1 connect internally to the -Sense potential (-S). Do not connect these terminals to any potential other than -Sense (-S), as it may damage the power supply.

4.1.2 Local /Remote Analog Control

Contact 8 of J1 (Fig. 3-2, item 5) accepts a Open-Short contact (referenced to J1-12) to select between Local or Remote Analog programming of the output voltage and current limit. In Local mode, the output voltage and current limit can be programmed via the front panel VOLTAGE and CURRENT encoders or via the RS232/485 port. In Remote Analog mode, the output voltage and current limit can be programmed by analog voltage or by programming resistors via J1 contacts 9 and 10 (refer to sec. 4.1.4 and 4.1.5). Refer to Table 4-1 for Local/Remote Analog control (J1-8) function and Setups witch SW1-1,2setting.

Table 4-1: Local/Remote Analog control function

SW1-1,2 setting	J1-8 function	Output voltage/Current setting
Down (default)	No effect	Local
Up	Short	Remote Analog
	Open	Local

4.1.3 Local /Remote Analog Indication

Contact 21 of J1 (Fig. 3-2, item 5) is an output that indicates if the power supply is in Local mode or in Remote Analog mode. In Local mode, the signal of J1-21 is shorted; In Remote mode, the signal of J1-21 is opened with a DC Level about 5V. Refer to Table 4-2 for J1-21 function.

Table 4-2: Local/Remote Analog indication

J1-8	SW1-1	SW1-2	J1-21 signal
Short	Down	Down	0V
	Down	Up	5V
	Up	Down	5V
	Up	Up	5V
Open	Down or Up	Down or Up	0V

4.1.4 Remote Voltage Programming Of Output Voltage And Current Limit

CAUTION

To maintain the isolation of power supply and prevent ground loops, use an isolated programming source when operating the power supply via remote analog programming at J1connector.

Perform the following procedure to set the power supply to Remote Voltage programming:

1. Turn the power supply AC On/Off switch to Off.
2. Set setup switch SW1-1 to its UP position for output voltage external programming andSW1-2 to its UP position for Output Current limit external programming.
3. Set SW1 position 3 to select programming voltage range according to Table 4-3.
4. Ensure that SW1 positions 7 and 8 are at their Down (default) position.
5. Connect a short between J1-8 and J1-12 (refer to Table 3-4).
6. Connect the programming source to the mating plug of J1 as shown in Fig.4-1. Observe correct polarity for the voltage source.
7. Set the programming sources to the desired levels and turn the power supply ON. Adjust the programming sources to change the power supply output. .

NOTES:

1. SW1 positions 4, 5, 6 and 9 are not required for remote programming. Their setting can be determined according the application.
2. The control circuits allow the user to set the output voltage and current limit up to 5% over the model-rated maximum value. The power supply will operate within the extended range, however it is not recommended to operate the power supply over its voltage and current rating and performance is not guaranteed.

Table 4-3: SW1-3 setting and programming range

SW1-3 setting	Output Voltage programming VPGM (J1-9)	Current limit programming IPGM (J1-10)
UP	0-10V	0-10V
DOWN	0-5V	0-5V

J1 connector, rear panel view

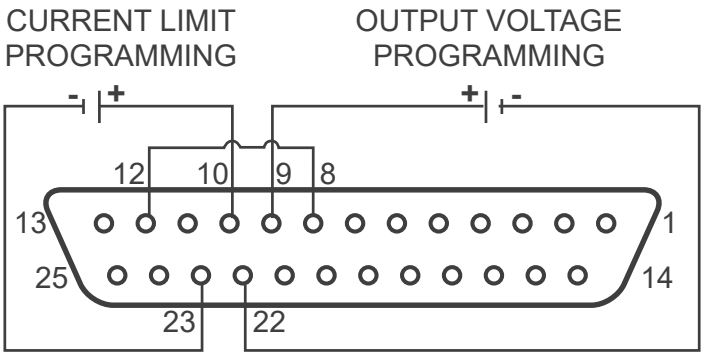


Fig.4-1: Remote voltage programming connection

4.1.5 Resistive Programming Of Output Voltage And Current Limit

For resistive programming, internal current sources, for output voltage and/or output current control, supply 1mAcurrent through external programming resistors connected between J1-9 & 22 and J1-10 & 23. The voltage across the programming resistors is used as a programming voltage for the power supply. Resistance of 0~5Kohm or 0~10Kohm can be selected to program the output voltage and current limit from zero to full scale. A variable resistor can control the output over its entire range, or a combination of variable resistor and series/parallel resistors can control the output over restricted portion of its range.

Perform the following procedure to set the power supply to Resistive programming:

1. Turn the AC On/Off switch to Off.
2. Set setup switch SW1-1 to its UP position for output voltage external programming and SW1-2 to its UP position for Output Current limit external programming.
3. Set SW1 position 3 to select programming resistor range according to Table 4-4.
4. SW1-7 to its UP position for output voltage resistive programming and SW1-8 to its UP position for Output Current limit resistive programming.
5. Connect a short between J1-8 and J1-12 (refer to Table 3-4).
6. Connect the programming resistors to the mating plug of J1 as shown in Fig.4-2.
7. Set the programming resistors to the desired resistance and turn the power supply ON. Adjust the resistors to change the power supply output.

