

USER MANUAL FOR  
**GENESYS™ 750W/1500W**  
**Programmable DC Power Supplies**

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## DECLARATION OF CONFORMITY

GEN 750W Series  
GENH 750W Series  
GEN 1500W Series

We, TDK-Lambda Americas Inc., of 405 Essex Road, Neptune, NJ 07753, USA declare under our sole responsibility that the GEN 750W, GENH 750W, and GEN 1500W series as detailed on the attached products covered sheet comply with the provisions of the following European Directives and are eligible to bear the CE mark:

Low Voltage Directive                    2006/95/EC  
EMC Directive                            2004/108/EC

Assurance of conformance of the described product with the provisions of the stated EC Directive is given through compliance to the following standards:

Electrical Safety                        IEC/EN60950-1:2001, First Edition  
                                              UL60950-1:2003, First Edition

Electromagnetic Emissions:            EN 55022: 1998 + A1::2000 + A2:2003  
                                              EN 55024: 1998 + A1::2001 + A2:2003  
                                              EN 61000-3-3: 1995+ A1:2001

These products are high-power equipment, with input power >1 kW, for professional use and installation, and carry the CE mark accordingly. These products are for use in Class A, ITE environment only, as defined by EN 55022: 1998 + A1::2000 + A2:2003 and EN 61000-3-3: 1995+ A2:2005.

Our European Representative in the EU is TDK-Lambda UK Limited, located at Kingsley Avenue, Ilfracombe, Devon, EX34 8ES UK. Further, all products covered by this declaration are manufactured in accordance with ISO9001:2000 which ensure continued compliance of the products with the requirements of the Low Voltage Directive.

Name of Authorized Signatory	Adam Rawicz-Szczerbo
Signature of Authorized Signatory	
Position of Authorized Signatory	Managing Director, TDK-Lambda EMEA
Date	29/08
Date series first CE marked	4 August 2003
Place where signed	Ilfracombe, Devon, England

## PRODUCTS COVERED SHEET FOR THE GEN 750W, GENH 750W, AND GEN 1500W SERIES

Product Name: GEN 750W Series Switch Mode DC Power Supply  
GENH 750W Series Switch Mode DC Power Supply  
GEN 1500W Series Switch Mode DC Power Supply

Models:	GEN 6-100ABCDE	GEN 60-12.5 ABCDE	GEN 6-200 ABCDE	GEN 60-25 ABCDE
	GEN 8-90 ABCDE	GEN 80-9.5 ABCDE	GEN 8-180 ABCDE	GEN 80-19 ABCDE
	GEN 12.5-60ABCDE	GEN 100-7.5ABCDE	GEN 12.5-120ABCDE	GEN 100-15ABCDE
	GEN 20-38 ABCDE	GEN 150-5 ABCDE	GEN 20-76 ABCDE	GEN 150-10 ABCDE
	GEN 30-25 ABCDE	GEN 300-2.5 ABCDE	GEN 30-50 ABCDE	GEN 300-5 ABCDE
	GEN 40-19 ABCDE	GEN 600-1.3 ABCDE	GEN 40-38 ABCDE	GEN 600-2.6 ABCDE
	GEN 50-30ABCDE			
	GENH 6-100ABCDE	GENH 60-12.5 ABCDE	GENH 8-90 ABCDE	GENH 80-9.5 ABCDE
	GEN 12.5-60ABCDE	GEN 100-7.5ABCDE	GENH 20-38 ABCDE	GENH 150-5 ABCDE
	GENH 30-25 ABCDE	GENH 300-2.5 ABCDE		
	GENH 40-19 ABCDE	GENH 600-1.3 ABCDE		

A= LAN, MD, IEEE, IEMD, or blank.

B= IS420, IS510, or blank.

C= USB or blank.

D=U or blank.

E= 1669 (GENH 60-12.5 only)

1670 (GENH 150-5 only)

1671(GENH 150-5 only)

1673, 1674, 1677, 1678, 1683, 1690, blank, or other optional suffix indicating changes not affecting safety or EMC

## **Genesys™ Manual Supplement**

For units equipped with the “**IEMD**” option,  
for IEEE-488 with Multi-drop,  
also refer to IEMD manual 83030200

For units equipped with the “**LAN**” option  
for Local Area Network with Multi-drop,  
also refer to LAN manual 83034100

For units equipped with “**MD**” option,  
for Multi-drop, also refer to the respective  
IEMD or LAN manuals.

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## **WARRANTY**

This TDK-Lambda Americas Inc. product is warranted against defects in materials and workmanship for a period of five years from date of shipment. During the warranty period, TDK-Lambda Americas Inc. will, at its option, either repair or replace products which prove to be defective.

### **LIMITATION OF WARRANTY**

The warranty shall not apply to defects resulting from improper or inadequate usage or maintenance by the buyer, buyer supplied products or interfacing. The warranty shall not apply to defects resulting from unauthorized modifications, or from operation exceeding the environmental specifications of the product, or if the QA seal has been removed or altered by anyone other than TDK-Lambda Americas Inc. authorized personnel. TDK-Lambda Americas Inc. does not warrant the buyer's circuitry or malfunctions of TDK-Lambda Americas Inc. products resulting from the buyer's circuitry. Furthermore, TDK-Lambda Americas Inc. does not warrant any damage occurring as a result of the buyer's circuitry or the buyer's - supplied products. THIS LIMITED WARRANTY IS IN LIEU OF, AND TDK-LAMBDA AMERICAS INC DISCLAIMS AND EXCLUDES, ALL OTHER WARRANTIES, STATUTORY, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR OF CONFORMITY TO MODELS OR SAMPLES.

### **WARRANTY SERVICE**

This product must be returned to an authorized TDK-Lambda Americas Inc. service facility for repairs or other warranty service. For products returned to TDK-Lambda Americas Inc. for warranty service, the buyer shall prepay shipping charges to TDK-Lambda Americas Inc. If the unit is covered under the foregoing warranty then TDK-Lambda Americas Inc. shall pay the shipping charges to return the product to the buyer. Refer to Section 3.11 for repackaging for shipment.

### **DISCLAIMER**

The information contained in this document is subject to change without notice. TDK-Lambda Americas Inc. shall not be liable for errors contained in this document or for incidental or consequential damages in connection with the furnishing, performance or use of this material. No part of this document may be photocopied, reproduced or translated into another language without the prior written consent of TDK-Lambda Americas Inc.

### **TRADEMARK INFORMATION**

Genesys™ power supply is a trademark of TDK-Lambda Americas Inc.  
Microsoft™ and Windows™ are trademarks of Microsoft Corporation.

### **THE FCC WANTS YOU TO KNOW**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

### **FCC WARNING**

Modifications not expressly approved by manufacturer could void the user authority to operate the equipment under FCC Rules.

## SAFETY INSTRUCTIONS

### Caution

The following safety precautions 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.

TDK-Lambda Americas Inc. Inc. shall not be liable for user's failure to comply with these requirements.

### Installation Category

The Genesys™ power supply series 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 Terminals 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 TDK-Lambda Americas Inc. Inc. service personnel only. For continued protection against risk of fire, replace only with the same type and rating of fuse. Refer to Chapter 9 for fuse ratings.

### 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 Genesys™ power supply series is: 100-240V~, 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-TDK-Lambda Americas Inc. Inc. 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 TDK-Lambda Americas Inc. Inc. service personnel only. For repairs or modifications, the instrument must be returned to an authorized TDK-Lambda Americas Inc. Inc. service facility.

## SAFETY INSTRUCTIONS

### ENVIRONMENTAL CONDITIONS

The Genesys™ power supply series safety approval applies to the following operating conditions:

\*Indoor use

\*Ambient temperature: 0°C to 50°C

\*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.



Indicates ground terminal.



Protective Ground Conductor Terminal



Off (Supply)



On (Supply)

#### WARNING

The WARNING sign denotes a hazard. An attention to a procedure is called. Not following procedure correctly could result in personal injury.  
A WARNING 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.

#### FCC Compliance Notice:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates electro-magnetic field, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## **SICHERHEITS-INSTALLATIONS ANWEISUNGEN**

### **Vorsicht**

Vor Anschluss an das Netz ist die Aufstellanleitung wie nachstehend beschrieben zu beachten. Die nachstehenden Sicherheitsanweisungen müssen während aller Phasen des Betriebes, des Services und der Reparatur dieser Ausrüstung beachtet werden. Alle notwendigen Bedingungen die sicherstellen, dass die Einrichtung zu keiner Gefahr im Sinne dieser Norm führen kann, sind in diesem Handbuch beschrieben.

TDK-Lambda Americas Inc. ist nicht verantwortlich für Fehler, die bei der Inbetriebnahme des Gerätes auf Grundlage dieser Sicherheitsanweisungen durch den Betreiber entstehen können.

### **Betriebsbedingungen**

Die Genesys<sup>TM</sup> Stromversorgungs-Reihe ist zur Installation gemäß Überspannungs-Kategorie 2 entwickelt worden.

Installations Kategorie (Überspannungs-Kategorien) 2 bedeutet: Kleinindustrie, Geräte, bewegliche Ausrüstung etc.. mit Überspannungen kleiner als Installation Kategorie 3.

### **Erdungskonzept**

Dieses Produkt ist ein Gerät mit Schutzklasse 1. Damit gefährliche Energieinhalte und Spannungen vermieden werden, ist das Gerätekörper an eine Schutzerde anzuschließen. Das Gerät muss an die AC-Wechselspannungsversorgung mit 3 Leitern (L, N, PE) angeschlossen werden. Der PE-Anschluss ist an einen festen Erder anzuschließen. Bei Festverdrahtung des Gerätes ist sicherzustellen, dass der PE Anschluss als erstes durchgeführt wird.

Jede mögliche Unterbrechung des PE-Leiters oder Trennung der PE Massen kann einen möglichen elektrischen Schlag hervorrufen, der Personenschaden zur Folge hatte.



### **Vorsicht**

#### **Erdung des DC-Ausgangs**

Es besteht Energiegefahr am RS232/485 und IEEE Anschluss, falls die Ausgangsspannung des Gerätes grösser ist als 400V und der positive Ausgangsanschluss des Netzteiles geerdet wird. Dies gilt insbesondere auch bei Reihenschaltungen von unterschiedlichen Netzteilen. Wird die RS232/485 oder IEEE Schnittstelle verwendet, ist darauf zu achten, dass der Plus-Ausgangsanschluss nicht geerdet wird.

### **Absicherung**

Sicherungen dürfen nur durch autorisierte TDK-Lambda Americas Inc. Service Personen ausgetauscht werden. Um Brandgefahr vorzubeugen, sind nur Sicherungen zu verwenden mit gleicher Bauart und Auslösecharakteristik. Siehe hierzu Wartungsanweisungen in Kapitel 6 bezüglich Sicherungen.

### **Anschluss an Versorgungsstromkreis**

Der Betrieb des Gerätes ist nur für den dafür spezifizierten Wechselspannungsbereich und der angegebenen Frequenz erlaubt.

Der Nominaleingangsspannungsbereich der Genesys<sup>TM</sup> Serie liegt bei 100-240VAC mit 50/60Hz. Für einen sicheren Betrieb des Gerätes ist eine Abweichung von max. +/-10% der Nominalspannung erlaubt.

## SICHERHEITS-INSTALLATIONS ANWEISUNGEN

### Spannungsfuhrende Teile

Die Geräteabdeckung darf nur im stromlosen Zustand geöffnet werden. Interne Modifikationen, sowie Bauteileaustausch ist nur durch TDK-Lambda Americas Inc. qualifiziertes Personal erlaubt. Vor Austausch von Bauteilen ist das Netzkabel bzw. Die Versorgungsspannung zu trennen. Energieversorgungsanschlüsse sind immer zu trennen um Personenverletzungen durch gefährliche Energieinhalte und Spannungen auszuschliessen. Die Stromkreise sind zu entladen, extreme Spannungsquellen sind zu entfernen bevor Bauteile bzw. Komponenten getauscht werden.

### Aenderungen and Bauteileersatz

Ersatzteilaustausch – und Aenderungen durfen nur von autorisiertem TDK-Lambda Americas Inc. SERVICE-PERSONEN durchgeführt werden. Für Reparaturen oder Aenderungen ist das Gerät zur TDK-Lambda Americas Inc. Service-Niederlassung zu returnieren.

## SICHERHEITS-HINWEISE

### Umweltbedingungen

Die Genesys™ Stromversorgungs-Serie ist gemassden Sicherheitsabnahmen für folgende Betriebsbedingungen zugelassen.

\*Stationare Einrichtungen in Gebäuden.

\*Umgebungstemperaturebereich: 0-50°C.

\*Maximale Relative Luftfeuchtigkeit: 90% (nicht kondensierend).

\*Betriebshöhe: bis zu 3000m.

\*Verschmutzungsgrad 2.

### Sicherheits-und Warnsymbole



VORSICHT Spannungsfuhrende Teile-Gefahr durch elektrischen Schlag bzw. Energieinhalte



Handbuch-Symbol. Das Gerät bzw. Geräteile werden mit diesem Symbol gekennzeichnet, wenn es für den Benutzer notwendig ist, sich auf die Anweisungen im Handbuch zu beziehen.



Zeigt „spannungsfuhrende Teile“ mit gefährlicher Spannung an.



Zeigt Masse-Anschluss an, keine Schutzerde. (z.B. Masseanschluss an einen Verbraucher).



Schutzleiter-Anschlussklemme.



Symbol für Schalter oder Druckknopf - Zeigt die



Symbol für Schalter oder Druckknopf - Zeigt die

**WARNING**

Dieses Warnaufschrift weist auf eine Gefahr hin, die eine Überprüfung anweisung nach sich zieht. Nichteinhaltung kann zu Personenschäden führen. Dieser Warnhinweis darf nicht übersprungen werden und die beschriebene Vorgehensweise musst strikt verstanden werden und dementsprechend umgesetzt werden.

**CAUTION**

Diese „Vorsichtswarnung“ weist auf eine Gefahr hin, die einer Vorkehrung bedarf. Nichteinhaltung kann zur Zerstörung der Anlage oder des Gerätes führen. Bitte berücksichtigen Sie alle Anweisungen, die dort beschrieben sind, bevor Sie mit Benutzung der Anlage bzw. des Gerätes fortfahren.

## **1. GENERAL INFORMATION**

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### **1.1. User Manual Content**

This User's Manual contains the operating instructions, installation instructions and specifications of the Genesys™ 1500W and 750W power supply series. The instructions refer to the standard power supplies, including the built-in RS232/485 serial communication. For information related to operation with the optional IEEE programming, refer to User's Manual for Power Supply Programming Interface. (TDK-Lambda Americas Inc. P/N 8303000)

### **1.2. Introduction**

#### **1.2.1. General Description**

Genesys™ power supplies are wide output range, high performance switching power supplies. The Genesys™ series 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 protections 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/RS485). GPIB programming and Isolated-Analog programming/monitoring are optional.

#### **1.2.2. Models Covered by this Manual**

Model	Voltage range (V)	Current range (A)
GEN 6-100	0 - 6	0 - 100
GEN 6-200	0 - 6	0 - 200
GEN 8-90	0 - 8	0 - 90
GEN 8-180	0 - 8	0 - 180
GEN 12.5-60	0 - 12.5	0 - 60
GEN 12.5-120	0 - 12.5	0 - 120
GEN 20-38	0 - 20	0 - 38
GEN 20-76	0 - 20	0 - 76
GEN 30-25	0 - 30	0 - 25
GEN 30-50	0 - 30	0 - 50
GEN 40-19	0 - 40	0 - 19
GEN 40-38	0 - 40	0 - 38
GEN 50-30	0 - 50	0 - 30

Model	Voltage range (V)	Current range (A)
GEN 60-12.5	0 - 60	0 - 12.5
GEN 60-25	0 - 60	0 - 25
GEN 80-9-5	0 - 80	0 - 9.5
GEN 80-19	0 - 80	0 - 19
GEN 100-7.5	0 - 100	0 - 7.5
GEN 100-15	0 - 100	0 - 15
GEN 150-5	0 - 150	0 - 5
GEN 150-10	0 - 150	0 - 10
GEN 300-2.5	0 - 300	0 - 2.5
GEN 300-5	0 - 300	0 - 5
GEN 600-1.3	0 - 600	0 - 1.3
GEN 600-2.6	0 - 600	0 - 2.6

**Table 1-1: Models Covered by the Manual**

### **1.2.3. 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 RS-232/RS-485 Interface.
- Voltage & Current high resolution adjustment by digital encoders.
- High accuracy programming/readback.
- Software Calibration (no internal trimmers / potentiometers).
- Last Setting Memory.
- Independent Remote ON/OFF (opto-isolated) 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.
- Optional LAN and GPIB interfaces (SCPI compatible).
- Optional Isolated Analog programming/monitoring (0-5V or 0-10V, user selectable and 4-20mA).

### **1.2.4. Multiple Output Power System**

The Genesys™ power supplies series can be configured into a programmable power system of up to 31 units using the built-in RS232/485 communication port and the RS485 linking cable provided with each power supply.

In a GPIB system, each power supply can be controlled using the optional GPIB controller (factory installed).

### **1.2.5. Control via the Serial Communication Port**

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

- a) Output Voltage setting.
- b) Output Current setting.
- c) Output Voltage measurement.
- d) Output On/Off control.
- e) Output Current measurement.
- f) Foldback protection setting
- g) Over-voltage protection setting and readback.
- h) Under-Voltage limit setting and readback.
- i) Power-supply start up mode (Auto-restart or Safe-start mode).

#### **1.2.6. 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 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).

#### **1.2.7. Parallel Operation**

Genesys™ power supplies of the same Output Voltage and Current rating can be paralleled in a master-slave configuration with automatic current sharing to increase power available.

#### **1.2.8. Output Connections**

Output connections are made to rear panel bus-bars for models up to 60V and to a 4-terminal wire clamp connector for models above 60V rated output voltage. Either the positive or negative terminal may be grounded or the output may be floated. Models up to 60VDC Rated Output shall not float outputs more than +/- 60VDC above/below chassis ground. Models >60VDC Rated Output shall not float outputs more than +/- 600VDC 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.

