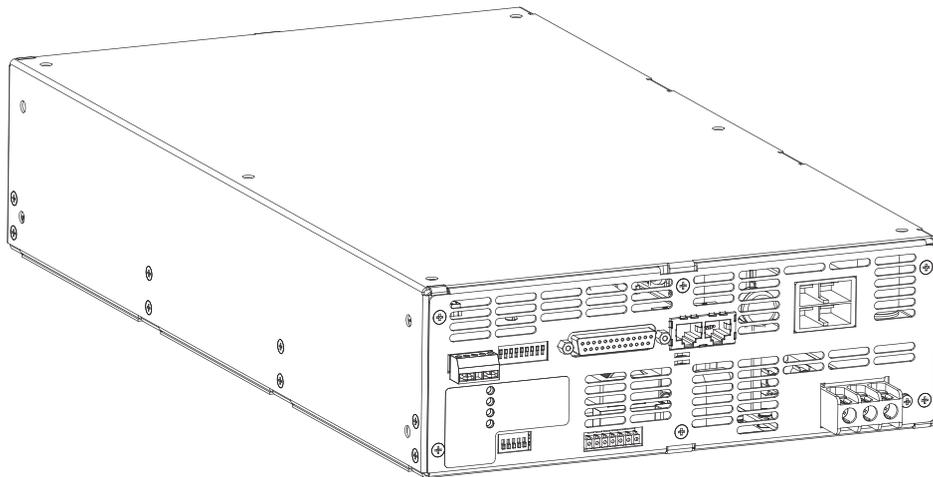


# EVA2400 Series

## Power Supplies INSTRUCTION MANUAL



**This Manual Covers Models:**

**EVA150-16**

**EVA300-8**

**EVA600-4**

## DECLARATION OF CONFORMITY EVA series

We, TDK-Lambda Ltd., located at Haharoshet St. 56 Industrial Zone P.O.B. 500 Karmiel, Israel declare under our sole responsibility that the EVA series as detailed on the products covered sheet comply with the provisions of the following European Directive and are eligible to bear the CE mark:

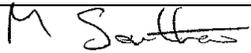
**Restriction Of the use of certain Hazardous Substances Directive**      **2011/65/EU (RoHS2)**

**Low Voltage Directive**      **2006/95/EC**

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

Electrical Safety      EN 60950-1:2006+A11+A1+A12

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 ISO9000:2008 which ensure continued compliance of the products with the requirements of the Low Voltage Directive.

Name of Authorized Signatory	Martin Southam
Signature of Authorized Signatory	
Position of Authorized Signatory	Marketing Director EMEA
Date	19th December 2012
Date Series first CE marked	19th December 2012
Place where signed	Ilfracombe, Devon, England

### PRODUCTS COVERED SHEET FOR:

- EVA150-16
- EVA300-8
- EVA600-4



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**BEFORE USING THE POWER SUPPLY UNIT**

Be sure to read this instruction manual thoroughly before using this product. Pay attention to all cautions and warnings before using this product. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

**⚠ DANGER:**

Never use this product in locations where flammable gas or ignitable substances are present. There are risks of igniting these substances and exploding by an arcing.

**⚠ WARNING:**

- Do not touch this product or its internal components while circuit is live, or shortly after shut down. There may be high voltage high temperature present and you may receive an electric shock or burn.
- When this product is operating, keep your hands and face away from it as you may be injured by an unexpected situation.
- Do not make unauthorized changes to this product, otherwise you may receive an electric shock and void warranty.
- Do not drop or insert anything into this product. It might cause a failure, fire and electric shock.
- Do not use this product under unusual condition such as emission of smoke or abnormal smell and sound etc. It might lead to fire and electric shock. In such cases, please contact us. Do not attempt repair by yourself, as it is dangerous for the user.
- Do not operate this product in the presence of condensation. It might lead fire or electric shock.