NOTES:

1. SW1 positions 4, 5, 6 and 9 are not required for remote programming. Their setting can be determined according to the application requirements.
2. The control circuits allow the user to set the output voltage and current limit up to 5% over the model-rated maximum value. The power supply will operate within the extended range, however it is not recommended to operate the power supply over its voltage and current rating and performance is not guaranteed.
3. To maintain the temperature stability specification of the power supply, the resistors used for programming should be stable and low noise resistors, with temperature coefficient of less than 50ppm.
4. When resistive programming is used, front panel and computer control (via serial communication port) of output voltage and current are disabled.

Table 4-4: SW1-3 setting and programming range

SW1-3 setting	Output Voltage programming VPGM (J1-9)	Current limit programming IPGM (J1-10)
UP	0-10Kohm	0-10Kohm
DOWN	0-5Kohm	0-5Kohm

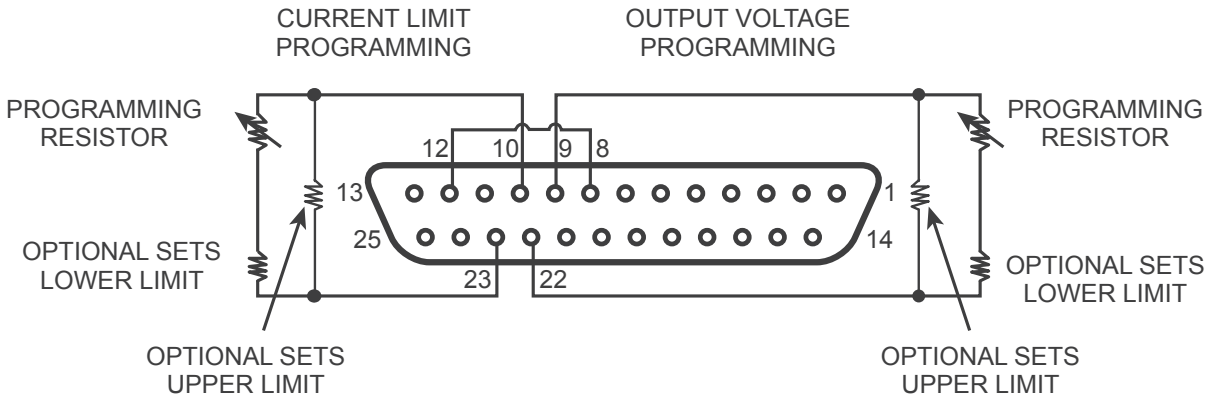


Fig.4-2: Remote resistive programming

4.1.6 Remote Monitoring Of Output Voltage And Current

The J1 connector, located on the rear panel provides analog signals for monitoring the output voltage and output current. Selection of the voltage range between 0-5V or 0-10V is made by setup switch SW1-4. The monitoring signals represent 0 to 100% of the power supply output voltage and output current has an input resistance of greater than 500 Kohm or accuracy will be reduced.

Refer to Table 4-5 for required J1 connection, SW1-4 setting and monitoring voltage range.

Table 4-5 Monitoring signals setting

Signal name	Signal function	J1 connection		Range	SW1-4
		Signal (+)	Return (-)		
VMON	Vout monitor	J1-11	J1-12	0-5V	Down
IMON	Iout monitor	J1-24			
VMON	Vout monitor	J1-11	J1-12	0-10V	Up
IMON	Iout monitor	J1-24			

Notes:

1. Radiated emissions, FCC requirements	FCC requirements for radiated emissions, use shielded cable for the analog control signals. In case of using unshielded cable, attach an EMI ferrite suppressor to the cable, as close as possible to the power supply.
2. Front panel encoders operation:	In Remote analog mode the output voltage and current can′ t be set by the VOLTAGE and CURRENT encoders.
3. Front panel PREV button:	Use PREV button to display the output voltage and current setting defined by the encoders or communication.
4. Communication:	In Remote analog mode, power supply parameters can be programmed and readback via the communication port except output voltage and current setting.

4.2 RS232 & RS485 Remote Control

4.2.1 Introduction

This chapter describes the operation of the D750 3000W power supplies via the serial communication port. Details of the initial set-up, operation via RS232 or RS485, the command set and the communication protocol are described in this chapter.

4.2.2 Configuration

4.2.2.1 Default setting

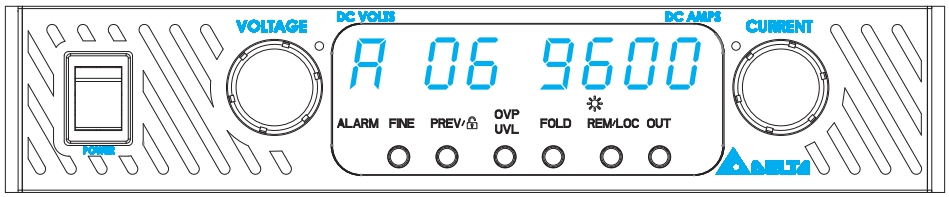
The power supply is shipped with the following setting:

-Address: 6
-Baud-rate: 9600
-RS232/485:RS232
-Vout setting: 0
-Iout setting: 0
-Master/Slave H1(Master)
-Output: Off
-Start up mode: Safe start
-OVP: Maximum
-UVL: 0
-Foldback: Off
-Front panel: Unlocked (UFP)

4.2.2.2 Address setting

The power supply address can be set to any address between 0 and 30. Follow the instructions described below to set the address.