#### **1.2.9. Cooling And Mechanical Construction**

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

#### **CAUTION**

Observe all torque guidelines within this manual. Over-torqueing may damage Unit or accessories. Such damage is not covered under manufacturers warranty.

### **1.3. Accessories**

#### **1.3.1. Included Accessories**

The following accessories are delivered with the power supply:

##### **1.3.1.1. Serial Link Cable**

Serial link cable for linking power supplies by RS-485 communication.GEN/RJ45.

Cable description: 0.5m Length, shielded, RJ-45 type plugs, eight (8) contacts  
(P/N 15507201)

##### **1.3.1.2. Hardware (delivered with power supply)**

- Strain Relief for AC Cord
- Output terminal Shield
- DB25 Programming Plug kit (AMP 749809-9)
- 750W Only - Power Cord
- 1500W Only - No Power Cord is Provided.
- 1500W Only Input Connector plug kit

(Phoenix Contact, plug: IMC 1,5/7-ST-3,81, Header: IMC 1, 5/7-G-3,81))

#### **1.3.2. Optional Communication Cables**

- RS-232 Cables to connect GEN to Serial Port on PC

GEN to PC (DB9)	GEN 232/9	P/N 15-507-203
GEN to PC (DB25)	GEN 232/25	P/N 15-507-204

- RS-485 Cable to connect GEN to Serial Port on PC

GEN to PC(DB9)	GEN/485-9	P/N 15-507-202
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#### **1.3.3. AC cables**

AC Cables are provided with 750W Model only, according to suffix in Model Number.

Part No.	Market	Description
NC301 (GEN/U)	USA	13A 125V, unshielded, 2m typical length, with IEC320 connector on one end and NEMA-5-15P connector on the other end.
NC302 (GEN/E)	Europe	10A 250V, unshielded, 2m typical length, with IEC320 connector on one end and INT'L 7 standard VII, dual earthing.
NC303 (GEN/O)	General	10A 250V, unshielded, 2m typical length, with IEC320 connector on one end and unterminated stripped wires on the other end. Use the cable only with plug approved by the national safety standards of the country of usage.
NC305 (GEN/J)	Japan	13A 125V, unshielded, 2m typical length, with IEC320 connector on one end and Japan type plug on the other end.
NC306 (GEN/GB)	UK	10A 250V unshielded, 2m typical length, with IEC320 connector on one end and UK type plug on the other end.

For 1500W Genesys™ power supplies the recommended AC cable (customer supplied):

25A 250V, 3x12AWG, outer diameter: 9-11mm, rated 60°C min., 3m max. length.

Add a non-locking plug approved by the national safety standards of the country of usage.

## 2. SPECIFICATIONS

### 2.1 OUTPUT RATING

MODEL	GEN	6-100	8-90	12.5-60	20-38	30-25	40-19	-	60-12.5	80-9.5	100-7.5	150-5	300-2.5	600-1.3
1.Rated output voltage (*1)	V	6	8	12.5	20	30	40	-	60	80	100	150	300	600
2.Rated output current 750W (*2)	A	100	90	60	38	25	19	-	12.5	9.5	7.5	5	2.5	1.3
3.Rated output power 750W	W	600	720	750	760	750	760	-	750	760	750	750	750	780

MODEL	GEN	6-200	8-180	12.5-120	20-76	30-50	40-38	50-30	60-25	80-19	100-15	150-10	300-5	600-2.6
1.Rated output voltage (*1)	V	6	8	12.5	20	30	40	50	60	80	100	150	300	600
2.Rated Output Current 1500W (*2)	A	200	180	120	76	50	38	30	25	19	15	10	5	2.6
3.Rated output power 1500W	W	1200	1440	1500	1520	1500	1520	1500	1500	1520	1500	1500	1500	1560

2.2 INPUT CHARACTERISTICS	V	6	8	12.5	20	30	40	50	60	80	100	150	300	600
1. Input voltage/freq. (*3)	-	85-265Vac continuous, 47-63Hz, single phase.												
2. Input current (at 100/200Vac)	A	10.5/5 for 750W model, 21/11 for 1500W models.												
3. Power Factor	-	0.99@100/200Vac, rated output power.												
4. 750W models Efficiency (*4)	%	76/78	77/80	81/84	82/85	82/85	83/87	83/87	83/87	83/87	83/87	83/87	83/87	83/87
5. 1500W models Efficiency (*4)	%	77/79	78/81	82/85	83/86	83/86	84/88	84/88	84/88	84/88	84/88	84/88	84/88	84/88
6. Inrush current at 100/200V	A	Less than 25A for 750W models, 50A for 1500W models.												

2.3 CONSTANT VOLTAGE MODE	V	6	8	12.5	20	30	40	50	60	80	100	150	300	600
1. Max.line regulation (*5)	-	0.01%	of rated output voltage +2mV											
2. Max.load regulation (*6)	-	0.01%	of rated output voltage +2mV											
3. Ripple and noise (p-p,20MHz) (*10)	mV	60	60	60	60	60	60	60	60	80	80	100	150	300
4. Ripple r.m.s., 5Hz~1MHz (*10)	mV	8	8	8	8	8	8	8	8	8	8	10	25	60
5. Temperature coefficient	PPM/°C	100PPM/°C of rated output voltage, following 30 minutes warm up												
6. Temperature drift	-	0.05% of rated Vout over 8hrs interval following 30 minutes warm-up. Constant line, load & temp.												
7. Rem. Sense compensation/wire	V	1	1	1	1	1.5	2	2	3	4	5	5	5	5
8. Up-prog. Response time 0~Vmax (*9)	ms	80												
9. Down-prog. Response time: Full load	ms	10	80											
No load	ms	500	600	700	800	900	1000	1100	1100	1200	1500	2000	2500	4000
10. Transient response time	ms	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%. Less than 1ms for models up to and including 100V; 2ms for models above 100V.												
11. Hold-up time	ms	More than 20ms, 100Vac, rated output power.												

2.4 CONSTANT CURRENT MODE	V	6	8	12.5	20	30	40	50	60	80	100	150	300	600
1. Max.line regulation (*5)	-	0.01% of rated output voltage +2mA												
2. Max.load regulation (*7)	-	0.02% of rated output current +5mA												
3. Ripple r.m.s. 5Hz~1MHz,750W (*8)	mA	200	180	120	76	63	48	-	38	29	23	18	13	8
1500W (*8)	mA	400	360	240	152	125	95	75	75	57	45	35	25	12
4. Temperature coefficient	PPM/°C	100PPM/°C from rated output current, following 30 minutes warm-up.												
5. Temperature drift	-	0.05% of rated Iout over 8hrs interval following 30 minutes warm-up. Constant line, load & temp.												

2.5 ANALOG PROGRAMMING AND MONITORING	-	0~100%, 0~5V or 0~10V, user select. Accuracy and linearity: +/-0.5% of rated Vout.												
1.Vout voltage programming	-	0~100%, 0~5V or 0~10V, user select. Accuracy and linearity: +/-1% of rated Iout.												
2.Iout voltage programming	-	0~100%, 0~5V or 0~10V, user select. Accuracy and linearity: +/-1% of rated Vout.												
3.Vout resistor programming	-	0~100%, 0~5/10Kohm full scale, user select. Accuracy and linearity: +/-1.5% of rated Iout.												
4.Iout resistor programming	-	0~100%, 0~5/10Kohm full scale, user select. Accuracy and linearity: +/-1.5% of rated Iout.												
5.On/off control	-	By electrical Voltage: 0~0.6V/2~15V or dry contact, user selectable logic.												
6.Output current monitor	-	0~5V or 0~10V, user selectable. Accuracy: 1%												
7.Output voltage monitor	-	0~5V or 0~10V, user selectable. Accuracy: 1%												
8.Power supply OK signal	-	4~5V-OK, 0V-Fail, 500ohm series resistance.												
9.Parallel operation	-	Possible, up to 4 units in master/slave mode with single wire current balance connection.												
10.Series operation	-	Possible (with external diodes), up to 2 units.												
11.CV/CC indicator	-	CV: TTL high (4~5V), source current: 10mA, CC: TTL low (0~0.6V). Sink current: 10mA .												
12.Enable/Disable	-	Dry contact. Open: off, Short: on. Max. voltage at Enable/Disable in: 6V.												
13.Local/Remote analog control	-	By electrical signal or Open/Short: 0~0.6V or short: Remote, 4~5V or open: Local.												
14.Local/remote analog indicator	-	Open collector. Local: Open, Remote: On. Maximum voltage: 30V, maximum sink current: 5mA.												

## 2.6 PROGRAMMING AND READBACK (RS232/485, Optional IEEE Int)

1. Vout programming accuracy	-	0.05% + 0.05% of rated output voltage.
2. Iout programming accuracy (*13)	-	0.1% of actual output current + 0.1% of rated output current (for Iout > 0.4% of rated Iout to 100% of rated Iout). 0.1% of actual output current + 0.4% of rated output current (for Iout < 0.4% of rated Iout to 0.4% of rated Iout).
3. Vout programming resolution.	-	0.012% of full scale.
4. Iout programming resolution	-	0.012% of full scale.
5. Vout readback accuracy	-	0.1% + 0.1% of rated output voltage
6. Iout readback accuracy (*13)	-	0.1% + 0.3% of rated output current
7. Vout readback resolution	-	0.012% of full scale
8. Iout readback resolution	-	0.012% of full scale

## 2.7 PROTECTIVE FUNCTIONS

	V	6	8	12.5	20	30	40	50	60	80	100	150	300	600
1. Foldback protection														
2. Over-voltage protection														
3. Over-voltage trip point	V	0.5-7.5	0.5-10	1-15	1-24	2-35	2-44.1	5-57	5-66	5-88	5-110	5-165	5-330	5-660
4. Output under voltage limit														
5. Over temperature protection														

## 2.8 FRONT PANEL

1. Control functions	-	Vout/Iout manual adjust by separate encoders. (Coarse and fine adjustment)
	-	OVP/UVL manual adjust by Volt. 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
	-	Serial or IEEE display at power-up
	-	Baud rate selection: 1200, 2400, 4800, 9600 and 19200
	-	Re-start modes (Auto Restart, Safe Start)
2. Display	-	Vout: 4 digits, accuracy: 0.5% of rated voltage + 1 count
	-	Iout: 4 digits, accuracy: 0.5% of rated current + 1 count
3. Indications	-	VOLTAGE, CURRENT, ALARM FINE, PREVIEW, FOLDBACK, LOCAL, OUTPUT ON.

## 2.9 ENVIRONMENTAL CONDITIONS

1. Operating temperature	C	0-50 C, 100% load.
2. Storage temperature	C	-20 to + 70
3. Operating humidity	%	30-90% RH (no condensation).
4. Storage humidity	%	10-95% RH (no condensation).
5. Altitude	-	Maximum 3000m, Derate output current by 2%/100m above 2000m. Alternatively, derate maximum ambient temperature by 1 degC/100m above 2000m.

## 2.10 MECHANICAL

1. Cooling	-	Forced air cooled by internal fans.
2. Weight	Kg	Less than 4.5Kg
3. Dimensions (W x H x D)	mm	W: 214.0 H: 43.6 (57.0 Benchtop Version), D: 437.5 (Refer to Outline drawing).
4. Vibration	-	MIL-810E, method 514.5 test condition I-3.3
5. Shock	-	Less than 20G, half sine, 11mS. Units unpacked

## 2.11 SAFETY/EMC

1. Applicable standards	Safety	-	UL 60950-1 listed, EN 60950-1 Vout <= 40V: Output is SELV, IEEE/Isolated Analog are SELV. 60 < Vout < 400V: Output is hazardous, IEEE/Isolated analog are SELV 400 < Vout < 600V: Output is hazardous, IEEE/Isolated, Analog are not SELV
	EMC	-	EN55024
2. Withstand voltage		-	Vout < 60V models: Input-Outputs (SELV): 3.0KVrms 1 min, Input-Ground: 2.0KVrms 1 min. 60 <= Vout < 600V models: Input-Haz, output: 2.5KVrms 1 min, Input-SELV: 3KVrms 1 min, 1900VDC 1 min. Hazardous Output - SELV: 1.9KVrms 1 min, Hazardous Output-Ground: 1.9KVrms 1 min. Input-Ground: 2KVrms 1 min
3. Insulation resistance		-	More than 100Mohm at 25°C, 70%RH
4. Conducted emission		-	EN55022B, FCC part 15-B, VCCI-B
5. Radiated emission		-	EN55022A, FCC part 15-A, VCCI-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. For cases where conformance to various safety standards (UL, IEC etc.) is required, to be described as 100-240Vac (50/60Hz).
4. At 100/200V input voltage and maximum output power.
5. From 85~132Vac or 170~265Vac, constant load.
6. From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.
7. For load voltage change, equal to the unit voltage rating, constant input voltage.
8. For 6V models the ripple is measured at 2~6V output voltage and full output current. For other models, the ripple is measured at 10~100% output voltage and full output current.
9. With rated, resistive load.
10. For 6~300V models: Measured with JEITA RC-9131A (1:1) probe  
For 600V model: Measured with (10:1) probe.

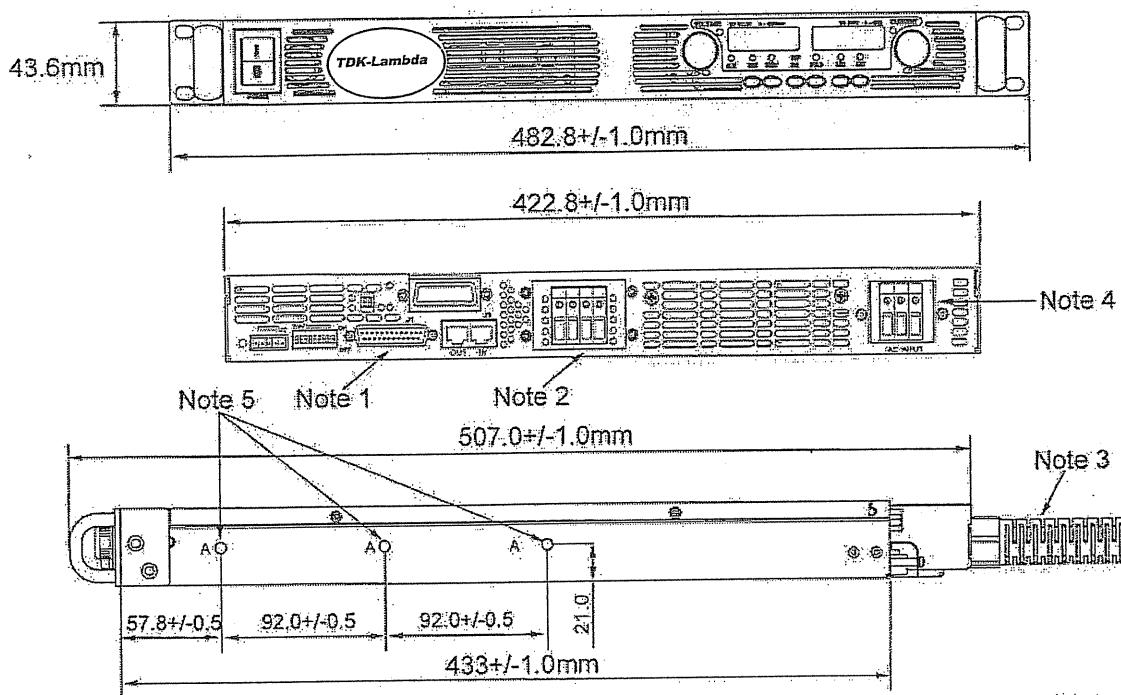
## 2.1. Supplemental Characteristics

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. IEC1000 Data: Performance of the power supply under IEC1000 test conditions.
4. EMI Data: Typical EMI (conducted and radiated) performance of the power supply.

The supplemental characteristics data is held in each TDK-Lambda Americas Inc. sales and service facility. For further details please contact the TDK-Lambda Americas Inc. office nearest you.

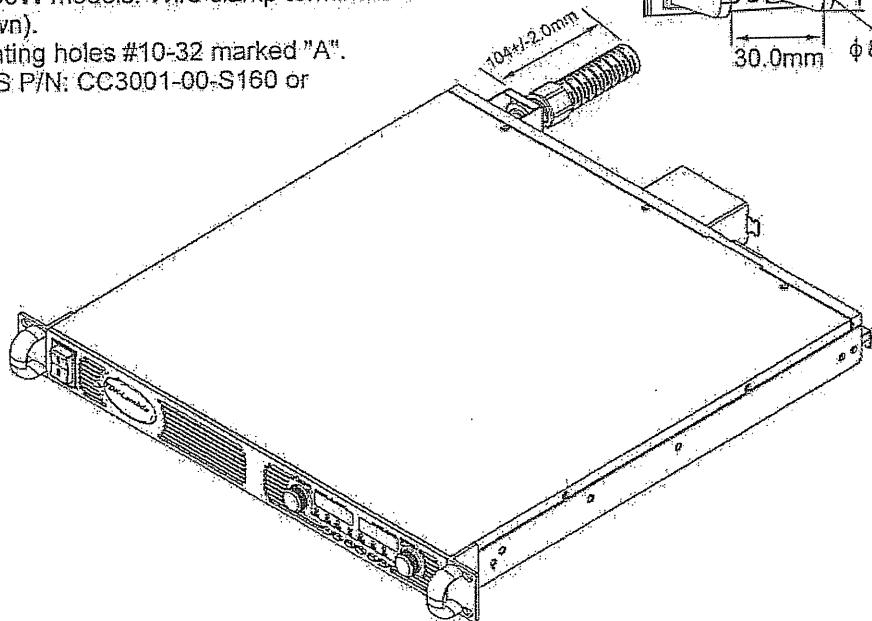
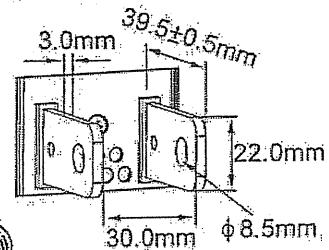
## 2.2. GENESYS™ 750W & 1500W Power Supplies Outline Drawings



### NOTES:

1. Mating plug supplied with power supply.
2. Bus-bars for 6V to 60V models. See detail.
- Wire clamp connector for 80V to 600V models (shown).
3. AC cable strain relief for 1500W models only (supplied with power supply).
4. IEC connector for 750W models. Wire clamp terminal for 1500W models (shown).
5. Chassis slides mounting holes #10-32 marked "A".  
GENERAL DEVICES P/N: CC3001-00-S160 or equivalent.