**⚠ CAUTION:**

- The power supply is designed and manufactured for use within an end product such that it is accessible to SERVICE ENGINEERS only.
- Confirm connections to input/output terminals and signal terminals are correct as indicated in the instruction manual before AC turn on.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged.
- Do not operate and store this product in an environment where condensation might occur. In such case, waterproof treatment is necessary.
- Do not use this product in environment with a strong electromagnetic field, corrosive gas or conductive substances.
- For applications, which require very high reliability (Nuclear related equipment, medical equipment, traffic control equipment, etc.), it is necessary to provide a fail-safe mechanism in the end equipment.
- Do not inject abnormal voltages into the output and signal of this product. The injection of reverse voltage or over voltage exceeding nominal output voltage into the output and signal terminals might cause damage to internal components.
- The output of this product is considered to be a hazardous energy level (The voltage is 2V or more and the power is 240VA or more). It must not be made accessible to users. Protection must be provided for Service Engineers against indirect contact with the output terminals and/or to prevent tools being dropped across them. While working on this product, the AC input power must be switched off and the input and output voltage should be zero.
- This product has a built-in fan for air-cooling. Do not block the air intake and exhaust as this might lead to fire.
- Blowing of internal fuse is considered internal failure. In such cases, please contact us.
- The information in this document is subject to change without prior notice. Please refer to the latest version of the data sheet, etc., for the most up-to date specifications of the product.
- No part of this document may be copied or reproduced in any form without prior written consent of TDK-Lambda.

**FOR SAFE OPERATION**

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

**SYMBOLS**

	<p>This symbol indicates a potentially or imminently hazardous situation that, if not avoided, will result in death or serious injury.</p>
	<p>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.</p>
	<p>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.</p>
	<p>Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual.</p>
	<p>CAUTION Risk of Electrical Shock.</p>
	<p>Indicates hazardous voltage.</p>
	<p>Indicates ground terminal.</p>
	<p>Protective Ground conductor Terminal.</p>

**ENVIRONMENTAL CONDITIONS**

EVA power supply series safety approval applies to the following operating conditions:

- Installation category (Over voltage category) II
- Pollution degree 2
- Indoor use
- Ambient temp. : -10~ +70 deg C (+45~ +70 deg C: derated load by 3.6 % / deg C)
- Maximum relative humidity: 90% (No condensation)
- Altitude: up to 2000m

**⚠ 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-wire 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.

**OUTPUT TERMINAL GROUNDING**

There is a potential shock hazard at the RS232/485 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.

## **⚠ 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 EVA2400 power supply series is: 190-240V~, 50/60Hz for Single Phase 200V models. For safety reasons, the mains supply voltage fluctuations should not exceed +/-10% of nominal voltage.

## **⚠ HANDLING OF THE PRODUCT**

Operating personnel must not remove the instrument cover.

No internal adjustment or component replacement is allowed by non-TDK-Lambda qualified personnel.

- **Parts substitutions & Modifications**  
For repair or modifications, the instrument must be returned to TDK-Lambda service.
- **FUSE**  
Fuses must be changed by authorized TDK-Lambda service personnel only.

## **WARRANTY**

### **Range of Free Warranty**

The power supply is warranted for a period of 5 years from the date of shipment. As for the breakdown under a normal use during free warranty term, repair is at free of charge. However, the built-in Fan replacement is charged. Please contact to our sales office for Fan replacement. Please see section 6.4 "FAN LIFE EXPECTANCY" for the exchange time of Fan. Condition of the free of charge warranty are follows:

- Average operating temperature ( ambient temperature of the power supply unit ) is under 40 deg C.
- Average load factor is 80% or less
- Mounting method: Standard mounting.

Following cases are not covered by warranty:

- Breakdown due to applied abnormal voltage.
- Breakdown due to incorrect usage.
- Breakdown and the damage by transportation after the product delivery.
- Improper usage like dropping products, applying shock and defects from operation exceeding specification of the units.
- Defects resulting from natural disaster (fire, flood, etc.).
- Unauthorized modifications or repair by the buyer's defects not cause by TDK-Lambda.
- TDK-Lambda does not warrant the buyer's circuitry or malfunctions of TDK-Lambda products resulting from the buyer's circuitry.
- TDK-Lambda does not warrant any damage occurring as a result of the buyer's circuitry or the buyer's-supplied products.

### **Warranty Service**

- Charged service is available after free warranty is expired.
- This product must be returned to an authorized.

TDK-Lambda service facility for repairs or other warranty service. For products returned to TDK-Lambda for warranty service, the buyer shall prepay shipping charges to TDK-Lambda and TDK-Lambda shall pay the shipping charges to return the product to the buyer. Refer to Section 2.3 for repackaging for shipment.

- About the overseas repair service (including the business trip), please contact us.
- Test report after repair is available up on request with charge.

### **Disclaimer**

The information contained in this document is subject to change without notice. TDK-Lambda shall not be liable for errors contained in this document or 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.