1. If the unit is in Remote mode (front panel REM/LOC LED illuminates), press REM/LOC button to put the unit into Local mode.
2. Press and hold for approximately 3sec. the REM/LOC button. The VOLTAGE display will indicate the communication port address.
3. Using the VOLTAGE adjust encoder, select the address.
   To preview the address at any time, press and hold the REM/LOC button for approx. 3sec.
   The VOLTAGE display will indicate the power supply address.



4.2.2.3 RS232 or RS485 selection

To select between RS232 or RS485 set the rear panel setup switch SW1-6 position to:
-Down for RS232
-Up for RS485

4.2.2.4 Baud rate setting

Five optional rates are possible: 1200, 2400, 4800, 9600 and 19200. To select the desired rate, the following steps should be taken:

1. If the unit is in Remote mode (front panel REM/LOC LED illuminates), press REM/LOC button to put the unit into Local mode.
2. Press and hold for approx. 3sec. the REM/LOC button. The CURRENT display will show the communication port Baud Rate.
3. Using the CURRENT adjust encoder, select the desired Baud Rate.

4.2.2.5 Setting the unit into Remote or Local mode

1. The unit will be put into Remote mode only via serial communication command. Commands that will put the unit into Remote mode are:
   RST PV n
   OUT n PC n
   RMT n
   (for n values see Tables 4-8, 4-9, 4-10, and 4-11)
2. There are two Remote modes:
   1. Remote: In this mode, return to local can be made by the front panel REM/LOC or via serial port command RMT 0. Set the unit into Remote mode via serial port RMT 1 command.
   2. Local Lockout: In this mode the unit can be returned to Remote mode via the serial port RMT 1 command or by turning off the AC power until the display turns off and then turn it to on again. In Local Lockout mode, the front panel REM/LOC button is not active. Set the unit into Local Lockout mode via serial port RMT 2 command.

4.2.2.6 RS232/485 port in Local mode

When the power supply is in local mode, it can receive queries or commands. If a query is received, the power supply will reply and remain in Local mode. If a command that affects the output is received, the power supply will perform the command and change to Remote mode.

Front panel control in Remote mode is disabled except for:
1. PREV: use to preview the Voltage and Current limit setting.
2. OVP/UVL: use to preview the OVP/UVL setting.
3. LOC/REM: use to set the unit into Local mode.

In Local Lockout mode, only PREV and OVP/UVL are active.

4.2.3 Rear Panel RS232/485 Connector

The RS232/485 interface is accessible through the rear panel RS232/485 IN and RS485 OUT connectors. The connectors are 8 contact RJ-45. The IN and OUT connectors are used to connect power supplies in a RS232 or RS485 chain to a controller. Refer to Fig.4-3 for IN/OUT connectors

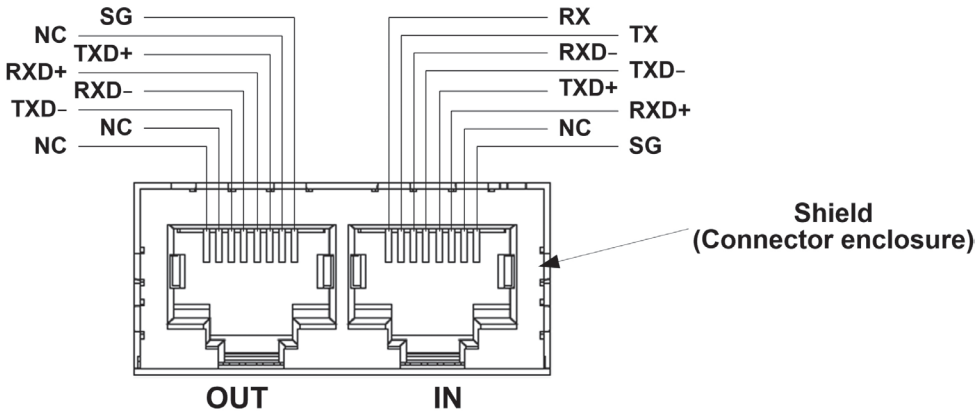


Fig.4-3: J3 rear panel IN/OUT connectors pinout

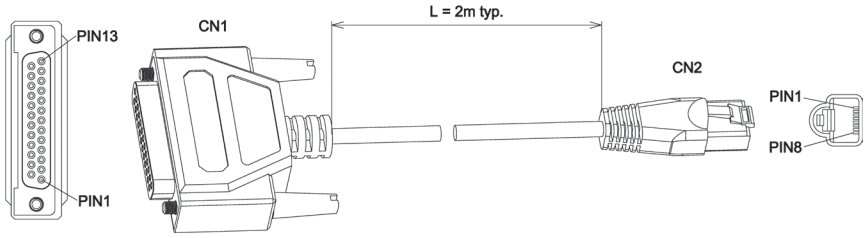
NOTE

Tx and Rx are used for RS232 communication. Txd +/-and Rxd +/-are used for RS485 communication. Refer to RS232 and RS485 cables description for connection details.