Bus-Bar Detail  
6V to 60V Models



### **3. INSTALLATION**

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#### **3.1. General**

This Chapter contains instructions for initial inspection, preparation for use and repackaging for shipment. Connection to PC, setting the communication port and linking Genesys™ power supplies are described in Chapter 7.

**NOTE**

*Genesys™ power supplies 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.*

#### **3.2. 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 3.6 and 3.7.

Table 3-1 below, describes the basic setup procedure. Follow the instructions in Table 3-1 in the sequence given to prepare the power supply for use.

<b>Step no.</b>	<b>Item</b>	<b>Description</b>	<b>Section</b>
1	Inspection	Initial physical inspection of the power supply	0
2	Installation	Installing the power supply, Ensuring adequate ventilation.	3.4 3.5
3	AC source	AC source requirements Connecting the power supply to the AC source	3.6 3.7
4	Test	Turn-on checkout procedure.	3.8
5	Load connection	Wire size selection. Local/Remote sensing. Single or multiple loads.	3.9
6	Default setting	The power supply setting at shipment.	7.2.1

**Table 3-1: Basic Setup Procedure**

#### **3.3. Initial Inspections**

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 TDK-Lambda Americas Inc. sales or authorized service facility nearest you.

### **3.4. Rack Mounting**

The Genesys™ power supply series is designed to fit in a standard 19" equipment rack.

#### **3.4.1. To install the Power Supply in a Rack:**

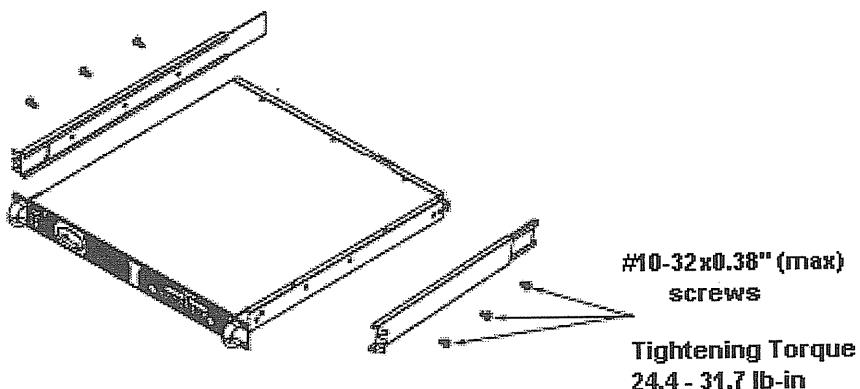
Use the front panel rack-mount brackets to install the power supply in the rack. Use a support bar to provide adequate support for the rear of the power supply. Do not obstruct the air exhaust at the rear panel of the unit.

#### **3.4.2. Rack Mount Slides (optional):**

**CAUTION**

Ensure that the screws used to attach the slides to the unit do not penetrate more than 6mm into the sides of the unit.

Use rack mount slides: General Devices P/N: CC3001-00-S160 or equivalent to install the unit in a standard 19" equipment rack. Refer to Fig. 3-1 for slides assembly instructions. Use three #10-32x0.38" (max.) screws at each side. To prevent internal damage, use the specified screw length only.



**Fig. 3-1: Rack-Mount Slides Assembly**

### **3.5. 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 a minimum of 10cm (4 Inch) 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 +50°C.

### **3.6. AC Source Requirements**

The Genesys™ series can be operated from a nominal 100V to 240V, single phase, 47~63 Hz. 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 Chapter 2.

**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.

### 3.7. 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.

**CAUTION**

AC Input Wires No Conductor Pretreatment: Phoenix Contact clamping parts are designed so that all kinds of copper conductors can be clamped without pretreatment.

It is forbidden to solder the conductors. The solder tin yields and fractures under high pressure. The result is increased contact resistance and an excessive temperature rise. In addition, corrosion caused by pickling or fluxes has been observed on soldered conductor ends. Notch fractures at the transition point from the rigid to the flexible conductor area are also possible

#### 3.7.1. AC Input Connector, 1500W Models

The AC input connector is a 3-Terminal wire clamp located on the rear panel. Use suitable wires and tightening torque as follows:

- Wire diameter: 12AWG or 10AWG.
- Tightening torque: 6.5 - 7.0 Lb-inch.

### 3.7.2. AC Input Connector, 750W Models

An IEC connector is provided on the rear panel for connecting the unit to the AC power source with an AC cord. The IEC connector also provides the safety ground connection while the AC cord is plugged into an appropriate AC receptacle.



#### WARNING

The AC input cord is the disconnect device of the power supply. The plug must be readily identifiable and accessible to the user. The AC input cord must be no longer than 3m.

### 3.7.3. AC Input Cord

Refer to Section 1.3.3 for details of the AC input cords recommended for the 750W and the 1500W models.

### 3.7.4. AC Input Wire Connection, 1500W Models

- a) Strip the outside insulation of the AC cable approx. 10cm (3.94 inches). Trim the wires so that the ground wire is 10mm (0.4 inches) longer than the other wires. Strip 14mm (0.55 inches) at the end of each of the wires.
- b) Unscrew the base of the strain relief from the helix-shaped body. Insert the base through the outside opening in the AC input cover and screw the locknut securely (11-14 Lb-inch.) the base, from the inside.
- c) Slide the helix-shaped body onto the AC cable. Insert the stripped wires through the strain relief base until the outer cable jacket is flush with the edge of the base. Tighten (16-18 Lb-inch.) the body to the base while holding the cable in place. Now the cable is securely fastened inside the strain relief. Refer to Fig. 3-2.

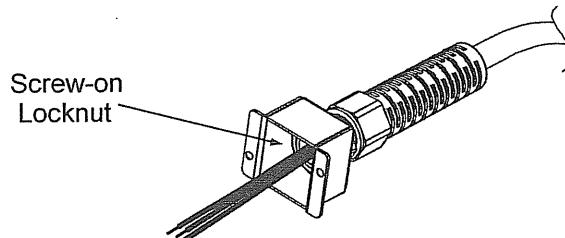


Fig.3-2: Stripped Wires installed in Strain Relief

- d) Route the AC wires to the input connector terminals as required. To connect the wires, loosen the terminal screw, insert the stripped wire into the terminal and tighten the screw securely (4.4-5.3 Lb-inch).
- e) Route the wires inside the cover to prevent pinching. Fasten the cover to the unit using the M3x8 Flat Head screws provided. Refer to Fig.3-3 for details.

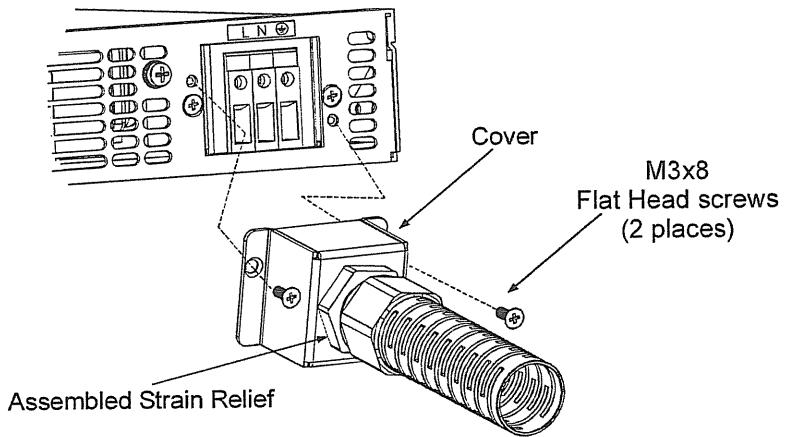


Fig.3-3: AC input cover and strain relief, 1500W models

### 3.8. Turn-On Checkout Procedure

#### 3.8.1. General

The following procedure ensures that the power supply is operational and may be used as a basic incoming inspection check. Refer to Fig. 4-1 and fig. 4-2 for the location of the controls indicated in the procedure.

#### 3.8.2. Prior to Operation

- a) Ensure that the power supply is configured to the default setting:
  - On/Off switch at Off position.
  - Dip switch: All positions at Down ("Off") position.
  - J2 Sense connector: Configured to Local Sense as shown in Fig. 3-4:

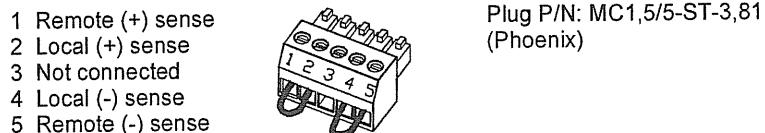


Fig.3-4: J2 Sense connector default connection

- For units equipped with IEEE option, ensure that the IEEE\_En switch is in Up (default) position (Refer to Fig.4-2, Item 9 for location) if checkout is to be done in IEEE mode.
- b) Connect the unit to an AC source as described in Section 3.7.
- c) Connect a DVM with appropriate cables for the rated voltage to the output terminals.
- d) Turn the front panel AC power switch to On.

### **3.8.3. Constant Voltage Check**

- a. Turn on the output by pressing the OUT pushbutton so the OUT LED illuminates.
- b. 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.
- c. 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.
- d. Turn Off the front panel AC power switch.

### **3.8.4. Constant Current Check**

- a. Ensure that the front panel AC power switch is at the Off position and the DVM connected to the output terminals shows zero voltage.
- b. Connect a DC shunt across the output terminals. Ensure that the shunt and the wire current ratings are higher than the power supply rating. Connect a DVM to the shunt.
- c. Turn the front panel AC power switch to the On position,
- d. Turn On the output by pressing OUT pushbutton so the OUT LED illuminates.
- e. 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.
- f. Compare the DVM reading with the front panel CURRENT display to verify the accuracy of the CURRENT display. Ensure the front panel CURRENT LED is On.
- g. Turn Off the front panel AC power switch.
- h. Remove the shunt from the power supply output terminals.

### **3.8.5. OVP Check**

Refer to Section 5.3 for explanation of the OVP function prior to performing the procedure below.

- a) Turn the front panel AC power switch to the On position and turn on the output by pressing OUT pushbutton.
- b) Using the VOLT encoder, adjust the Output Voltage to approx. 10% of the unit voltage rating.
- c) 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.
- d) Rotate the VOLT encoder CCW to adjust the OVP setting to 50% of the unit voltage rating.
- e) Wait a few seconds until the VOLT display returns to show the Output Voltage.
- f) Adjust the Output Voltage toward its maximum and check that the Output Voltage cannot be increased more than the OVP setting.
- g) Adjust OVP limit to the maximum by repeating Step 3 and rotating the VOLT encoder C.W.

### **3.8.6. UVL Check**

Refer to Section 5.4 for explanation of the UVL function prior to performing the procedure below.

- a) 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.
- b) Rotate the VOLT encoder to adjust the UVL level to approx. 10% of the unit voltage rating.
- c) Wait a few seconds until the VOLT display returns to show the output voltage.

- d) Adjust the output voltage toward its minimum and check that the output voltage cannot be decreased below the UVL setting.
- e) Adjust the UVL limit to the minimum by repeating Sep 1 and rotating the VOLT encoder CCW

### 3.8.7. Foldback Check



#### WARNING

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

Refer to Section 5.5 for explanation of the FOLD function prior to performing the procedure below.

- a. Ensure that the Output Voltage is set to approx. 10% of the unit rating.
- b. Adjust the CURRENT encoder to set the Output Current setting to approx. 10% of the unit rating.
- c. Momentarily press the FOLD button. Ensure that the FOLD LED illuminates. The Output Voltage remains unchanged.
- d. 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.
- e. Press the FOLD button again to cancel the protection. The Output Voltage remains zero.
- f. Press the OUT button. Ensure that the Output Voltage returns to its last setting.
- g. Turn the output off by pressing the OUT button. Ensure that the VOLT display shows "OFF".

### 3.8.8. Address Setting

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

### 3.8.9. Baud Rate Setting (RS-232 and RS-485 only)

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

### 3.9. 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.

### 3.9.1. 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 Section 3.9.2)
- 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 Section 3.9.2)
- Noise and impedance effects of the load wiring (refer to Section 0).

### 3.9.2. Current Carrying Capacity

Two factors must be considered when selecting the wire size:

- a. 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.
- b) 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 3-2 and 3-3 for minimum wire length (to limit voltage drop) in American and European dimensions respectively.

Wire size AWG	Resistivity OHM/1000ft	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 3-2: Maximum Wire Length for 1V Drop on Lead (in feet)

Cross sect. area (mm <sup>2</sup> )	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

Table 3-3: Maximum Wire Length for 1 V Drop on Lead (in meters)

For currents not shown in Table 3-2 and 3-3, use the formula:

$$\text{Maximum length} = 1000 / (\text{current} \times \text{resistivity})$$

Where current is expressed in Amperes and resistivity in ohms/km or ohms/1000ft.

### **3.9.3. Wire Termination**

The wires should be properly terminated with terminals securely attached. DO NOT use unterminated 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).

### **3.9.4. Noise and Impedance Effects**

To minimize the noise pickup 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 Ground screw. 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 the 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.

### **3.9.5. 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.

### **3.9.6. Making the Load Connections**

#### **6V to 60V Models**

Refer to Fig.3-5 for connection of the load wires to the power supply bus-bars and to Fig.3-6 for mounting the bus-bars shield to the chassis.

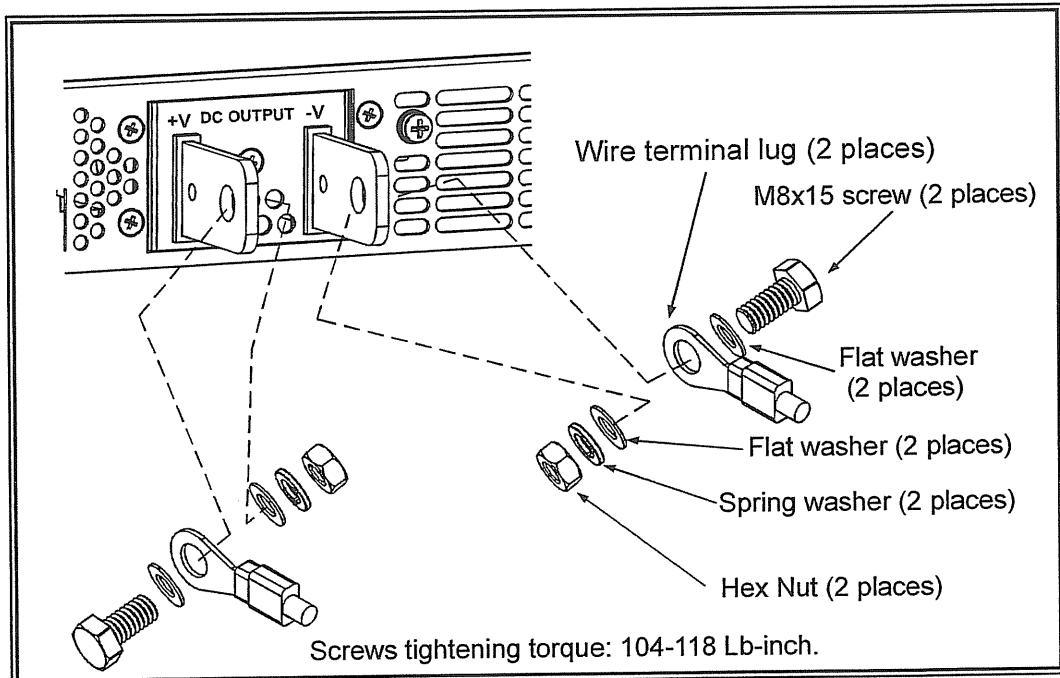


Fig. 3-5: Load Wires Connection, 6V to 60V Models

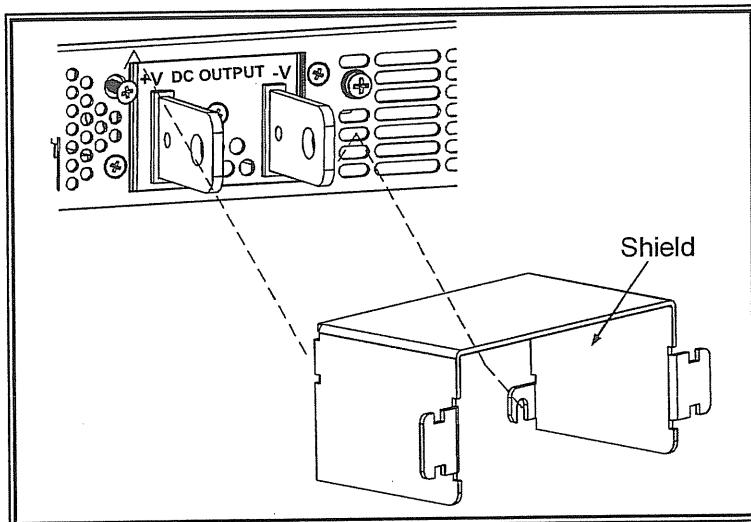


Fig. 3-6: Bus-Bars Shield Mounting

## 80V to 600V Models

### WARNING



Hazardous voltages exist at the outputs and the load connections. To protect personnel against accidental contact with hazardous voltages, ensure that the load and its connections have no accessible live parts. Ensure that the load wiring insulation rating is greater than or equal to the maximum output voltage of the power supply.

The 80V to 600V models have a four terminal wire clamp output connector. The two left terminals are the positive outputs and the two right terminals are the negative outputs. The connector requirements are as follows:

- Wires: AWG18 to AWG10.
- Tightening torque: 6.5-7.0 Lb-inch.