### **NOTE:**

- The installation, wiring, grounding and end application of the switching power supply in the equipment system may influence its EMC characteristics. Therefore, the EMC performance has to be tested on end system level.
- CE Marking when applied to a product covered by this handbook indicates compliance with the low voltage directive (2006/95/EC) as modified by the CE Marking Directive (2006/95/EC) in that it complies with EN60950-1.

**CHAPTER 1: GENERAL INFORMATION**

**1.1 Instruction Manual Content**

This Instruction manual contains the installation instructions, operating instructions and specifications of the EVA2400 power supply series.

**1.2 Introduction**

EVA2400 power supply series are wide output range, high performance switching power supplies. It is controlled with PC via RS232/485 serial communication or analog signals. This product of the same output voltage and current rating (up to 4 units) can be paralleled in Master/Slave configuration with automatic current sharing to increase output current.

**1.2.1 Models Covered by Instruction Manual**

Model	Output voltage range (V)	Output current range (A)
EVA150-16	15~150	0~16
EVA300-8	30~300	0~8
EVA600-4	60~600	0~4

Table1-1: Models covered by Instruction manual

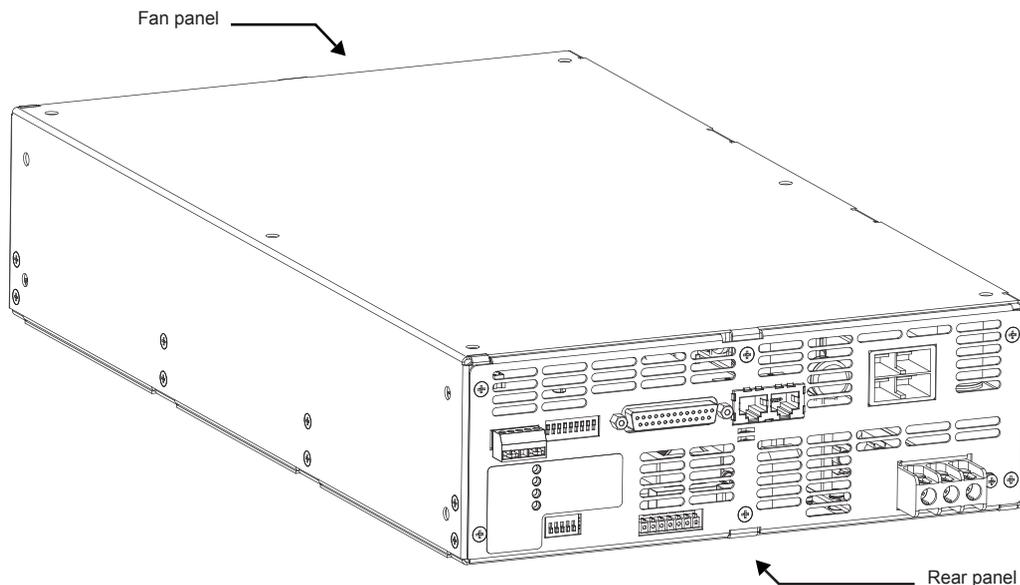
**1.2.2 Features**

- Constant Voltage / Constant Current with automatic crossover
- Active Power Factor Correction
- Single Phase 200V input
- Embedded Microprocessor Controller
- Built in RS232/485 Interface
- High accuracy programming / readback-16 bit
- Software Calibration (no internal trimmers / potentiometers)
- Last Setting Memory
- Output voltage and current setting and monitoring function with Analog signal control.
- Independent remote ON/OFF (SO: Shut-Out) and Enable/Disable. (Isolated from the output with opto-coupler)
- Parallel operation (Master/Slave) with Active current sharing
- Cooling Fan speed control for low noise and extended Fan life
- 2U size with 2400W outout power
- Compact and lightweight package which allows easy installation and space saving in the application equipment
- High Density Stacking - no ventilation holes on the top and bottom surface of the power supply.

**1.3 FUNCTIONAL DESCRIPTION**

**1.3.1 Rear Panel**

See Fig.1-1 to review the connections and controls on the power supply rear panel. Refer to Table 1-2 for the description about the rear panel connections and controls.