4.2.4 Connecting Power Supplies To RS232 Or RS485 Bus

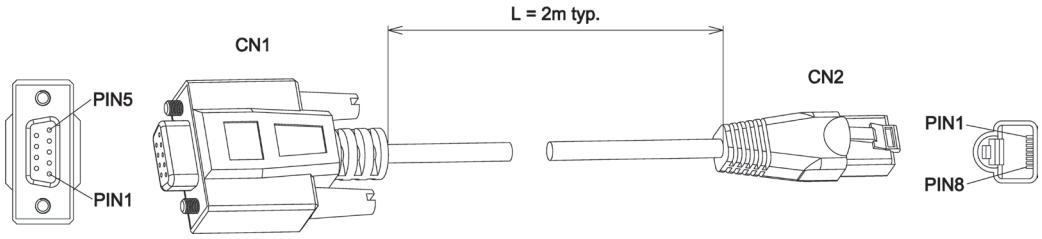
4.2.4.1 Single power supply

1. Select the desired interface RS232 or RS485 using rear panel setup switch SW1-6 (section3.1.5).
   -RS232: Down position
   -RS485: Up position
2. Connect rear panel IN connector to the controller RS232 or RS485 port using a suitable shielded cable.



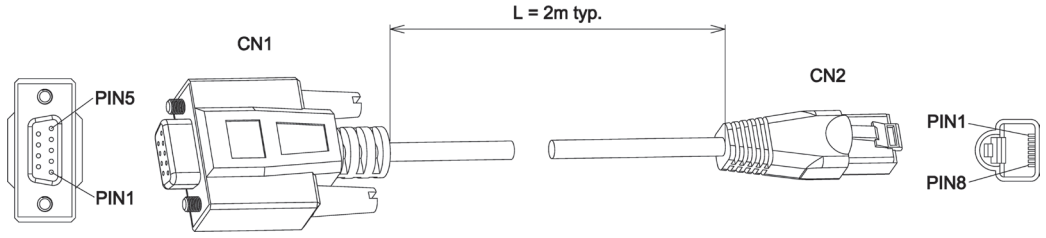
CN1 (DB-25)		CN2 (8 PIN CONNECTOR)		REMARKS
PIN NO.	NAME	PIN NO.	NAME	
1	SHILED		SHIELD	
2	TX	8	RX	TWISTED PAIR
3	RX	7	TX	
7	SG	1	SG	

Fig. 4-4: RS-232 cable with DB25 connector



CN1 (DB-9)		CN2 (8 PIN CONNECTOR)		REMARKS
PIN NO.	NAME	PIN NO.	NAME	
HOUSING	SHILED	HOUSING	SHIELD	
2	RX	7	TX	TWISTED PAIR
3	TX	8	RX	
5	SG	1	SG	

Fig. 4-5: RS-232 cable with DB9 connector



CN1 (DB-9)		CN2 (8 PIN CONNECTOR)		REMARKS
PIN NO.	NAME	PIN NO.	NAME	
HOUSING	SHILED	HOUSING	SHIELD	
9	TXD −	6	RXD −	TWISTED PAIR
8	TXD+	3	RXD+	
1	SG	1	SG	
5	RXD −	5	TXD −	TWISTED PAIR
4	RXD+	4	TXD+	

Fig. 4-6: RS-485 cable with DB9 connector

4.2.4.2 Multi power supply connection to RS232 or RS485 bus

Daisy-chain up to 31 units can be connected to RS232 or RS485 bus. The first unit connects to the controller via RS232 or RS485 and the other units are connected with RS485 bus,

1.First unit connection: Refer to section 4.2.4.1 for connecting the first unit to the controller.

2.Other units connection: The other units on the bus are connected via their RS485 interface.

3.Refer to Fig. 4-7 for typical connection.

-Set rear panel setup switch SW1-6 to it's UP position

-Using the Linking cable supplied with each unit (refer to Fig. 4-8), connect each unit OUT connector to the next unit IN connector.

* It is recommended when using several power supplies in Daisy-chain system to connect a 120Ω resistive termination at the last unit' s RS485 OUT connector.