Follow the instructions below for connection of the load wires to the power supply:

- Strip approx. 10mm (0.39 inches) at the end of each of the wires.
- Loosen the connector terminal screws.
- Insert the stripped wires into the terminal and tighten the terminal screw securely (see Fig.3-7)

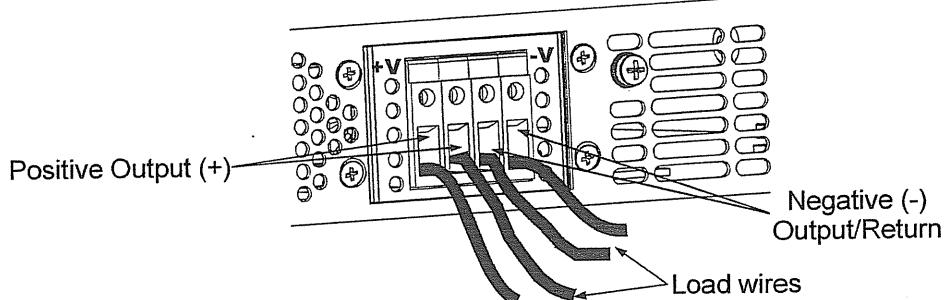


Fig.3-7: Load wires connection to the output connector

- Loosen the two chassis screws marked "A" halfway as shown in Fig.3-8.
- Assemble the protective shield to the chassis and tighten the two screws to fix the shield to the chassis (see Fig.3-8). Screws tightening torque: 4.8-5.3 Lb-inch.

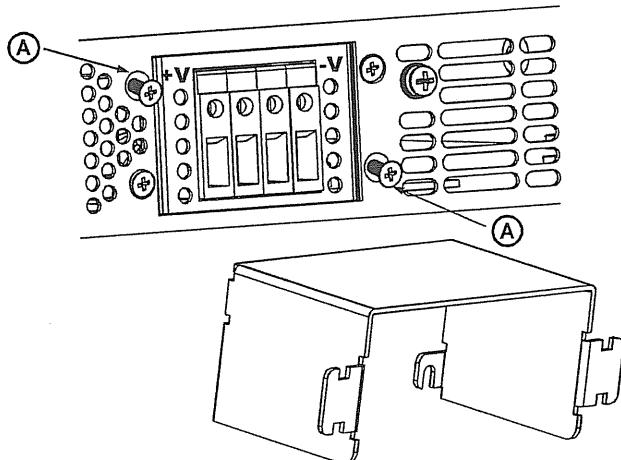


Fig.3-8: Shield assembly

- f) Tighten the wires to one of the shield sides using typ-wrap or equivalent. Refer to Fig.3-9. Ensure that the wire length inside the shield is long enough to provide proper strain relief.

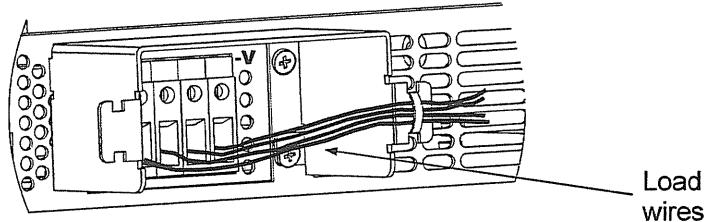


Fig.3-9: Protective shield and wires assembly

### 3.9.7. Connecting Single Loads, Local Sensing (default).

Fig.3-10 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.

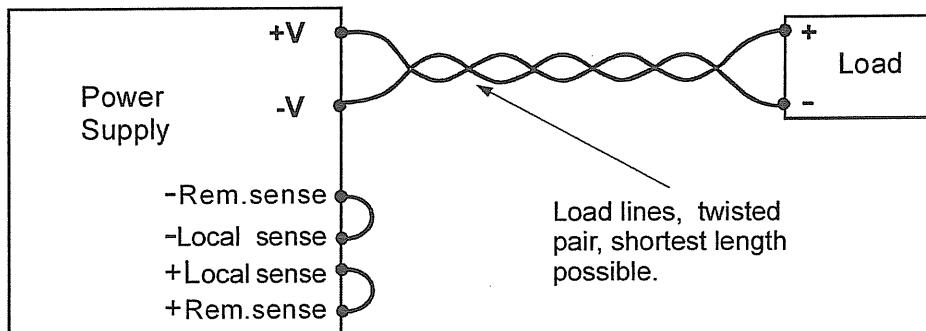


Fig.3-10: Single load connection, local sensing

### 3.9.8. Connecting Single Loads, Remote Sensing

Fig.3-11 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.

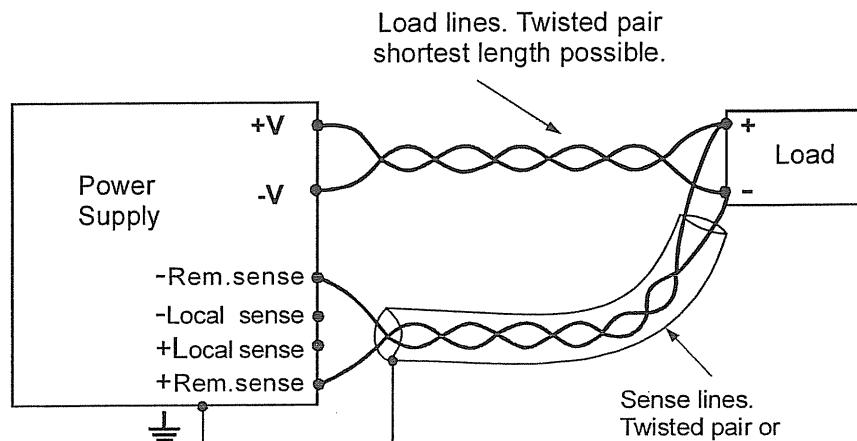


Fig.3-11: Remote sensing, single load

### 3.9.9. Connecting Multiple Loads, Radial Distribution Method

Fig.3-12 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.

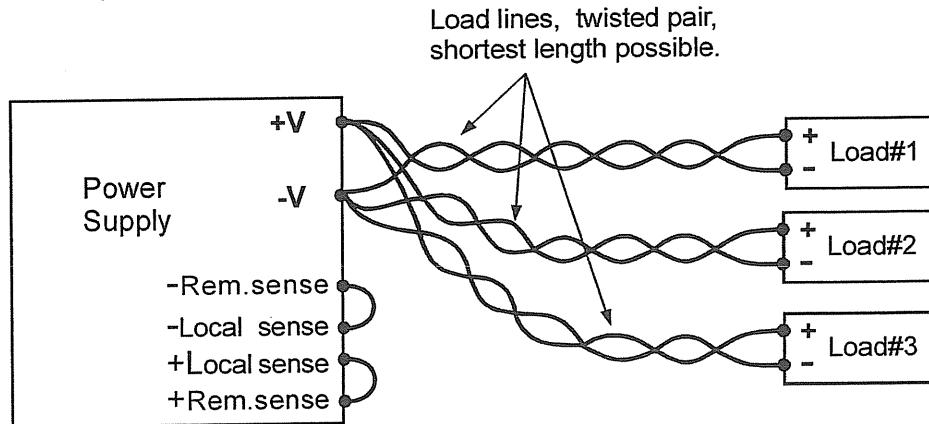


Fig.3-12: Multiple loads connection, radial distribution, local sense

### 3.9.10. 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 pair of twisted and/or shielded wires. Each load should be separately connected to the remote distribution terminals (see Fig.3-13).

If remote sensing is required, the sensing wires should be connected to the distribution terminals or at the most critical load.

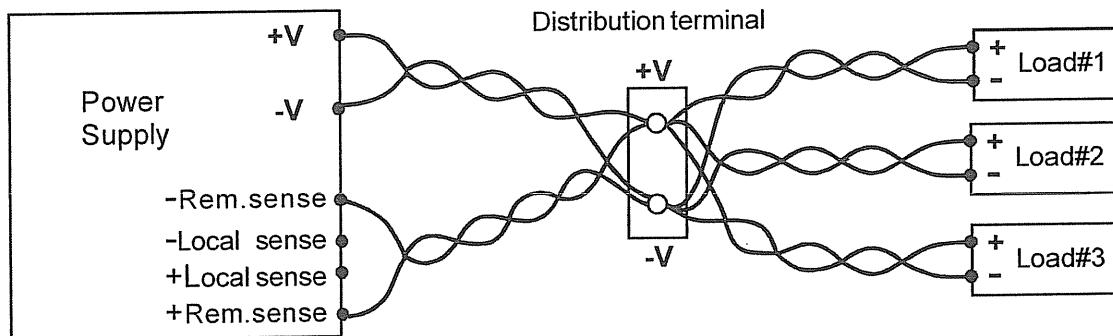


Fig.3-13: Multiple loads connection with distribution terminal

### 3.9.11. 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 up to 60VDC Rated Output shall not float outputs more than +/-60VDC above/below chassis ground. Models > 60VDC Rated Output shall not float outputs more than +/-600VDC above/below chassis ground.

### 3.10. 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.3-14 for sense connector location.

#### 3.10.1. 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.

#### 3.10.2. Local sensing

The power supply is shipped with the rear panel J2 sense connector wired for local sensing of the Output Voltage. See Table 3-4 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.

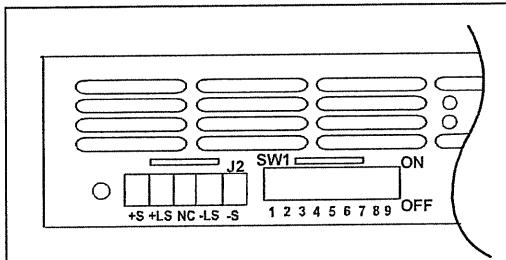


Fig.3-14: J2 Sense connector location

Table 3-4: 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).

### 3.10.3. Remote sensing

#### WARNING



There is a potential shock hazard at the sense point when using a 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:

- a) Ensure that the AC On/Off is in the Off position.
- b) Remove the local sense jumpers from J2.
- c) 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.
- d) Turn On the power supply.

#### Notes:

1. If the power supply is operating in remote sense and either the positive or negative load wire is not connected, an internal protection circuit will activate and shut down the power supply. To resume operation, turn the AC On/Off to the Off position, connect the open load wire, and turn On the power supply.
2. 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.

### 3.10.4. J2 sense connector technical information

- J2 connector type: MC 1.5/5-G-3.81, Phoenix.
- Plug type: MC 1.5/5-ST-3.81, Phoenix.
- Wire AWG: 28 up to 16.
- Stripping length: 7mm (0.28 inches).
- Tightening torque: 0.22-0.25Nm (1.95-2.21Lb-Inch.)

### 3.11. Repackaging for Shipment

To ensure safe transportation of the instrument, contact the TDK-Lambda Americas Inc. 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.

## 4. FRONT AND REAR PANEL CONTROLS AND CONNECTORS

### 4.1. Introduction

The Genesys™ Power Supply series 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 4.2: Front Panel Controls and Indicators.
- Section 4.3: Rear Panel Connections and Controls.

### 4.2. Front Panel Controls and Indicators

See Fig.4-1 to review the controls, indicators and meters located on the power supply front panel.

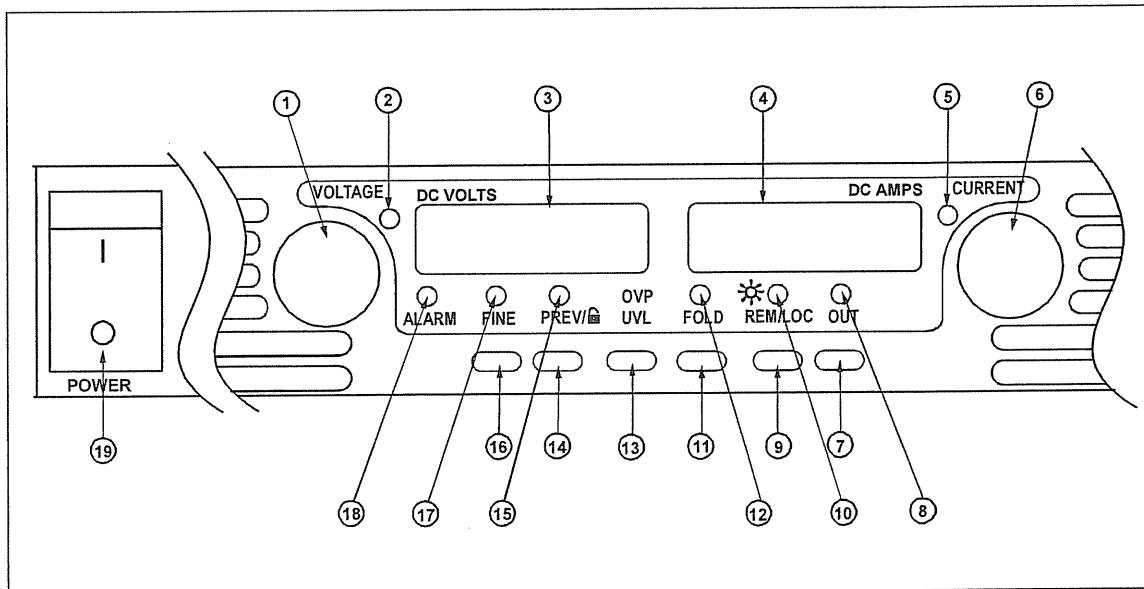


Fig.4-1: Front panel controls and indicators

Table 4-1: 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	5.2.1 5.3.1 5.4.1 7.2.2
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.	

Table 4-1: Front Panel Controls and Indicators

Number	Control/Indicator	Description	Section
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. <b>Auxiliary Function:</b> a) Selects the Baud-Rate of communication port. b) Set desired mode of the Master Power Supply in Advanced parallel operation.	5.2.2 7.2.4 5.15.2
7	OUT button	<b>Main function:</b> 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.  <b>Auxiliary function:</b> Selects between "Safe-Start" and "Auto-Restart" modes. Press and hold OUT button to toggle between "Safe-Start" and "Auto-Restart". The VOLT display will cycle between "SAF" and "AUT". Releasing the OUT button while one of the modes is displayed, selects that mode.	5.6 5.11
8	OUT indicator	Green LED, lights when the DC output is enabled.	
9	REM/LOC button	<b>Main function:</b> Go to local. Press REM/LOC to put the unit into Local mode (REM/LOC button is disabled at Local Lockout mode).  <b>Auxiliary function:</b> Address and Baud Rate setting. Press and hold REM/LOC for 3 sec. to set the Address with the VOLTAGE encoder and the Baud Rate with the CURRENT encoder.	7.2.5 7.2.2 7.2.4
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 even, press OUT to enable the output and re-arm the protection. -Press FOLD again to cancel the Foldback protection.	5.5
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").	5.3 5.4

Number	Control/Indicator	Description	Section
14	PREV button	<b>Main function:</b> Press PREV to display the Output Voltage and Current setting. For 5 sec. the display will show the setting and then it will return to show the actual Output Voltage and Current.  <b>Auxiliary function:</b> 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.	5.17
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).  <b>Auxiliary function:</b> Set units as Master or Slave in Advanced parallel operation	5.15.2
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.	

#### 4.3. Rear Panel Connections and Controls

See Fig.4-2 to review the connections and controls located on the power supply rear panel. Refer to Table 4-2 for explanations about the rear panel connections and controls.

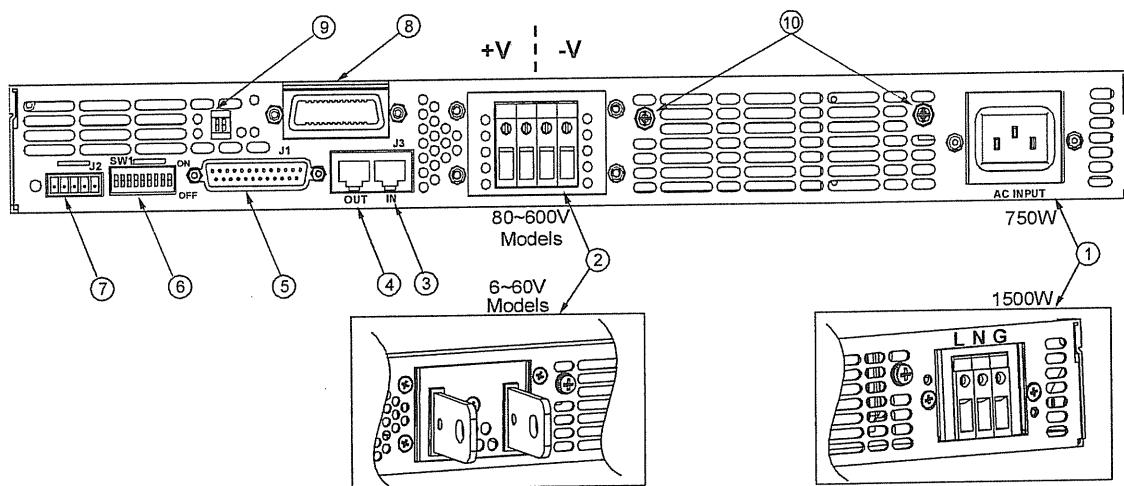


Fig.4-2: Rear panel connections and controls

Table 4-2: Rear panel connections and controls

Number	Item	Description	Section
1	AC input connector	Wire clamp connector for 1500W units. IEC connector for 750W units.	3.7.1 3.7.2
2	DC output	Bus-bars for 6V to 60V models. Wire clamp connector for 80V to 600V models.	3.9.6
3	Remote-In connector	RJ-45 type connector, used for connecting power supplies to 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 daisy-chained, Remote-In to Remote-Out.	7.3 7.4
4	Remote Out connector	RJ-45 type connector, used for daisy-chaining power supplies to form a serial communication bus.	7.3 7.4
5	J1 Analog Remote connector	Connector for remote analog interface. Includes Output Voltage and Current 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.	
6	SW1 Setup switch	Nine position DIP-switch for selecting remote programming and monitoring modes for Output Voltage, Output Current and other control functions.	0
7	J2 Remote sense connector	Connector for making remote sensing connections to the load for regulation of the load voltage and compensation of load wire drop.	3.10 3.8.2
8	Blank Sub-plate	Blank sub-plate for standard units. Isolated Remote Analog programming connector for units equipped with Isolated Analog control option. IEEE connector for units equipped with IEEE programming option (shown).	Fig.4.2
9	IEEE switch	Two position DIP-switch for selecting IEEE mode or RS232/485 mode when IEEE option is installed.	Fig.4.2
10	Ground screw	M4x0.7, 8mm long DBL-SEMS screw for chassis ground connection.	Fig.4.2

#### 4.4. Rear Panel SW1 Setup Switch

The SW1 Setup switch (see Fig.4-3) is a 9-position DIP-switch that allows the user to choose the following:

- Internal or remote programming for Output Voltage and Output Current.
- 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 and RS485 communication interface.
- Enable or disable the rear panel Enable/Disable control (dry contact).