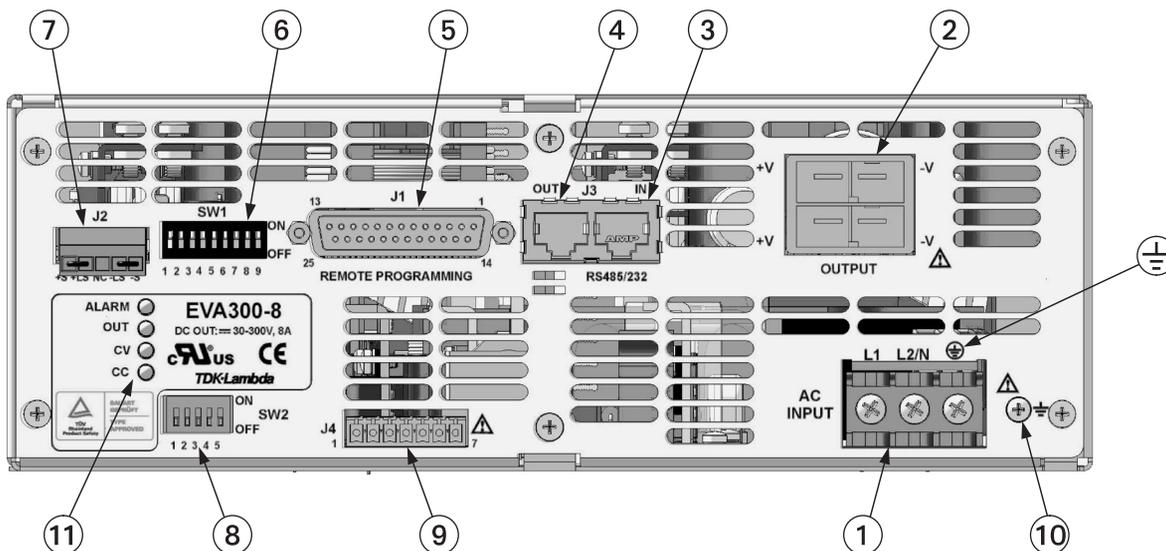


Fig.1-1: Rear panel connections and controls

No.	Item	Description	Reference
1	AC Input terminal	Connect to AC input line.	Sec. 2.5
2	DC Output connector	Connect to load wire.	Sec. 2.7
3	J3 Serial communication connector (IN)	Used for connecting power supplies to serial communication port of PC for control purpose.	Sec. 4.4
4	J3 Serial communication connector (OUT)	Used for chaining power supplies to from a serial communication bus.	Sec. 4.4
5	J1 Analog control connector	Connector for remote analog interface.	Sec. 5.2
6	SW1 Setup switch	Switch for set up function.	Sec. 5.2
7	J2 Sense connector	Used for local sense.	Sec. 2.8
8	SW2 Address switch	Switch for setting of address.	Sec. 4.3
9	J4 Auxiliary power supply output connector	Auxiliary power supply	Sec. 2.9
10	Ground screw	Screw for chassis ground connection	
11	LED Indications	ALARM	Red LED, blinks in case of fault condition. OVP, OTP, Output off by Enable/Disable, AC Fail
		OUT	Green LED, lights when the output is "ON".
		CV	Green LED for CV mode operation.
		CC	Green LED for CC mode operation.

Table 1-2: Rear panel connections and controls

**1.3.2 Control via Serial Communication Port (RS232/485)**

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

- Output voltage setting and output current limit setting
- Output voltage monitoring and output current monitoring
- Output ON/OFF control
- Over voltage protection setting and readback
- Under voltage limit setting and readback
- Power supply start up mode (Auto-restart mode or Safe start mode)
- STATUS, ERROR AND SRQ (Service Request)

### 1.3.3 Analog Programming and Monitoring

Analog control connector (J1) and Setup switch (SW1) are provided at the rear panel for analog control of the power supply.

- Output voltage setting and output current limit setting by analog voltage or by resistor
- Output voltage monitoring and output current monitoring by analog voltage
- Analog signals monitor for proper operation of the power supply. (CV/CC signal etc.)
- Independent remote ON/OFF (SO: Shut-Out) and Enable/Disable. (Isolated from the output with opto-coupler)

### 1.3.4 Parallel Operation

EVA2400 power supplies of the same output voltage and current rating (up to 4 units) can be paralleled in Master/Slave configuration with automatic current sharing to increase power available.

### 1.3.5 Multiple Output Power System

EVA2400 power supplies series can be configured into a programmable power system of up to 31 units using the built-in RS232/485 linking cable provided with each power supply.

### 1.3.6 Cooling and Mechanical Construction

EVA2400 power supplies series are cooled with internal fans. At the installation, care must be taken to allow free airflow into the power supply via the fan panel and out of the power supply via the rear panel.