120Ω, 0.5W between TXD + and TXD -

120Ω, 0.5W between RXD + and RXD -

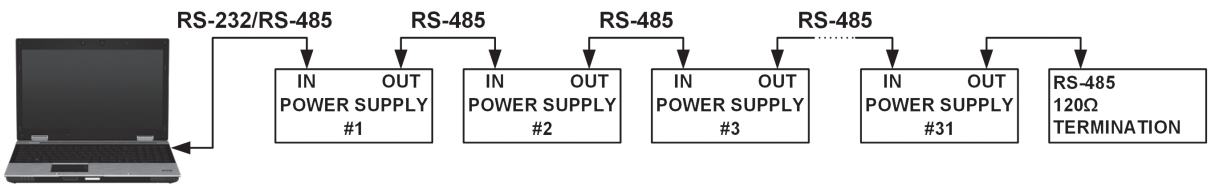
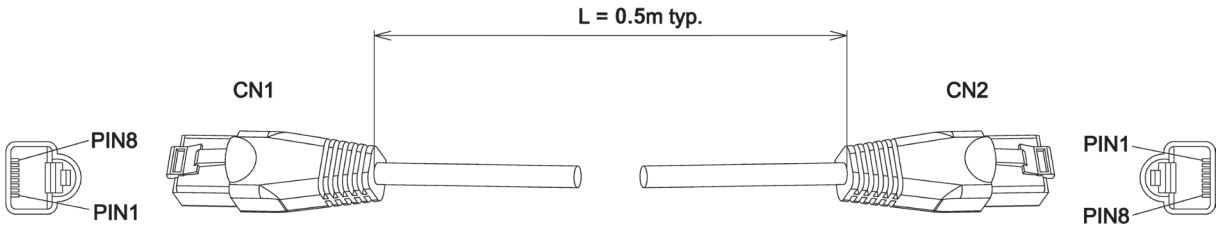


Fig 4-7: Multi power supplies RS232/485 connection



CN1(8 PIN CONNECTOR) (IN)		CN2(8 PIN CONNECTOR) (OUT)	
PIN NO.	NAME	PIN NO.	NAME
HOUSING	SHILED	HOUSING	SHIELD
1	SG	1	SG
6	TXD −	6	RXD −
3	TXD+	3	RXD+
5	RXD −	5	TXD −
4	RXD+	4	TXD+

Fig 4-8: Serial link cable with RJ-45 shielded connectors

4.2.5 Communication Interface Protocol

NOTE

The address (ADR n) command must return an "OK" response before any other commands are accepted.

4.2.5.1 Data format

Serial data form at is 8 bit, one start bit and one stop bit. No parity bit..

4.2.5.2 Addressing

The Address is sent separately from the command.

It is recommended to add a 100 msec software delay between query or sent command to next unit addressing.

Refer to section 4.2.7.3 for details.

4.2.5.3 End of Message

The end of message is the Carriage Return character (ASCII 13). The power supply ignores the Line Feed (ASCII10) character.

4.2.5.4 Command Repeat

The backslash character "\" will cause the last command to be repeated.

4.2.5.5 Acknowledge

The power supply acknowledges received commands by returning "OK" message. If an error is detected, the power supply will return an error message. The rules of checksum apply also to the acknowledge.

4.2.5.6 Error message

If an error is detected in a command or query, the power supply will respond with an error message. Refer to section 4.2.6 for details.

4.2.5.7 Backspace

The backspace character (ASCII 8) clears the last character sent to the power supply.

4.2.6 Error Messages

The power supply will return error messages for illegal commands and illegal programming parameters. Refer to Table 4-6 for programming error messages and Table 4-7 for commands error messages.

Table 4-6: Programming error messages

Error Code	Description
E01	Returned when program voltage (PV) is programmed above acceptable range. Example: PV value is above '105% of supply rating' or 'PV above 95% of OVP setting'.
E02	Returned when programming output voltage below UVL setting.
E04	Returned when OVP is programmed below acceptable range. Example: OVP value is less than '5% of supply voltage rating' plus 'voltage setting'.
E06	Returned when UVL value is programmed above the programmed output voltage.
E07	Returned when programming the Output to ON during a fault shut down.

Table 4-7: Commands error messages

Error Code	Description
C01	Illegal command or query
C02	Missing parameter
C03	Illegal parameter
C04	Checksum error
C05	Setting out of range

4.2.7 Command Set Description

4.2.7.1 General guides

1. Any command or argument may be in capital letters or small letters.
2. In commands with an argument, a space must be between the command and the argument.
3. For any command that sets a numeric value, the value may be up to 12 characters long.
4. Carriage Return: If the CR character (ASCII 13) is received by itself, the power supply will respond with "OK" and CR.

4.2.7.2 Command set categories

The D750 series command set is divided into four categories as follows:
1. Initialization control
2. ID control
3. Output control

4.2.7.3 Initialization control commands

#	Command	Description
1	ADR n	ADR is followed by address which can be 0 to 30 and is used to access the power supply.
2	RST	Reset command. Brings the power supply to a safe and known state: Output voltage: zero, Remote: non-latched remote, Output current: zero, Auto-start: Off, Output: Off, OVP: maximum, FOLD: Off, UVL: zero
3	RMT	Sets the power supply to local or remote mode: 1. RMT 0 or RMT LOC, sets the power supply into Local mode. 2. RMT 1 or RMT REM, sets the unit into remote mode. 3. RMT 2 or RMT LLO, sets the unit into Local Lockout mode (latched remote mode).
4	RMT?	Returns the Remote mode setting: 1. "LOC"-The unit is in Local mode. 2. "REM"-The unit is in Remote mode. 3. "LLO"-The unit is in Local Lockout (latched remote) mode.
5	\	Repeat last command. If \<CR> is received, the power supply will repeat the last command.