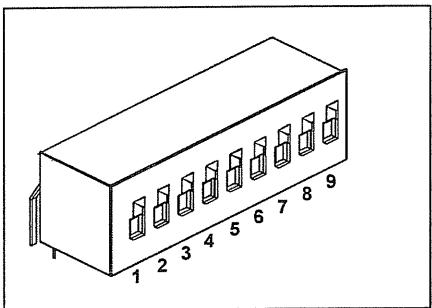


Fig.4-3: SW1 setup DIP-switch

#### 4.4.1. SW1 Position Function

Refer to Table 4-3 for description of SW1 position functions. The factory default setting is Down for all positions.

Table 4-3: 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 Remote Analog programming	Output Current programmed by Front Panel	Output Current 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	Off: Low (0-0.6V) or Short On: High (2-15V) or Open	Off: Low (2-15V) or Open On: High (0-0.6V) or Short
SW1-6	RS232/485 select	RS232 interface	RS485 interface
SW1-7	Output Voltage Resistive Programming	Output Voltage programmed by Front Panel	Output Voltage programmed by External resistor
SW1-8	Output Current Resistive Programming	Output Current Programmed by Front Panel	Output Current Programmed by External Resistor
SW1-9	Enable/Disable control	Rear panel Enable/Disable control is not Active	Rear panel Enable/Disable control is Active

#### 4.4.2. 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 the OUT LED is Off. Then use any small flat-bladed screwdriver to change the SW1 switch setting.

### 4.5. 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 4-4 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 a plastic body plug to conform to Safety Agency requirements. If a shield is required for the J1 wires, connect the shield to a power supply chassis ground screw.

#### 4.5.1. Making J1 connections

- J1 Connector type: AMP, P/N:747461-3
- J1 plug description: AMP, P/N:745211-2
- Wire dimension range: AWG26-22
- Extraction tool: AMP, 91232-1 or equivalent.
- Manual Pistol grip tool:

Handle:AMP, P/N:58074-1

Head:AMP, P/N:58063-2

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 the negative sense (-S) potential of the power supply. Do not attempt to bias any of these terminals relative to the negative sense. Use the Isolated Programming interface option to allow control from a programming source at a different potential relative to the power supply negative.

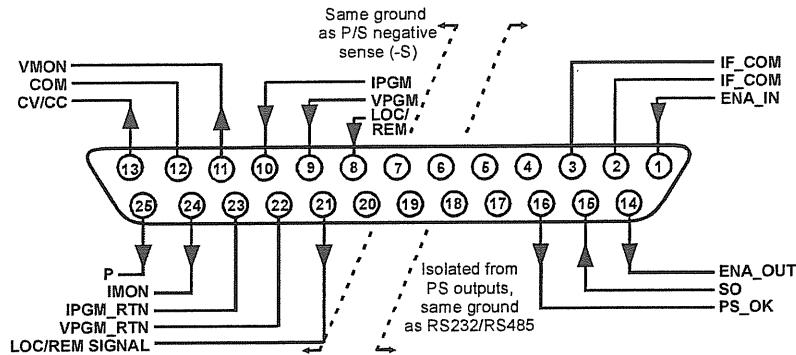
#### CAUTION

To prevent ground loops and to maintain power supply isolation 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. 4-4: J1 connector terminals and functions**

**Table 4-4: J1 connector terminals and functions**

J1 contact	Signal name	Function	Section
J1-1	ENA_IN	Enable/Disable the power supply output by dry-contact (short/open) with ENA_OUT.	5.8
J1-2 J1-3	IF_COM	Isolated Interface Common. Return for the SO control, PS_OK signal and for the optional IEEE interface.	5.7 5.10
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.	6.2
J1-9	VPGM	Input for remote analog voltage/resistance programming of the Output Voltage.	6.1~6.4
J1-10	IPGM	Input for remote analog voltage/resistance programming of the Output Current.	6.1~6.4
J1-11	VMON	Output for monitoring the power supply Output Voltage.	6.6
J1-12	COM	Control Common. Return for VMON, IMON, CV/CC, LOC/REM. Connected internally to the negative sense potential (-S).	
J1-13	CV/CC	Output for Constant-Voltage/Constant-Current mode indication.	5.9
J1-14	ENA_OUT	Enable/Disable the power supply output by dry-contact (short/open) with ENA_IN.	5.8
J1-15	SO	Input for Shut-Off control of the power supply output.	5.7
J1-16	PS_OK	Output for indication of the power supply status.	5.10
J1-17~20	N/C	No Connection.	
J1-21	LOC/REM SIGNAL	Output for indicating if the unit is in Local or Remote analog programming mode.	6.3
J1-22	VPGM_RTN	Return for VPGM input. Connected internally to the "-S".	6.1, 6.4, 6.5
J1-23	IPGM_RTN	Return for IPGM input. Connected internally to the "-S".	6.1, 6.4, 6.5
J1-24	IMON	Output for monitoring the power supply Output Current.	6.6
J1-25	P	Output for current balance in parallel operation.	5.15

## **5. LOCAL OPERATION**

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### **5.1. Introduction**

This Chapter describes the operating modes that are not involved in programming and monitoring the power supply via its serial communication port (RS232/RS485) 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 Chapter 6.
- For information regarding usage of the Serial Communication Port, refer to Chapter 7.

### **5.2. 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 setting and the load resistance.

#### **5.2.1. Constant Voltage Mode**

In constant voltage mode, the power supply regulates the Output Voltage at the selected value, while the load current varies as required by the load.

While the power supply operates in constant voltage mode, the VOLTAGE LED on the front panel illuminates.

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".

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 Output Current 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 Sections 5.3 and 5.4 for more details.*

### 5.2.2. Constant Current Mode

- In constant current mode, the power supply regulates the Output Current at the selected value, while the voltage varies with the load requirement.
- While the power supply is operating in constant current mode, the CURRENT LED on the front panel illuminates.
- Adjustment of the Output Current setting 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 Output 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 Output Current 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 Output Current.
- 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.

### 5.2.3. 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.

## 5.3. 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 provides the protection level at the load. Upon detection of an Over Voltage condition, the power supply output will shut down.

### 5.3.1. 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 its previous state.

The minimum setting level is approximately 105% of the set Output Voltage, or the value in Table 7-6, whichever is higher. The maximum setting level is shown in Table 5-1.

Model	Max. OVP	Model	Max. OVP
6V	7.5V	60V	66.0V
8V	10.0V	80V	88.0V
12.5V	15.0V	100V	110.0V
20V	24.0V	150V	165.0V
30V	36.0V	300V	330.0V
40V	44.0V	600V	660.0V
50V	57.0V		

Table 5-1: Maximum OVP setting levels

To preview the OVP setting, press the OVP/UVL pushbutton 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 its previous state.

### 5.3.2. 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.

### 5.3.3. 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 are connected properly.
3. There are four methods to reset the OVP circuit.
  - a) Press the OUT button.
  - b) 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.
  - c) Turn the power supply output Off and then On using the SO control (refer to Section 5.7). In this method the power supply should be set to Auto-Restart mode.
  - d) Send an OUT 1 command via the RS232/485 communication port.

## 5.4. 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 a protection window for sensitive load circuitry.

### 5.4.1. 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 its 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.

## 5.5. 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 overcurrent condition.

### **5.5.1. 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 displays "Fb" on the VOLTAGE meter.

### **5.5.2. Resetting Activated Foldback Protection**

There are four methods to reset an activated Foldback protection.

Press the OUT button. 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.

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.

Turn the power supply output Off and then On using the SO control (refer to Section 5.7). In this method the Foldback protection remains armed, therefore if the load current is higher than the output current setting, the Foldback protection will be activated.

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 output current setting, the Foldback protection will be activated again.

## **5.6. 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".

## **5.7. Output Shut-Off (SO) Control via Rear Panel J1 Connector**

Contacts 2, 3 and 15 of J1 (Fig.4-2, Item 5) serve as Output Shut-Off (SO) terminals. The SO terminals accept a 2.5V to 15V signal or 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 the unit. (Thus, in Auto-Restart mode, the output will be Enabled after applying

AC power; even if SO is at an Off level). After an On to Off transition it 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 5.16). The SO control can also be used to reset the OVP and Fold Protection (refer to Section 5.3 and 5.5 for details).

When the unit is shut-off by a 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). Contacts 2, 3 and 15 are optically isolated from the power supply output.

The SO control logic can be selected by the rear panel SW1 Setup switch. Refer to Table 5-2 for SW1 setting and SO Control Logic.

SW1-5 setting	SO signal level J1-2(3), 15	Power supply output	Display
Down (default)	2-15V or Open	On	Voltage/Current
	0-0.6V or Short	Off	"SO"
Up	2-15V or Open	Off	"SO"
	0-0.6V or Short	On	Voltage/Current

Table 5-2: SO logic selection

### 5.8. Enable/Disable Control via Rear Panel J1 Connector

Contacts 1 and 14 of J1 (Fig.4-2, 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 5-3 for 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
	Open	Off	"ENA"	Blinking
	Short	On	Voltage/Current	Off

Table 5-3: Enable/Disable function and SW1 setting

#### 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 an 'OUT 1' serial command. Auto Restart mode-The output will return back ON automatically when the Enable/Disable fault conditions clears.*

### 5.9. CV/CC Signal

CV/CC signal indicates the operating mode of the power supply, Constant Voltage or Constant Current. The CV/CC signal is an open collector output with a 30V parallel zener, at J1-13, 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 open. When the power supply operates in Constant Current mode, the CV/CC signal output is low (0-0.6), with maximum 10mA sink current.

### **CAUTION**

Do not connect the CV/CC signal to a voltage source higher than 30VDC.  
Always connect the CV/CC signal to voltage source with a series resistor to  
limit the sink current to less than 10mA.

#### **5.10. PS\_OK Signal**

The PS\_OK signal indicates the fault condition of the power supply. PS\_OK is a TTL signal output at J1-16, referenced to IF\_COM at J1-2, 3 (Isolated Interface Common). When a fault condition occurs, the PS\_OK level is low, with a maximum sink current of 1mA; when no fault condition occurs, the PS\_OK level is high with a maximum source current of 2mA. The following faults will set the PS\_OK to a Fault state:

*OTP	*Enable/Disable open (Power supply is disabled)
*OVP	*SO (Rear panel Shut-Off, Power Supply is shut off)
*Foldback	*IEEE failure (With optional IEEE interface)
*AC fail	*Output Off

#### **5.11. 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 with the output Enabled (Auto-restart mode) or start with the output Disabled (Safe-start 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 "AUT" ("7" represents "T") every 3 seconds. Releasing the OUT pushbutton while one of the modes is displayed, selects that mode. The default setting at shipment is Safe-start mode.

##### **5.11.1. Auto-Restart Mode**

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.

##### **5.11.2. Safe-Start Mode**

In this mode, the power supply restores its last operation setting and sets the Output to an 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 values, momentarily press the OUT button.

#### **5.12. 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" ("7" represents "T") and the ALARM LED blinks.

Resetting the OTP circuit can be automatic (non-latched) or manual (latched) depending on the Safe-start or Auto-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 continues to show "O7P" and the ALARM LED continues to blink. To reset the OTP circuit, press the OUT button (or send an OUT ON command via the serial port).

2. **Auto-restart mode:** In Auto-restart mode, the power supply recovers to its last setting automatically when the over temperature condition is removed.

### 5.13. Last Setting Memory

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

#### STORED PARAMETERS:

1. OUT On or Off
2. Output Voltage setting (PV setting)
3. Output Current setting (PC setting)
4. OVP level
5. UVL level
6. FOLD setting
7. Start-up mode (Safe-start 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)
12. (Items 8, 9, 10 are related to Remote Digital Control operation and are explained in Chapter 7)
13. Master/Slave setting

### 5.14. Series 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.

#### 5.14.1. Series Connection for Increased Output Voltage

In this mode, two units are connected so that their outputs are summed. Set the Current 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 unit shuts down. Each diode should be rated to at least the power supply rated Output Voltage and Output Current. Refer to Fig.5-1 and 5-2 for series operation with local and remote sensing.

#### WARNING



When power supplies are connected in series, and the load or one of the output terminals is grounded, no point may be at a greater potential of +/-60VDC from ground for models up to 60VDC Rated Output and +/-600VDC from ground for models >60VDC Rated Output. When using RS232/485, LAN or IEEE, refer to the OUTPUT TERMINALS GROUNDING warning in Section 3.9.11.

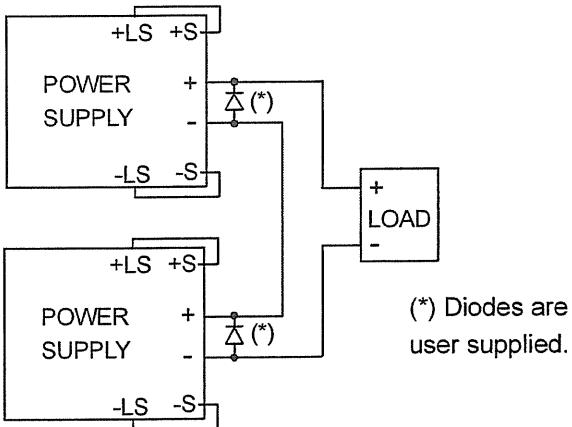


Fig.5-1: Series connection, local sensing

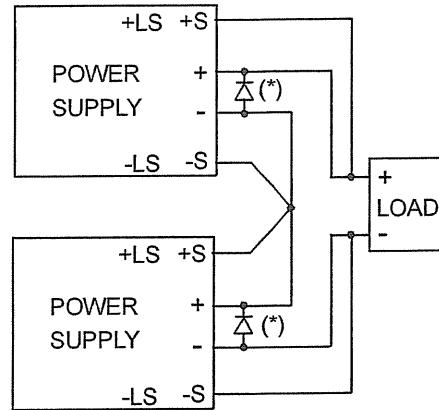


Fig.5-2: Series connection, remote sensing

#### 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 output 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 isolated interface 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 6.5 for details.

4. Programming via the Serial Communication port (RS232/RS485):

The communication port is referenced to the IF\_COM which is isolated from the power supply output potential. Therefore power supplies connected in series can be daisy-chained using the Remote-In and Remote-Out connectors. Refer to Chapter 7 for details.

### 5.14.2. Series Connection for Positive and Negative Output Voltage

In this mode, two units are configured as a positive and negative output. Set the Output 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 in case 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.5-3 for this operating mode.

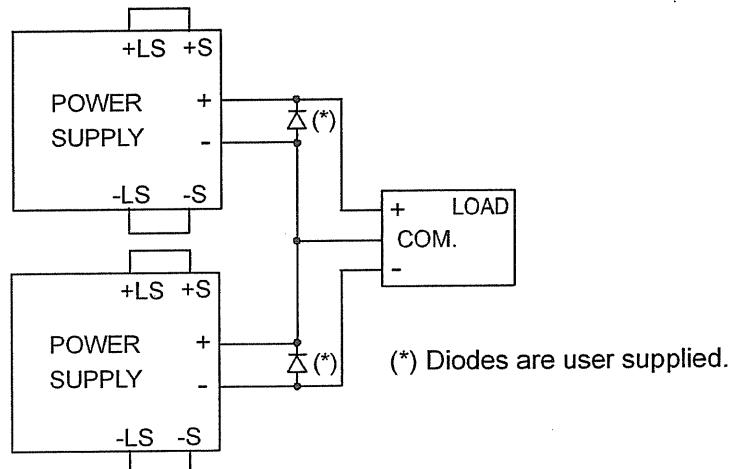


Fig.5-3: Series connection for positive/negative output voltages

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

1. Programming by external voltage:
2. Using the SO function and PS\_OK signal:
3. Programming by external resistor:
4. Programming via the Serial Communication port (RS232/RS485):

The analog programming circuits of this power supply are referenced to the negative output potential. Therefore, the circuits used to control each series connected unit must be separated and floated from each other.

The Shut-Off and PS\_OK circuits are referenced to the isolated interface 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.

Programming by external resistor is possible. Refer to section 6.5 for details.

The communication port is referenced to the IF\_COM which is isolated from the power supply output potential. Therefore power supplies connected in series can be chained using the Remote-In and Remote-Out connectors. Refer to Chapter 7 for details.

## 5.15. 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, while the Slave units may be connected to the computer for voltage, current and status readback only. Follow the following procedure to configure multiple supplies for parallel operation. Refer to Sec. 5.15.1 and to Sec. 5.15.2 for detailed explanation.

### 5.15.1. 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 basic parallel operation.

#### 5.15.1.1. Setting Up the Master Unit

Set the Master unit Output Voltage to the desired voltage. Program the Output Current to the desired load current 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.5-4 or fig.5-5.

#### 5.15.1.2. Setting up the Slave Units

- a) 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 Output Current setting of each unit should be programmed to the desired load current divided by the number of parallel units.
- b) Set the rear panel setup switch SW1 position 2 to the up position.
- c) Connect a wire jumper between J1-8 and J1-12 (refer to Table 4-4).
- d) 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 be designed so that each unit supplies up to 95% of its current rating because of the imbalance which may be caused by cabling and connection voltage drop.

#### 5.15.1.3. Daisy Chain Connection: (See Fig. 5-6)

These set up and connections are optional but are strongly recommended. It will shut down all power supplies when a fault condition occurs in any one of them.

- a) Switch SW1 position 5 should be in its down position for all power supplies.
- b) Connect J1-16 of the Master Supply to J1-15 of the 'First' Slave Supply (If any).
- c) Connect J1-16 of the 'First' Slave Supply to J1-15 of the 'Second' Slave Supply (if any).
- d) Connect J1-16 of the 'Second' Slave Supply to J1-15 of the 'Third' Slave Supply (If any).
- e) Connect J1-16 of the 'Last' Slave Supply to J1-15 of the master supply.
- f) Connect J1-2 (or J1-3) common to all supplies (See Fig. 5.6).

#### 5.15.1.4. Setting Over Voltage protection

The Master unit OVP setting should be programmed to the desired OVP level. The OVP setting 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 Slave unit would shut down, and the remaining Slave units would supply all of the load current.

#### 5.15.1.5. 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.

#### 5.15.1.6. Connection to the load

In parallel operation, power supplies can be connected in local or remote sensing. Refer to Fig. 5-4 and 5-5 for typical connections of parallel power supplies. The figures show the connection of two units, however the same connection method applies for up to 4 units.

### 5.15.2. 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 readback 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.

#### 5.15.2.1. Advanced Parallel Configuration

- a) SW1 position 2 - Down in the Master Supply and up in all Slave Supplies.
- b) Connect a short between J1-8 and J1-12 in all Slave Supplies.
- c) Connect J1-25 of the Master Supply to J1-10 of all Slave Supplies.

The following set-up connections are optional but are strongly recommended. These settings and connections will shut down all the parallel power supplies when a fault condition occurs in any one of them:

- d) Switch SW1 position 5 should be in its down position for all power supplies (See Section 5.6)
- e) Connect J1-16 of the Master Supply to J1-15 of the 'First' Slave Supply.
- f) Connect J1-16 of the 'First' Slave Supply to J1-15 of the 'Second' Slave Supply (if any)
- g) Connect J1-16 of the 'Second' Slave Supply to J1-15 of the 'Third' Slave Supply (if any)
- h) Connect J1-16 of the 'Last' Slave Supply to J1-15 of the Master Supply
- i) Connect J1-2 (or J1-3) common to all supplies
- j) Select Local or Remote sense - Ref. Figures 5-4 and 5-5

#### 5.15.2.2. 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 5-4 for the CURRENT display and modes 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

Table 5-4: Setting mode of operation

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

#### 5.15.2.3. 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. 7.2.7 for details).
- b) The Slave units parameters will automatically set the following:
  - Output voltage to approximate. 102% of rated output voltage.
  - Programmed Current to zero.
  - UVL to zero volts
  - OVP to its maximum value
  - AST On
  - OUT On
  - 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.

#### 5.15.2.4. CURRENT Display Accuracy

In the advanced parallel mode, the Master unit calculates the total current by multiplying the Master output current by the number of Slave units. 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.

#### 5.15.2.5. 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.

- e) After exiting from Slave operation the unit's parameters will be set to:
- Programmed Voltage to zero
  - Programmed Current to zero
  - UVL to zero volts
  - OVP to its maximum value
  - AST OFF
  - OUT OFF
  - Foldback protection OFF
  - Locked Front Panel
- f) To unlock the front panel, depress PREView button until the display shows "UFP"

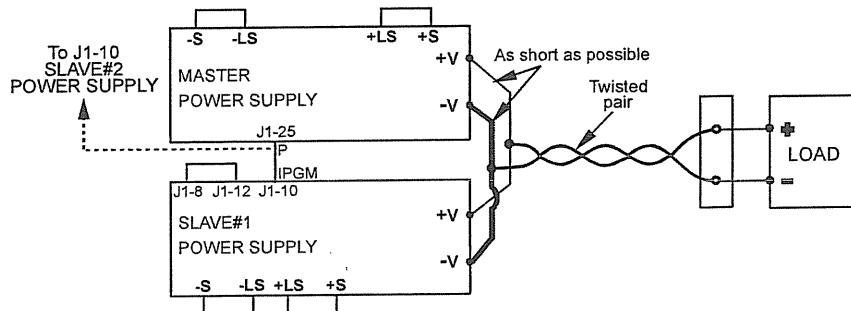


Fig.5-4: Parallel connection with local sensing

**CAUTION**

Make sure that the connection between –V 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.*

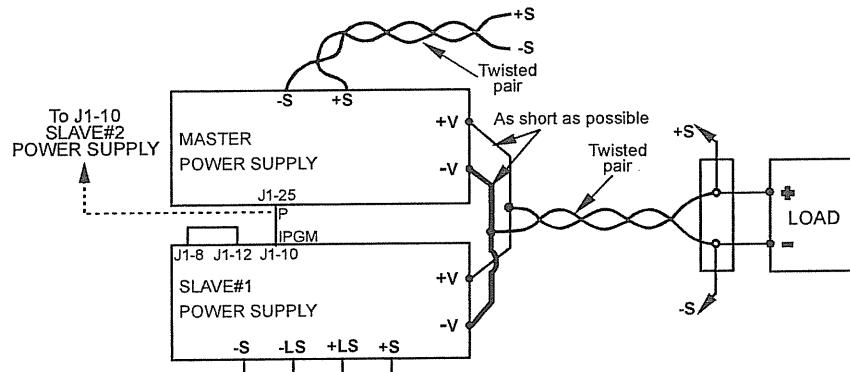


Fig.5-5: Parallel operation with Remote sensing

## 5.16. 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 or Auto-restart mode.

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 a 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.5-6 shows connection of three units, however the same connection method applies to systems with a larger number of units.

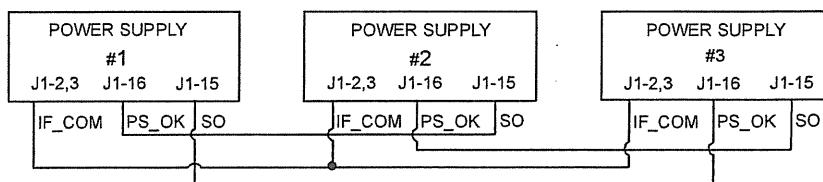


Fig.5-6: Daisy-chain connection

## 5.17. Front Panel Locking

The front panel controls can be locked to protect from accidental power supply parameter change. Press and hold the 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.

### 5.17.1. Unlocked Front Panel

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

### **5.17.2. 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 the PREV button to preview the Output Voltage and Current setting or to unlock the front panel.

## 6. REMOTE ANALOG PROGRAMMING

### 6.1. Introduction

The rear panel connector J1 allows the user to program the power supply Output Voltage and Current 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 0-10V using the setup switch SW1. When the power supply is in Remote Analog programming mode, the serial communication port is active and can be used to query the power supply settings.

**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.

### 6.2. Local/Remote Analog Indication

Contact 8 of J1 (Fig.4-2, Item 5) accepts TTL signal or Open-Short contact (referenced to J1-12) to select between Local or Remote Analog programming of the Output Voltage and Current.

In Local mode, the Output Voltage and Output Current 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 can be programmed by analog voltage or by programming resistors via J1 contacts 9 and 10 (refer to Sections 6.4 and 6.5). Refer to Table 6-1 for Local/Remote Analog control (J1-8) function and Setup switch SW1-1, 2 settings.

SW1-1, 2 setting	J1-8 function	Output Voltage/Current setting
Down (default)	No effect	Local
Up	"0" or Short "1" or Open	Remote Local

Table 6-1: Local/Remote Analog control function

### 6.3. Local/Remote Analog Indication

Contact 21 of J1 (Fig. 4-2, Item 5) is an open collector output that indicates if the power supply is in Local mode or in Remote Analog mode. To use this output, connect a pull-up resistor to a voltage source of 30Vdc maximum. Choose the pull-up resistor so that the sink current will be less than 5mA when the output is in a low state. Refer to table 6-2 for J1-21 function.

J1-8	SW1-1	SW1-2	J1-21 signal	Mode
TTL "0" or short	Down	Down	Open	Local (FP)
	Down	Up	0~0.6V	Remote Analog
	Up	Down	0~0.6V	Remote Analog
	Up	Up	0~0.6V	Remote Analog
TTL "1" or open	Down or Up	Down or Up	Open	Local (FP)

Table 6-2: Local/Remote Analog indication

## 6.4. Remote Voltage Programming of Output Voltage and Output Current

### CAUTION

To maintain the power supply isolation and to prevent ground loops, use an isolated programming source when operating the power supply via remote analog programming at the J1 connector.

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, positions 1 and 2 to their UP position.
3. Set SW1, position 3 to select the programming voltage range according to Table 6-3.
4. Ensure that SW1, positions 7 and 8 are at their DOWN (default) position.
5. Connect a wire jumper between J1-8 and J1-12 (refer to Table 4-4).
6. Connect the programming source to the mating plug of J1 as shown in Fig.6-1. 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:

SW1, positions, 4, 5, 6 and 9 are not required for remote programming. Their settings can be determined according the application.

The control circuits allow the user to set the Output Voltage and Output Current 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 6-3: SW1-3 setting and programming range

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

J1 connector, rear panel view

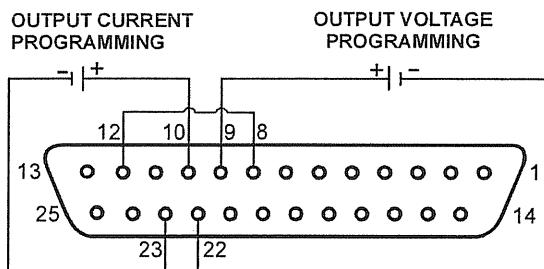


Fig.6-1: Remote voltage programming connection

## 6.5. Resistive Programming of Output Voltage and Current Limit

For resistive programming, internal current sources, for Output Voltage and/or Output Current control, supply 1mA current 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 Output Current 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, positions 1 and 2 to their UP position.
3. Set SW1, position 3 to select the programming resistor range according to Table 6-4.
4. Set SW1, positions 7 and 8 to their UP position, to enable resistive programming mode.
5. Connect a wire jumper between J1-8 and J1-12 (refer to Table 4-4).
6. Connect the programming resistors to the mating plug of J1 as shown in Fig.6-2.
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 settings can be determined according to the application requirements.
2. The control circuits allow the user to set the Output Voltage and Output Current 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 6-4: SW1-3 setting and programming range

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

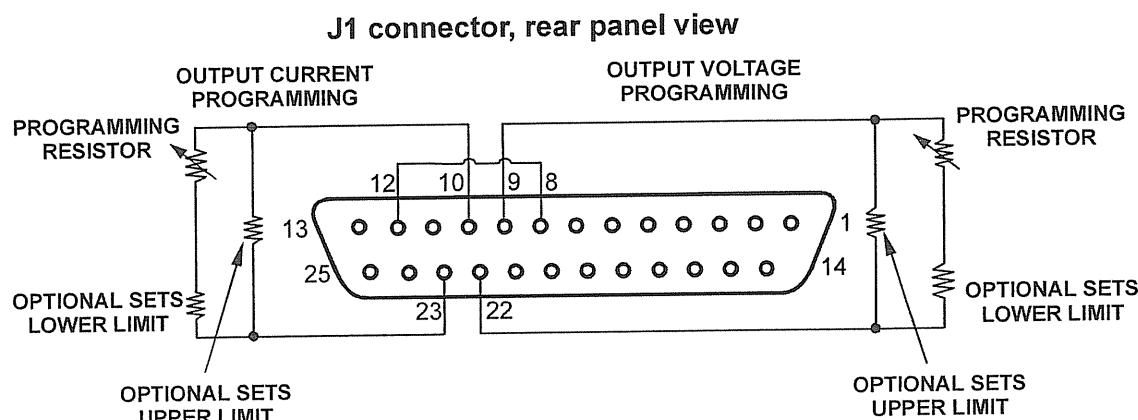


Fig.6-2: Remote resistive programming

## 6.6. 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. The monitor outputs have 500 ohm series output resistance. Ensure that the sensing circuit has an input resistance of greater than 500 Kohm or accuracy will be reduced.

Refer to Table 6-5 for the required J1 connection, SW1-4 setting and monitoring voltage range.

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			

**Table 6-5 Monitoring signals setting**

### NOTES:

1. Radiated emissions, RCC requirements: FCC requirements for radiated emissions; use a shielded cable for the analog control signals. If 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 the PREV button to display the Output Voltage and Current setting, as defined by the encoders or digital communication.
4. Communication: In Remote analog mode, all power supply parameters can be programmed and readback via the communication port, except the Output Voltage and Current setting.

## **7. RS232 & RS485 REMOTE CONTROL**

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### **7.1. Introduction**

This Chapter describes the operation of the GenesysTM 3300W 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.

### **7.2. Configuration**

#### **7.2.1. Default Setting**

The power supply is shipped with the following settings:

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

#### **7.2.2. Address Setting**

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

If the unit is in Remote mode (front panel REM/LOC LED illuminated), press the REM/LOC button to put the unit into Local mode.

Press and hold for the REM/LOC button for approximately 3 sec. The VOLTAGE display will indicate the unit address.

Using the VOLTAGE adjust encoder, select the unit address.

To preview the power supply address at any time, press and hold the REM/LOC button for approx. 3 sec. The VOLTAGE display will indicate the power supply address.

#### **7.2.3. 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

#### **7.2.4. Baud Rate Setting**

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

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

### **7.2.5. Setting the Unit into Remote or Local Mode**

- a) 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 7-4, 7-5 and 7-6)

- b) There are two Remote modes:

1. 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.

### **7.2.6. 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.

Serial commands may be sent to set the status registers and read them while the unit is in Local mode. If the Enable registers are set (refer to Section 7.11) the power supply will transmit SRQ's while in Local.

### **7.2.7. Front panel in Remote Mode**

Front panel control in Remote mode is Disabled except for:

- a) PREV: use to preview the Voltage and Current setting.
- b) OVP/UVL: use to preview the OVP/UVL setting.
- c) LOC/REM: use to set the unit into Local mode.

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

## **7.3. 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. 7-1 for IN/OUT connectors.

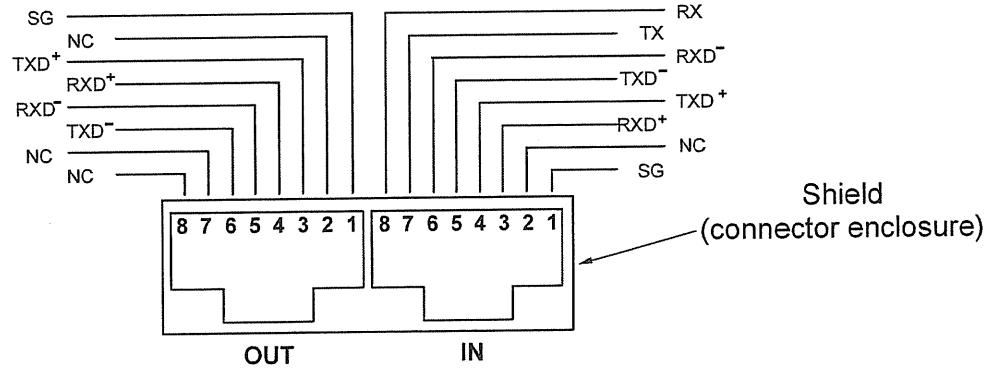


Fig.7-1: Rear panel J3 IN/OUT connectors pinout

**NOTE**

*Tx and Rx are used for RS232 communication. Txd +/- and Rxd +/- are used for RS485 communication. Refer to RS-232 and RS-485 cabling and connection details*

## 7.4. Connecting Power Supplies to Rs232 or Rs485 Bus

### 7.4.1. Single Power Supply

- Select the desired interface RS232 or RS485 using rear panel setup switch SW1-6 (Section 0).
  - RS232: DOWN position
  - RS485: UP position
- Connect rear panel IN connector to the controller RS232 or RS485 port using a suitable shielded cable. Refer to Figures 7-2, 7-3 and 7-4 for available RS232 and RS485 cables.

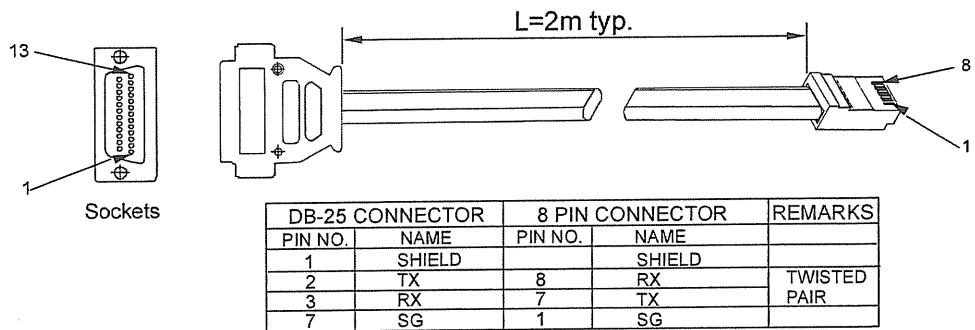


Fig.7-2: RS232 cable with DB25 connector (P/N: GEN/232-25)

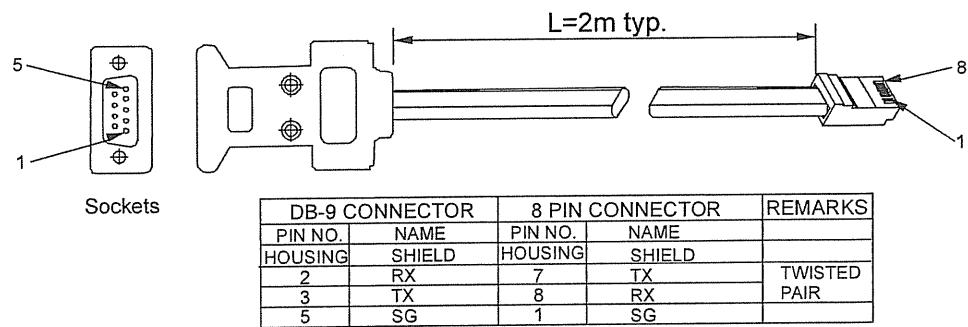


Fig.7-3: RS232 cable with DB9 connector (P/N: GEN/232-9)

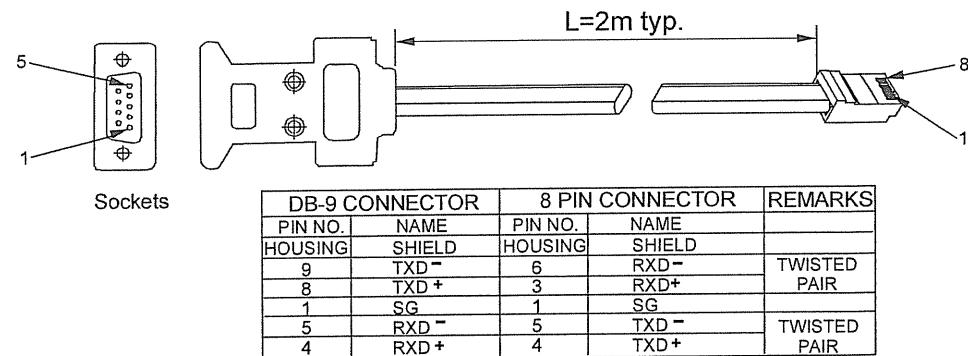


Fig.7-4: RS485 cable with DB9 connector (P/N: GEN/485-9)

#### 7.4.2. Multi Power Supply Connection to RS232 or RS485 Bus

Up to 31 units can be connected (daisy chained) to the RS232 or RS485 bus. The first unit connects to the controller via RS232 or RS485 and the other units are connected via the RS485 bus.