4.2.7.4 ID control commands

#	Command	Description
1	IDN?	Returns the power supply model identification as an ASCII string : DME-D751ABS A
2	REV?	Returns the software version as an ASCII string.
3	DATE?	Returns date of last test. Date format: yyyy/mm/dd

4.2.7.5 Output control commands

#	Command	Description
1	PV n	Sets the output voltage value in Volts.
2	PV?	Reads the output voltage setting.
3	MV?	Reads the actual output voltage.
4	PC n (See Note 1)	Sets the output current value in Amperes.
5	PC?	Reads the output current setting.
6	MC? (See Note 2)	Reads the actual output current.
7	DVC?	Display Voltage and Current data. Data will be returned as a string of ASCII characters. A comma will separate the different fields. The fields, in order, are: Measured Voltage, Programmed Voltage, Measured Current, Programmed Current, Over Voltage Set point and Under Voltage Set Point. Example: 5.9999, 6.0000, 010.02, 010.00, 7.500, 0.000
8	OUT n	Turns the output to ON or OFF. Recover from Safe-Start, OVP or FLD fault. OUT 1 (or OUT ON)-Turn On.
9	OUT?	Returns the output On/Off status string. ON-output on. OFF-output off
10	FLD n	Sets the Foldback protection to ON or OFF. FLD 1 (or FOLD ON) -Arms the Foldback protection. FLD 0 (or FOLD OFF)-Cancels the Foldback protection. When the Foldback protection has been activated, OUT 1 command will release the protection and re-arm it, while FLD 0 will cancel the protection.
11	FLD?	Returns the Foldback protection status string: "ON" -Foldback is armed, "OFF" -Foldback is canceled.
12	FBD nn	Add (nn x 0.1) seconds to the Fold Back Delay. This delay is in addition to the standard delay. The range of nn is 0 to 255. The value is stored in EEPROM at AC power down and recovered at AC power up.
13	FBD?	Supply returns the value of the added Fold Back Delay.
14	FBDRST	Reset the added Fold Back Delay to zero.

15	OVP n	Sets the OVP level. The OVP setting range is given in Table 4-10. The minimum setting level is approx. 105% of the set output voltage, or the value in Table 4-11, whichever is higher. Attempting to program the OVP below this level will result in execution error response (" E04"). The OVP setting stays unchanged.
16	OVP?	Returns the setting "n" where "n" is the exact string in the user' s "OVP n" . When in Local mode, returns the last setting from the front panel in a 4 digit string.
17	OVM	Sets OVP level to the maximum level. Refer to Table 4-10.
18	UVL n	Sets Under Voltage Limit. Value of "n" may be equal to PV setting, but returns "E06" if higher. Refer to Table 4-11 for UVL programming range.
19	UVL?	Returns the setting "n" where "n" is the exact string in the user' s "UVL n" . When in Local mode, returns the last setting from the front panel in a 4 digit string.
20	AST n	Sets the auto-restart mode to ON or OFF. AST 1 (or AST ON)-Auto restart on.AST 0 (or AST OFF)-Auto restart off.
21	AST?	Returns the string auto-restart mode status.
22	SAV	Saves present settings. The settings are the same as power-down last settings. These settings are erased when the supply power is switched off and the new "last settings " are saved.
23	RCL	Recalls last settings. Settings are from the last power-down or from the last "SAV" command.
24	MODE?	Returns the power supply operation mode. When the power supply is On (OUT 1) it will return "CV" or "CC" . When the power supply is OFF (OUT 0) it will return "OFF" .
25	MS?	Returns the Master/Slave setting. Master: n = 1, 2, 3, or 4 Slave: n=0

NOTES:
1. In Advanced parallel mode (refer to Sec. 3.4.2.2), "n" is the total system current.
2. In Advanced parallel mode, "MC?" returns the Master unit current multiplied by the number of slave units.

4.2.7.6 GPIB

ITEM	Command	R/W	Function
1.PROGRAMMING AND MEASUREMENT COMMANDS			
1	[SOURce]:VOLTage[:LEVel] [:IMMediate] [:AMPLitude]<SP><value>	W	PROGRAM OUTPUT VOLTAGE
2	[SOURce]:VOLTage[:AMPLitude]?	R	READ PROGRAMMED VOLTAGE COMMAND
3	MEASure:VOLTage?	R	MEASURE VOLTAGE COMMAND

4	[SOURce]:CURRent[:LEVel] [:IMMediate] [:AMPLitude]<SP><value>	W	PROGRAM OUTPUT CURRENT COMMAND
5	[SOURce]:CURRent[:AMPLitude]?	R	READ PROGRAMMED CURRENT COMMAND
6	MEASure:CURRent?	R	MEASURE CURRENT COMMAND
7	OUTPut:STATe<SP>1	W	ENABLE THE SUPPLY OUTPUT COMMAND
8	OUTPut:STATe<SP>0	W	DISABLE THE SUPPLY OUTPUT COMMAND
9	OUTPut:STATe?	R	READ OUTPUT ENABLE COMMAND
10	SYSTem:SET<SP><0>	W	GO TO LOCAL MODE COMMAND
11	SYSTem:SET<SP><1>	W	GO TO REMOTE MODE COMMAND
12	SYSTem:SET<SP><2>	W	GO TO REMOTE WITH LOCAL LOCK OUT COMMAND
13	SYSTem:SET?	R	READ PROGRAMMING MODE COMMAND
3.OUTPUT PROTECTION COMMANDS			
1	[SOURce]:VOLTage:PROTecti on:LEVel <SP><value>	W	SET THE OVER VOLTAGE PROTECTION LEVEL COMMAND
2	[SOURce]:VOLTage:PROTecti on:LEVel?	R	READ THE OVER VOLTAGE PROTECTION LEVEL COMMAND
3	[SOURce]:VOLTage:PROTecti on:TRIPped?	R	READ OVER VOLTAGE TRIPPED STATE COMMAND
4	[SOURce]:VOLTage:LIMit:LO W<SP><value>	W	SET THE UNDER VOLTAGE PROTECTION LEVEL COMMAND
5	[SOURce]:VOLTage:LIMit:LOW?	R	READ THE UNDER VOLTAGE PROTECTION LEVEL COMMAND
6	[SOURce]:CURRent:PROTecti on:STATe <SP><1>	W	SET CURRENT FOLD BACK PROTECTION COMMAND
7	[SOURce]:CURRent:PROTecti on:STATe<SP><0>	W	CLEAR CURRENT FOLD BACK PROTECTION COMMAND
8	[SOURce]:CURRent:PROTecti on:STATe?	R	READ CURRENT FOLD BACK STATE COMMAND
9	[SOURce]:CURRent:PROTecti on:TRIPped?	R	READ FOLD BACK TRIPPED STATE COMMAND
4.OPERATING CONDITION COMMANDS			
1	SYSTem:ERRor?	R	READ SYSTEM ERROR COMMAND
2	SOURce:MODe?	R	READ SUPPLY OUTPUT MODE COMMAND

3	OUTPut:PON<SP><value>	W	SET POWER SUPPLY POWER-UP MODE COMMAND
4	OUTPut:PON?	R	REPORT POWER SUPPLY POWER-UP MODE COMMAND
5	SYSTem:VERSion?	R	READ SCPI VERSION COMMAND
6	SYSTem:DATE?	R	READ DATE COMMAND
5.COMMON COMMANDS			
1	*IDN?	R	READ IDENTITY COMMAND
2	*SAV<SP><0>	W	SAVE POWER SUPPLY SETTINGS COMMAND
3	*RCL<SP><0>	W	RECALL POWER SUPPLY SETTINGS COMMAND

4.2.7.7 Global output commands

1. General

All supplies, even if not the currently addressed supply, receiving a global command will execute the command. No response to the PC issuing the command will be returned to the PC. The PC issuing the command will be responsible to delay and any other communications until the command is execute. 200ms minimum is the suggested delay.

If the command contains an error, out of range values for example, no error report will be sent to the issuing PC.

1.	GRST	Reset. Brings the Power Supply to a safe and known state: Output voltage: 0V, output current: 0A, OUT: Off, Remote: RMT 1′ AST: Off OVP: Max, UVL:0. Non-Latching faults (FB, OVP, SO) are cleared, OUT fault stays.
2.	GPV n	Sets the output voltage value in volts. The range of voltage values is shown in Table 4-8.
3.	GPC n	Program the output current value in amperes. The range of current values is shown in Table 4-9.
4.	GOUT	Turns the output to ON or OFF: “OUT 1/ON” = turn on “OUT 0/OFF” = turn off OUT ON will respond with “E07′ if the output cannot be turned on because of a latching fault (OTP< AC, ENA, SO) shutdown.
5.	GSAV	Save present settings. Same settings as power-down last settings listed in Sec. 3.3. Except the address and Baud rate are not saved Saves to the RAM. These settings are erased when the supply power is switched off and the new ‘last settings’ are saved.
6.	GRCL	Recall last settings. Settings are from last power-down or from last ‘SAV’ or ‘GSAV’ command. Address and Baud rate are not recalled so communication is not Interrupted.

Table 4-8:Voltage programming range

Model Rated Output Voltage (V)	Minimum (V)	Maximum (V)
300	000.00	300.00

Table 4-9:Voltage programming range

Model Rated Output Current (A)	Minimum (A)	Maximum (A)
2.5	0.000	2.5

NOTE:

The power supply can accept values higher by 5% than the table values, however it is not recommended to program the power supply over the rated values.

Model Rated Output Voltage (V)	Minimum (V)	Maximum (V)
300	5.0	330

Table 4-10: OVP programming range

Model Rated Output Voltage (V)	Minimum (V)	Maximum (V)
300	0	285

Table 4-11: UVL programming range Model

4.2.8 Serial Communication Test Set-up

Use the following instructions as basic set-up to test the serial communication operation.

1. Equipment: PC with Windows Hyper Terminal, private edition, software installed, power supply, RS232 cable.
2. PC set-up:
   2.1 Open Hyper Terminal.....New Connection.
   2.2 Enter a name
   2.3 Connect to.....Direct to Com1 or Com 2
   2.4 Configure port properties:
      Bits per second 9600
      Data bits 8
      Parity .....None
      Stop bits.....1
      Flow control.....None
   2.5 Open Properties in the program
      File.....Properties
   2.6 Setting: ASCII Set Up
      Select Echo characters locally, select send line ends with line feed. On some PC systems, pressing the number keypad "Enter" will distort displayed messages. Use the alphabetic "Enter" instead.