- First unit connection: Refer to Section 7.4.1 for connecting the first unit to the controller.
- Other units connection: The other units on the bus are connected via their RS485 interface.

Refer to Figure 7-5 for typical connection.

- Set rear panel setup switch SW1-6 to its UP position.
- Using the Linking cable supplied with each unit (refer to Fig. 7-6), connect each unit OUT connector to the next unit IN connector.

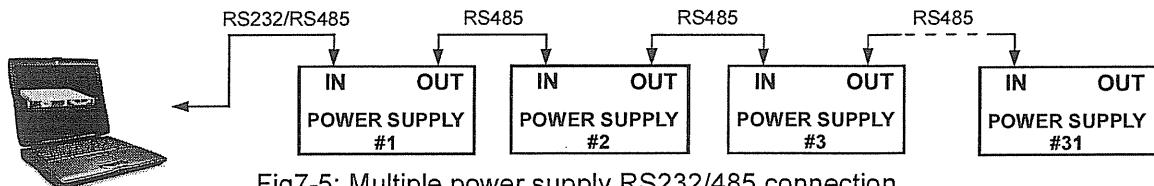


Fig 7-5: Multiple power supply RS232/485 connection

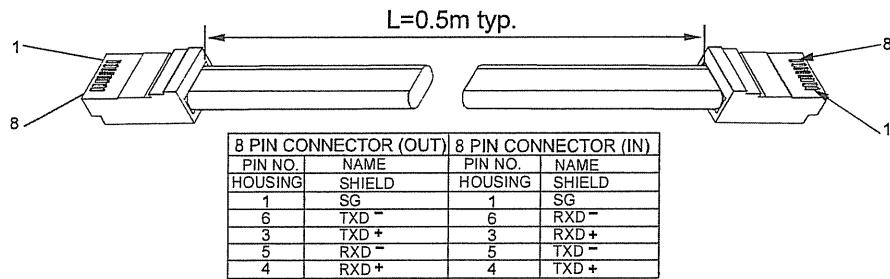


Fig.7-6: Serial link cable with RJ-45 shielded connectors (P/N: GEN/RJ-45)

#### 7.5. Communication Interface Protocol

##### **NOTE**

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

##### 7.5.1. Data Format

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

##### 7.5.2. Addressing

The Address is sent separately from the command. It is recommended to add 100msec delay between query or sent command to next unit addressing. Refer to Section 7.7.3 for details.

##### 7.5.3. End of Message

The end of message is the Carriage Return character (ASCII 13). The power supply ignores the Line Feed (ASCII 10) character.

#### **7.5.4. Command Repeat**

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

#### **7.5.5. Checksum**

The user may add a checksum (optional) to the end of the command. The checksum is “\$” followed by two hex characters. If a command or a query has a checksum, the response will also have one. There is no CR between the command string and the “\$” sign.

Example: STT?3A  
STAT?\$B

#### **7.5.6. Acknowledge**

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

#### **7.5.7. Error message**

If an error is detected in command or query, the power supply will respond with an error message. Refer to Section 7.6 for details.

#### **7.5.8. Backspace**

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

### **7.6. Error Messages**

The power supply will return error messages for illegal commands and illegal programming parameters. Refer to Table 7-1 for programming error messages and Table 7-2 for command error messages.

Table 7-1: Programming error messages

Error Code	Description
E01	Returned when program voltage (PV) is programmed above acceptable range. Example: PV 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 less than “5% of supply voltage rating’ plus ‘voltage setting’.
E06	Returned when UVL is programmed above the programmed output voltage.
E07	Returned when programming the Output to ON during a fault shut down.

Table 7-2: 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

## 7.7. Command Set Description

### 7.7.1. General Guide

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

### 7.7.2. Command Set Categories

- a) Initialization control
- b) ID control
- c) Output control
- d) Status control

### 7.7.3. 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	CLS	Clear status. Sets FEVE and SEVE registers to zero (refer to Section 7.11).
3	RST	Reset command. Brings the power supply to a safe and known state: Output voltage: zero, Remote: non-lockout remote, Output current: zero, Auto-start: Off, Output: Off, OVP: maximum, FOLD: Off, UVL: zero The conditional registers (FLT and STAT) are updated, the other registers are not changed.
4	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).
5	RMT?	Returns to 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.
6	MDAV?	Returns if Multi-drop option is installed. 1 indicates installed and 0 indicates not installed.
7	\	Repeat last command. If \<CR> is received, the power supply will repeat the last command.

### 7.7.4. ID Control Commands

#	Command	Description
1	IDN?	Returns the power supply model identification as an ASCII string:LAMBDA, GENX-Y
2	REV?	Returns the software version as an ASCII string.
3	SN?	Returns the unit serial number. Up to 12 characters.
4	DATE?	Returns date of last test. Date format: yyyy/mm/dd

### 7.7.5. Output Control Commands

#	Command	Description
1	PV n	Sets the output voltage value in Volts. The range of voltage value is described in Table 7-5. The maximum number of characters is 12. See the following examples for PV n format: PV 12, PV 012, PV 12.0, PV 012.00, etc...
2	PV?	Reads the output voltage setting. Returns the string "n" where "n" is the exact string sent in the PV n command. When in Local mode, returns the PREVIEW (front panel) settings in a 5 digit string.
3	MV?	Reads the actual output voltage. Returns a 5 digits string. Example: 60V supply sends 01.150, 15.012, 50.000, etc...
4	PC n	Set the Output Current value in Amperes. The range of current values is described in Table 7-6. The maximum number of characters is 12. Examples for PC n format: PC 10, PC 10.0, PC 010.00, etc...See Note 1
5	PC?	Reads the Output Current setting. Returns the string "n" where "n" is the exact string sent in the PC n command. When in Local mode, returns the PREVIEW (front panel) settings in a 5 digit string.
6	MC?	Reads the actual Output Current. Returns a 5 digit string. Example: 200A supply sends 000.50, 110.12, 200.00, etc...See Note 2
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	STT?	Reads the complete power supply status. Returns ASCII characters representing the following data, separated by commas: MV<actual (measured) voltage> PC<programmed (set) current> PV<programmed (set) voltage> SR<status register, 2-digit hex> MC<actual (measured) current> FR<fault register, 2-digit hex> Example response: MV(45.201),PV(45), MC(4.3257), PC(10), SR(30), FR(00)
9	FILTER nn	Set the low pass filter frequency of the A to D Converter for Voltage and Current Measurement where nn = 18, 23 or 46 Hz (default is 18)
10	FILTER?	Returns the A to D Converter filter frequency: 18,23 or 46 Hz.
11	OUT n	Turns the output to ON or OFF. Recover from Safe-Start, OVP or FLD fault. OUT 1 (or OUT ON)-Turn On. OUT 0 (or OUT OFF)-Turn Off
12	OUT?	Returns the output On/Off status string. ON - output On. OFF - output Off.
13	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.
14	FLD?	Returns the Foldback protection status string: "ON" - Foldback is armed. "OFF" - Foldback is cancelled.
15	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 eprom at AC power down and recovered at AC power up.
16	FBD ?	Supply returns the value of the added Fold Back Delay.
17	FBDRST	Reset the added Fold Back Delay to zero.
18	OVP n	Sets the OVP level. The OVP setting range is given in Table 7-7. The number of characters after OVP is up to 12. The minimum setting level is approximately 105% of the Output Voltage setting, or the value in Table 7-7, whichever is higher. The maximum OVP setting level is shown in Table 5-1. Attempting to program the OVP below this level will result in an execution error response ("E04"). The OVP setting stays unchanged.
19	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.
20	OVM	Sets OVP level to the maximum level. Refer to Table 7-7.
21	UVL n	Sets Under Voltage Limit. Value of "n" may be equal to PV setting, but returns "E06" if higher. Refer to Table 7-8 for UVL programming range.
22	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.

#	Command	Description
23	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.
24	AST?	Returns the string auto-restart mode status.
25	SAV	Saves present settings. The settings are the same as power-down last setting. These settings are erased when the supply power is switched Off and the new "last settings" are saved.
26	RCL	Recalls last settings. Settings are from the last power-down or from the last "SAV" command.

**NOTES:**

1. In Advanced parallel mode (refer to Sec. 5.15.2), "n" is the total system current.
2. In Advanced parallel mode, "MC?" returns the Master unit current multiplied by the number of slave units +1.

## 7.8. Global Output Commands

### 7.8.1. Description

Global commands are a way to quickly set all power supplies on the RS-232/485 bus to the same setting. For example, sending "GOUT OFF" is one way to turn a whole group of supplies OFF at nearly the same time.



**WARNING**

After sending a global command, it is important that the controller wait 200 mSec wait 200mSec before sending any more RS-232/485 messages.

If the command contains an error, such as incorrect syntax or range values, NO error response will be returned by any power supply.

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. The conditional register (FLT and STAT) are updated. Other registers are <i>not</i> changed. 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 7-5. 'n' may be up to 12 char plus dec. pt
3	GPC n	Program the output current value in amperes. The range of current values is shown in Table 7-6. 'n' may be up to 12 characters plus decimal pt
4	GOUT	Turns the output to ON or OFF: "OUT 1/ON" = turn on "OUT 0/OFF" = turn off, clears CV and CC bits in the Status Condition (STAT). 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 Error! Reference source not found. 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.

**NOTE:**

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

**GEN750W models**

Table 7-4: Current programming range

Model	Minimum (A)	Maximum (A)
GEN6-100	000.00	100.00
GEN8-90	00.00	90.00
GEN12.5-60	00.000	60.000
GEN20-38	00.000	38.000
GEN30-25	00.000	25.000
GEN40-19	00.000	19.000
GEN60-12.5	00.000	12.500
GEN80-9.5	0.000	9.500
GEN100-7.5	0.000	7.500
GEN150-5	0.000	5.000
GEN300-2.5	0.000	2.500
GEN600-1.3	0.000	1.300

**GEN1500W models**

Table 7-5: Current programming range=

Model	Minimum (A)	Maximum (A)
GEN6-200	000.00	200.00
GEN8-180	000.00	180.00
GEN12.5-120	000.00	120.00
GEN20-76	00.00	76.00
GEN30-50	00.000	50.000
GEN40-38	00.000	38.000
GEN60-25	00.000	25.000
GEN80-19	00.000	19.000
GEN100-15	00.000	15.000
GEN150-10	00.000	10.000
GEN300-5	0.000	5.000
GEN600-2.6	0.000	2.600

Table 7-6: OVP programming range

Model Rated Output Voltage (V)	Minimum (V)	Maximum (V)
6	0.5	7.50
8	0.5	10.0
12.5	1.0	15.0
20	1.0	24.0
30	2.0	36.0
40	2.0	44.0
60	5.0	66.0
80	5.0	88.0
100	5.0	110.0
150	5.0	165.0
300	5.0	330.0
600	5.0	660.0

Table 7-7: UVL programming range

Model Rated Output Voltage (V)	Minimum (V)	Maximum (V)
6	0	5.70
8	0	7.60
12.5	0	11.9
20	0	19.0
30	0	28.5
40	0	38.0
60	0	57.0
80	0	76.0
100	0	95.0
150	0	142
300	0	285
600	0	570

**7.9. Fast Queries**

These are commands that read a response very quickly from the power supply. They use unprintable character codes. They allow the power supply to avoid the normal command processing delays.

The processing time for these queries is typically 2 mSec, so total query speed is 2 mSec plus the RS-232/485 transmission time.

Since these queries embed the power supply address (0 to 30), there is no need to first send the "ADR n" addressing command.

### 7.9.1. Fast Test for Connection

This is an addressed query that is good for scanning to see what supplies are “on line”. If no response is returned within 10 mSec, your control program has determined that no power supply is connected at that address.

*Query Format:*

Send two bytes of unreadable characters. First:

Byte 1 = 1010 1010 = AA hex

Byte 2 = 000x xxxx (where xxxx is the address of the supply in binary)

*Query Response:*

The power supply returns 5 characters:

First a “1” = 31 hex if Multi-drop is enabled

or a “0” = 30 hex if Multi-drop is not enabled

Then four printable characters:

Dollar sign “\$”

Checksum (two ASCII hex characters) = “30” or “31”

Carriage-return terminator

### 7.9.2. Fast Read Registers

This query allows fast polling of the status and error registers for many power supplies on a RS-232/485 link. It is useful for checking many supplies to verify they are all operating as expected.

*Query Format:*

Send two bytes of unreadable characters. First:

100x xxxx (where xxxx is the address of the supply in binary)

And send it a second time:

100x xxxx send 2 characters sequentially

*Query Response:*

The power supply returns 16 characters including the contents of the status and fault registers (see section TBD and Figure TBD).

First twelve bytes contain binary data from six registers:

STAT? SENA? SEVE? FLT? FENA? FEVE?

Then four printable characters:

Dollar sign “\$”

Checksum (two ASCII hex characters)

Carriage-return terminator

### 7.9.3. Read Power-On Time

This query allows you to read how many minutes the power supply has been running since it was built. The accuracy, in minutes, is not guaranteed for time critical applications.

*Query Format:*

Send two bytes of unreadable characters. First:

Byte 1 = 1010 0110 = A6 hex

Byte 2 = 000x xxxx (where xxxx is the address of the supply in binary)

*Query Response:*

The power supply returns 12 characters:

First is the minutes as a 32 Bit integer as 8 ASCII Hex bytes

Then four printable characters:

Dollar sign "\$"

Checksum (two ASCII hex characters) = "30" or "31"

Carriage-return terminator

#### 7.9.4. Service Request Messages

A Genesys power supply can automatically send messages over the RS-232/485 lines when there is a change in operating mode or if a fault occurs. These messages are called Service Requests or SRQs. They are setup with the RS-232/485 status registers (see section 7.10 and 7.11).

Since the SRQ messages may be sent from any supply at any time, there is a chance they can collide with other messages from other supplies. Your controller software has to be developed enough to read messages that may come at any time, and to recover if messages are corrupted by collisions.

If you need Service Request messaging, please contact TDK-Lambda for assistance. We can provide several special communication commands and settings that will help with this.

#### 7.10. Status Control Commands

The following commands operate on the power supply status and error registers. They are used to read operating conditions and fault conditions, they can be set to latch changes in these conditions, and masks can be set up to send service requests messages if the conditions change.

Refer to Section 7.10 and figure 7-7 for more instructions.

#	Command	Description
1	FLT?	Reads Fault Conditional Register. Returns 2-digit hex.
2	FENA	Set Fault Enable Register using 2-digit hex.
3	FENA?	Reads Fault Enable Register. Returns 2-digit hex.
4	FEVE?	Reads Fault Event Register. Returns 2-digit hex. Clears bits of Fault Event Register.
5	STAT?	Reads Status Conditional Register. Returns 2-digit hex.
6	SENA	Sets Status Enable Register using 2-digit hex.
7	SENA?	Reads Status Enable Register. Returns 2-digit hex.
8	SEVE?	Reads Status Event register. Returns 2-digit hex. Clears bits of Status Event register.

## 7.11. Status, Error and SRQ Registers

### 7.11.1. General Description

This Section describes the structure and operation of the six status, error, and SRQ registers. The registers can be set or read via RS232/485 commands.

Refer to Fig. 7-7 for the Status and Error Registers Diagram.

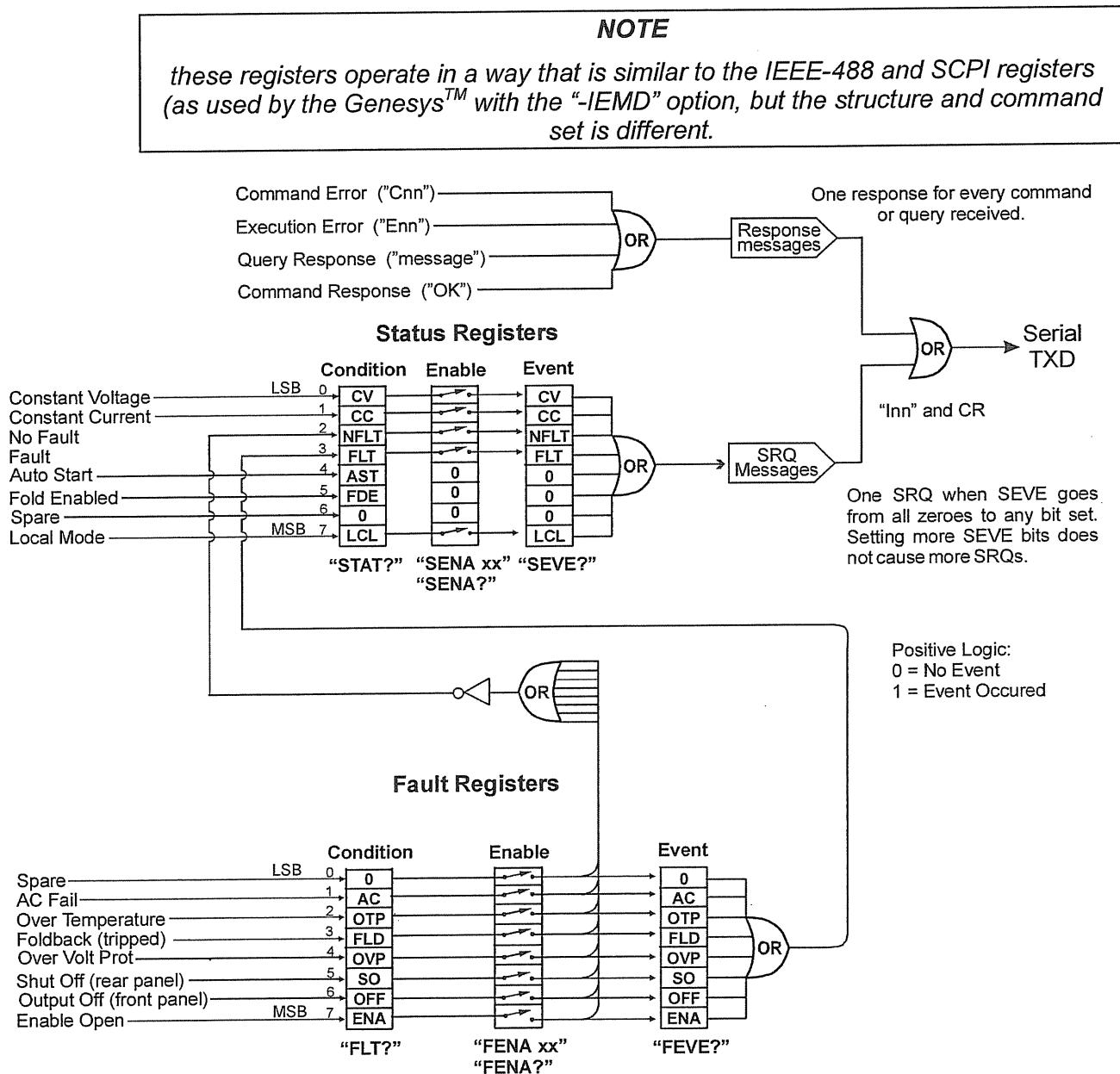


Fig.7-7: Status and Error Registers Diagram

### 7.11.2. Conditional Registers

The fault Condition Register and the Status Condition Register are read only registers that the user may read to see the condition of the Power supply. Refer to Table 7-8 for description of the Fault Condition Register bits and Table 7-9 for the Status Condition register bits.