3. Power supply set-up:
   3.1 Connect the power supply to the PC using the RS232 cable.
   3.2 Set via the front panel: Baud Rate: 9600, Address: 06.
   3.3 Set via the rear panel: RS232/485 to RS232 (refer to section: 3.1.5).
4. Communication Test:
   4.1 Model identification:
      PC: write: ADR 06
      Power supply response: "OK"
   4.2 Command test:
      PC write: OUT 1
      Power supply response: "OK"
      PC write: PV n
      Power supply response: "OK"
      PC write: PC n (for n values see Table 4-9)
      Power supply response: "OK"

The power supply should turn on and the display will indicate the output voltage and the actual output current.

Chapter 5 Maintenance

5.1 Introduction

This chapter provides information about maintenance, calibration and trouble shooting.

5.2 Units Under Warranty

Units requiring repair during the warranty period should be returned to a DELTA authorized service facility. Refer to the addresses listing on the back cover of this manual. Unauthorized repairs performed by other than the authorized service facilities may void the warranty.

5.3 Periodic Maintenance

No routine maintenance of the power supply is required except for periodic cleaning. To clean, disconnect the unit from the AC supply and allow 30sec. for discharging internal voltage. The front panel and the metal surfaces should be cleaned using mild solution of detergent and water. The solution should be applied onto a soft cloth, and not directly to the surface of the unit. Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. Use low pressure compressed air to blow dust from the unit.

5.4 Adjustments And Calibration

No internal adjustment or calibration is required. There is NO REASON to open the power supply cover.

5.5 Parts Replacement And Repairs

As repairs are made only by the manufacturer or by authorized service facilities, no parts replacement information is provided in the manual. In case of failure, unusual or erratic operation of the unit, contact a DELTA sales or service facility nearest you. Please refer to the DELTA sales offices addresses listing on the back cover of this user manual.

5.6 Troubleshooting

If the power supply appears to operating improperly, use the troubleshooting guide to determine whether the power supply, load or external control circuit are the cause. Configure the power supply for basic front panel operation and perform the tests of section 2.7 to determine if the problem is with the supply.

Table 5-1 provides the basic checks that can be performed to diagnose problems, and references to sections of this manual for further information.

Table 5-1: Troubleshooting guide

SYMPTOM	CHECK	ACTION	REF.
No output. All displays and indicators are blank.	Is the AC power cord defective?	Check continuity, replace if necessary.	2.6
	Is the AC input voltage with in range?	Check input AC voltage. Connect to appropriate voltage source.	2.5 2.6
Output is present momentarily but shuts off quickly. The display indicates "AC".	Does the AC source voltage sag when load is applied?	Check input AC voltage. Connect to appropriate voltage source.	2.5
Output is present momentarily but shuts off quickly. the display indicates "OUP".	Is the power supply configured to Remote sense?	Check if the positive or negative load wire is loose.	2.8.6 2.8.8
Output voltage will not adjust. Front panel CC LED is on.	Is the unit in constant current mode?	Check current limit setting and load current.	3.2.2.1 3.2.2.2
Output voltage will not adjust. Front panel CV LED is on.	Check if output voltage is adjusted above OVP setting or below UVL setting.	Set OVP or UVL so they will not limit the output.	3.2.3 3.2.4
Output current will not adjust. Front panel CV LED is on.	Is the unit in constant voltage mode?	Check current limit and voltage setting.	3.2.2
Large ripple present in output.	Is the power supply in remote sense? Is the voltage drop on the load wire high?	Check load and sense wires connection for noise and impedance effects. Minimize the drop on the load wires.	2.8.4 2.8.8
No output. Display indicates "OUP"	Over Voltage Protection circuit is tripped.	Turn off the AC power switch. Check load connections. If analog programming is used, check if the OVP is set lower than the output.	3.2.3

No output. Front panel ALARMLED is blinking.	Display indicates "ENA"	Check rear panel J1ENABLE connection.	3.2.8
		Setup switch SW1 setting.	3.1.5
	Display indicates "SO"	Check rear panel J1Output Shut-Off connection.	3.2.7
	Display indicates "O7P"	Check if air intake or exhaust are blocked. Check if the unit is installed adjacent to heat generating equipment.	3.2.12
	Display indicates "FB"	Check Foldback setting and load current.	3.2.5
Poor Load regulation Front panel CV LED is on.	Are sensing wires connected properly?	Connect the sense wires according to User's manual instructions.	2.8.8
The front panel controls are nonfunctional.	Is the power supply in Local-Lockout mode?	Turn Off the AC power and wait until the display turns off. Turn on the AC power and press front panel REM/LOC button.	4.2.2.5

Delta Electronics Ltd.

3 Tungyuan Rd., Chungli Industrial Zone,
Taoyuan City 32063
TEL：+886 3 4526107
Mail：Inquiry@deltaww.com