### 7.11.3. Conditional Registers (continued)

Table 7-8: Fault Condition Register (FLT?)

<b>BIT</b>	<b>Fault name</b>	<b>Fault symbol</b>	<b>Bit Set condition</b>	<b>Bit Reset condition</b>
0 (LSB)	Spare bit	SPARE	Fixed to zero	Fixed to zero
1	AC Fail	AC	AC fail has occurred.	The AC input returns to normal.
2	Over temperature	OTP	OTP shutdown has occurred.	The power supply cools down.
3	Foldback	FOLD	Foldback shutdown has occurred	The supply output is turned On by front panel button or OUT 1 command.
4	Over voltage	OVP	OVP shutdown has occurred.	The supply output is turned ON by front panel button or OUT 1 command.
5	Shut Off	SO	Rear panel J1 "Shut Off" condition has occurred.	Rear panel J1 "Shut Off" condition has been removed.
6	Output Off	OFF	Front panel OUT button pressed to Off.	The supply output is turned On by front panel button or OUT 1 command.
7(MSB)	Enable	ENA	Rear panel J1 Enable terminal (J1-1&J1-14) opened.	Rear panel J1 Enable terminals closed.

Table 7-9: Status Condition Register (STAT?)

<b>BIT</b>	<b>Fault name</b>	<b>Fault symbol</b>	<b>Bit Set condition</b>	<b>Bit Reset condition</b>
0 (LSB)	Constant Voltage	CV	Output is On and the supply in CV.	Output is ON and the supply is not in CV.
1	Constant Current	CC	Output is ON and the supply in CC.	Output is ON and the supply is not in CC.
2	No Fault	NFLT	The power supply is operating normally or fault reporting is not enabled.	One or more faults are active and fault reporting is enabled (using "FENAxx").
3	Fault active	FLT	One or more faults are enabled and occur.	Fault Event Register cleared (FEVE?).
4	Auto-Restart Enabled	AST	Supply is in Auto-Restart mode (from Front Panel or serial command).	Supply is in Safe-Start mode (from Front Panel or serial command).
5	Fold Enabled	FDE	Fold protection is enabled (from Front Panel or serial command).	Fold protection disabled (from Front Panel or serial command).
6	Spare bit	SPARE	Fixed to zero.	Fixed to zero.
7(MSB)	Local Mode	LCL	Supply in Local mode.	Supply in Remote mode or Local-Lockout mode.

#### 7.11.4. Service Request: Enable and Event Registers

The conditional Registers are continuously monitored. When a change is detected in a register bit which is enabled, the power supply will generate an SRQ message.

The SRQ message is: “Inn” terminated by CR, where the nn is the power supply address. The SRQ will be generated either in Local or Remote mode.

Refer to Tables 7-10 to 7-13 for details of the Enable and Event registers.

##### 1. Fault Enable Register (FENA nn, FENA?)

The Fault Enable Register is set to the enable faults SRQs.

Table 7-10: Fault Enable Register

BIT	Enable bit name	Fault symbol	Bit Set condition	Bit reset condition
0 (LSB)	Spare bit	SPARE	User command: “FENA nn” where nn is hexadecimal	User command: “FENA nn” where nn is hexadecimal (if nn=“00”, no fault SRQs will be generated).
1	AC Fail	AC		
2	Over Temperature	OTP		
3	Foldback	FOLD		
4	Over Voltage	OVP		
5	Shut Off	SO		
6	Output Off	OFF		
7(MSB)	Enable	ENA		

##### 2. Fault Event Register (FEVE?)

The Fault Event will set a bit if a condition occurs and it is Enabled. The register is cleared when FEVE?, CLS or RST commands are received.

Table 7-11: Fault Event Register

BIT	Enable bit name	Fault symbol	Bit Set condition	Bit reset condition
0 (LSB)	Spare bit	SPARE	Fault condition occurs and it is enabled. The fault can set a bit, but when the fault clears the bit remains set.	Entire Event Register is cleared when user sends “FEVE?” command to read the register. “CLS” and power-up also clear the Fault Event Register. (The Fault Event Register is not cleared by RST)
1	AC Fail	AC		
2	Over Temperature	OTP		
3	Foldback	FOLD		
4	Over Voltage	OVP		
5	Shut Off	SO		
6	Output Off	OFF		
7(MSB)	Enable	ENA		

### 3. Status Enable Register (SENA nn, SENA?)

The Status Enable Register is set by the user to Enable SRQs for changes in power supply status.

Table 7-12: Status Enable Register

BIT	Status name	Status symbol	Bit Set condition	Bit reset condition
0 (LSB)	Constant Voltage	CV	User command: “SENA nn” is received, where nn is hexadecimal bits.  If “nn”=00, no SRQ is sent when there is a change in Status Condition Register.	User command: “SENA nn” is received, where nn is hexadecimal bits.  If “nn”=00, no SRQ is sent when there is a change in Status Condition Register.
1	Constant Current	CC		
2	No Fault	NFLT		
3	Fault active	FLT		
4	Auto-Restart enabled	AST	Always zero	Always zero
5	Fold enabled	FDE	Always zero	Always zero
6	Spare	Spare	Always zero	Always zero
7 (MSB)	Local Mode	LCL	“SENA nn” command	“SENA nn” command

### 4. Status Event Register (SEVE?)

The Status Event Register will set a bit if a change in the power supply status occurs and it is enabled. The register is cleared when the “SEVE?” or “CLS” commands are received. A change in this register will generate SRQ.

Table 7-13: Status Event Register

BIT	Status name	Status symbol	Bit Set condition	Bit reset condition
0 (LSB)	Constant Voltage	CV	Changes in status occur and it is Enabled.  The change can set a bit, but when the change clears the bit remains set.	Entire Event Register is cleared when user sends “SEVE?” command to read the register. “CLS” and power-up also clear the Status Event Register.
1	Constant Current	CC		
2	No Fault	NFLT		
3	Fault active	FLT		
4	Auto-Restart enabled	0	Always zero	
5	Fold enabled	0	Always zero	
6	Spare	0	Always zero	
7 (MSB)	Local Mode	LCL	Unit is set to Local by pressing front panel REM/LOC button.	

## 7.12. 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, software installed, Genesys™ 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 Com 1 or Com 2
    - 2.4 Configure port properties:

Bits per second.....	9600
Data bits.....	8
Parity.....	None
Stop bits.....	1
Flow control.....	None
File.....	Properties
    - 2.5 Open Properties in the program
    - 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 (default).
    - 3.3 Set via the rear panel: RS232/485 to RS232 (refer to Section 0).
  4. **Communication Test:**
    - 4.1 Select a power supply at address 6:

PC:write: ADR 6
Power supply response: "OK"
    - 4.2 Command test:

PC write: OUT 1
Power supply response: "OK"
PC write: PV 5.0
Power supply response: "OK"
PC write: PC 1.0
Power supply response: "OK"
- The power supply should turn on and the display will indicate the actual Output Voltage and the actual Output Current.

## **8. ISOLATED ANALOG PROGRAMMING OPTION**

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### **8.1. Introduction**

Isolated Analog Programming is an internal Option Card for analog programming of the Genesys™ power supply series. The option is factory installed and cannot be obtained with a GPIB (IEEE-488) Interface. Output Voltage and Output Current can be programmed and readback through optically isolated signals which are isolated from all other ground references in the power supply.

There are two types of Isolated Analog programming cards:

- a) 0-5V/0-10V option (PN: IS510): Using 0-5V or 0-10V signals for programming and readback.
- b) 4-20mA option (PN: IS420): Using current signals for programming and readback.

### **8.2. Specifications**

#### **8.2.1. 0-5V/0-10V OPTION (PN: IS510)**

Programming Inputs	Output Voltage programming accuracy	%	+/-1
	Output Current programming accuracy	%	+/-1
	Output Voltage programming temperature coefficient	PPM/°C	+/-100
	Output Current programming temperature coefficient	PPM/°C	+/-100
	Input impedance	Ohm	1M
	Absolute maximum voltage	Vdc	0-15
	Max. voltage between program inputs and supply outputs	Vdc	600
Monitoring Outputs	Output Voltage monitoring accuracy	%	+/-1.5
	Output Current monitoring accuracy	%	+/-1.5
	Output Impedance (see Note)	Ohm	100
	Max. voltage between monitoring outputs and supply outputs	Vdc	600

**NOTE:**

*Use 100Kohm minimum input impedance for the monitoring circuits to minimize the readback error.*

### 8.2.2. 4-20mA option (PN: IS420)

Programming Inputs	Output Voltage programming accuracy	%	+/-1
	Output Current programming accuracy	%	+/-1
	Output Voltage programming temperature coefficient	PPM/°C	+/-200
	Output Current programming temperature coefficient	PPM/°C	+/-200
	Input impedance	Ohm	50
	Absolute maximum input current	Vdc	0-30
	Max. voltage between program inputs and supply outputs	Vdc	600
Monitoring Outputs	Output Voltage monitoring accuracy	%	+/-1.5
	Output Current monitoring accuracy	%	+/-1.5
	Maximum load impedance	Ohm	500
	Max. voltage between monitoring outputs and supply outputs	Vdc	600

### 8.3. Isolated Programming & Monitoring Connector

Refer to Table 8-1 for detailed description of the rear panel Isolated Programming & Monitoring connector. To provide the lowest noise performance, it is recommended to use shielded-twisted pair wiring.

Refer to Fig.8-1 for description of the Isolated Analog Programming & Monitoring connector.  
Isolated programming plug P/N: MC1.5/8-ST-3.81, Phoenix.

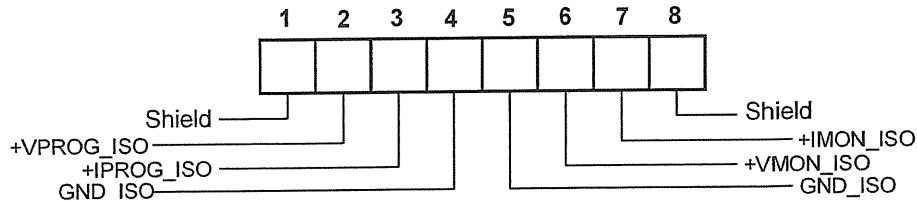


Fig.8-1: Isolated Programming & Monitoring connector

Table 8-1: Detailed description of Isolated programming & Monitoring connector

Terminal	Signal name	Function	Range 0-5V/0-10V IS510 option	Range 4-20mA IS420 option
1	SHLD	Shield, connected internally to chassis of the power supply.		Chassis ground
2	+VPROG_ISO	Output Voltage programming input	0-5V/0-10V	4-20mA
3	+IPROG_ISO	Output Current programming input	0-5V/0-10V	4-20mA
4	GND	Ground for programming signals.	Ground	Ground
5	GND	Ground for programming signals.	Ground	Ground
6	+VMON_ISO	Output voltage monitoring output	0-5V/0-10V	4-20mA
7	+IMON_ISO	Output current monitoring output	0-5V/0-10V	4-20mA
8	SHLD	Shield, connected internally to chassis of the supply.		Chassis ground

**CAUTION**

When the Isolated Analog Option is installed, do not apply any signals to the non-isolated VPGM and IPGM (J1-9 and J1-10) pins. All other J1 features may be used normally. Refer to Section 4.5 for a description of J1 features.

#### 8.4. Setup and Operating Instructions

**CAUTION**

To prevent damage to the unit, do not program the output voltage and current to higher than the power supply rating.

##### 8.4.1. Setting up the Power Supply for 0-5V/0-10V Isolated Programming and Monitoring

Perform the following procedure to configure the power supply:

1. Turn the power supply AC power switch to Off.
2. Connect a wire jumper between J1-8 and J1-12 (refer to Table 4-4).
3. Set the Setup switch SW1, positions 1 and 2 to the UP position.
4. Set SW1, position 3 to select the Programming Voltage Range: Down=0-5V, Up=0-10V.
5. Set SW1, position 4 to select the Monitoring Range: Down=0-5V, Up=0-10V.
6. Ensure that SW1, positions 7 and 8 are in the Down position.
7. Connect the programming sources to the mating plug of the Isolated Programming connector. Observe for correct polarity of the voltage source.

**NOTE**

*J1-8 and J1-12 must be shorted together with a wire jumper.*

8. Set the programming sources to the desired levels and turn the power supply ON.

#### **8.4.2. Setting up the power supply for 4-20mA Isolated Programming and Monitoring**

Perform the following procedure to configure the power supply:

1. Turn the power supply AC power switch to Off.
2. Connect a wire jumper between J1-8 and J1-12 (refer to Table 4-4).
3. Set the Setup switch SW1, positions 1 and 2 to the Up position.
4. Set SW1, position 3 to the Up position.
5. Set SW1, position 4 to the Up position.
6. Ensure that SW1 positions 1 and 2 to their Up position.
7. Connect the programming source to the mating plug of the Isolated Programming connector. Observe for correct polarity of the voltage source.

**NOTE**

*J1-8 and J1-12 must be shorted together with a wire jumper.*

9. Set the programming sources to the desired levels and turn the power supply ON.

**NOTE**

*SW1 position 3 and 4 must be in the Up position for operation with 4-20mA Isolated Programming and Monitoring.*

## **9. MAINTENANCE**

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### **9.1. Introduction**

This Chapter provides information about maintenance, calibration and troubleshooting.

### **9.2. Units Under Warranty**

Units requiring repair during the warranty period should be returned to a TDK-Lambda Americas Inc. authorized service facility. Refer to the addresses listing on the back cover of this User's Manual. Unauthorized repairs performed by other than the authorized service facilities may void the warranty.

### **9.3. 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 voltages. The front panel and the metal surfaces should be cleaned using a 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.

### **9.4. Adjustments and Calibration**

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

### **9.5. 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 TDK-Lambda Americas Inc. sales or service facility nearest you. Please refer to the TDK-Lambda Americas Inc. sales offices addresses listing on the back cover of this User's Manual.

### **9.6. Troubleshooting**

If the power supply appears to be operating improperly, use the Troubleshooting Guide (Table 9-1) 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 3.8 to determine if the problem is with the supply.

Table 9-1 provides the basic checks that can be performed to diagnose problems, with references to Sections of this User's Manual for further information.

Table 9-1: 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.	3.7
	Is the AC input voltage within range?	Check AC input voltage. Connect to appropriate voltage source.	3.6 3.7
Output is present momentarily but shuts Off quickly. The display indicates "AC".	Does the AC source voltage sag when load is applied?	Check AC input voltage. Connect to appropriate voltage source.	3.6
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.	3.9.6 3.9.8
Output Voltage will not adjust. Front panel CC LED is On.	Is the unit in constant current mode?	Check Output Current setting and load current.	5.2.1 5.2.2
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.	5.3 5.4
Output Current will not adjust. Front panel CV LED is on.	Is the unit in constant voltage mode?	Check Output Current and voltage setting	5.2
Large ripple present in output.	Is the power supply in remote sense?	Check load and sense wires connection for noise and impedance effects. Minimize the drop on the load wires.	3.9.4 3.9.8
	Is the voltage drop on the load wire high?		
No output. Display indicates "OUP"	Overvoltage 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.	5.3
No output. Front panel ALARM LED is blinking.	Display indicates "ENA"	Check rear panel J1 ENABLE connection.	5.8
		Setup switch SW1 setting.	4.4
	Display indicates "SO"	Check rear panel J1 Output Shut-Off connection.	5.7
	Display indicates "OTP"	Check if air intake or exhaust are blocked. Check if the unit is installed adjacent to heat generating equipment.	
Poor Load regulation. Front panel CV LED is on.	Are sensing wires connected properly?	Check Foldback setting and load current.	5.5
		Connect the sense wires according to User's Manual instructions.	3.9.8
The front panel controls are non-functional.	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.	7.2.5

## 9.7. Fuse Rating

There are no user replaceable fuses in the power supply. Internal fuses are sized for fault protection and if a fuse was opened, it would indicate that service is required. Fuse replacement should be made by qualified technical personnel. Refer to Table 9-2 for a listing of the fuses.

Table 9-2: Internal fuses

Fuse designation	1500W model	750W model
F301	30A 250VAC, TIME DELAY	20A 250VAC, FAST
F302, F304	2A 400VDC, NORMAL	2A 400VDC, NORMAL
F31, F32	20A 250VAC, FAST	NOT USED