EVA2400 power supplies series require space around both panels for intake and exhaust air. (Refer to Section 2.4).

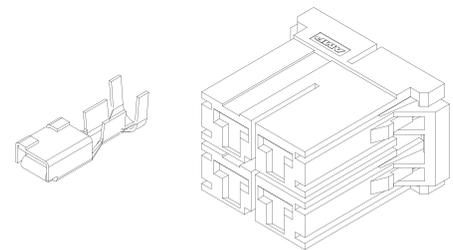
## 1.4 Accessories

### 1.4.1 Output Connector

Table 1-3 shows the Output connector.

Item	Manufacturer	P/N	QTY
Terminal Pin	Tyco Electronics	316041-2	4
Housing	Tyco Electronics	1-917807-2	1

Table 1-3: Output connector



Terminal Pin

Housing

### 1.4.2 Option Parts (Upon Ordering)

< RS232 and RS485 cable >

- RS232 serial communication cable
 

Length: 2.0m	D-SUB 25pin / RJ45 connector	RS232 cable (P/N: GEN/232-25)	Refer to Fig.1-2
Length: 2.0m	D-SUB 9pin / RJ45 connector	RS232 cable (P/N: GEN/232-9)	Refer to Fig.1-3
- RS485 serial communication cable
 

Length: 2.0m	D-SUB 9pin / RJ45 connector	RS485 cable (P/N: GEN/485-9)	Refer to Fig.1-4
--------------	-----------------------------	------------------------------	------------------
- RS485 Linking cable
 

Length: 0.5m	RJ45/RJ45 connector with a shield	Linking cable (P/N: GEN/RJ45)	Refer to Fig.1-5
--------------	-----------------------------------	-------------------------------	------------------

< Connector >

- J1 connector: D-SUB 25pin, Plug kit: 749809-9 (Tyco Electronics)
- J4 connector: IMC 1,5/7-ST-3,81 (Phoenix Contact)

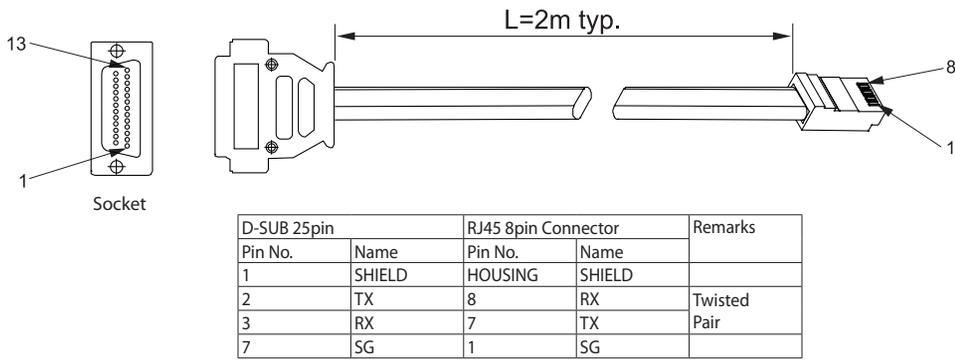


Fig.1-2: D-SUB 25pin / RJ45 connector, RS232 cable (P/N: GEN/232-25)

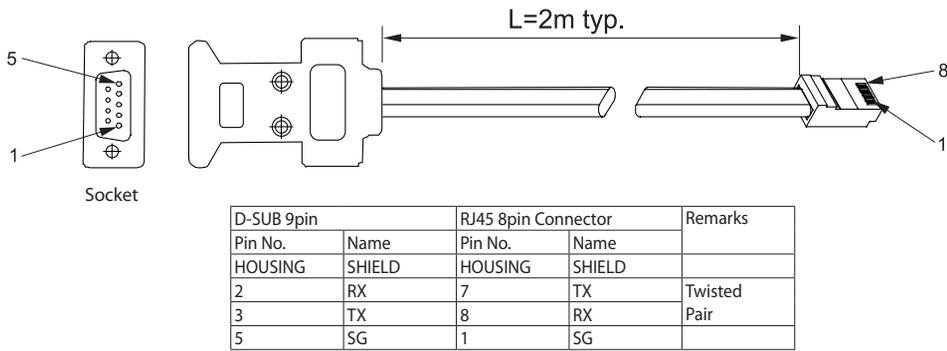


Fig.1-3: D-SUB 9pin / RJ45 connector, RS232 cable (P/N: GEN/232-9)

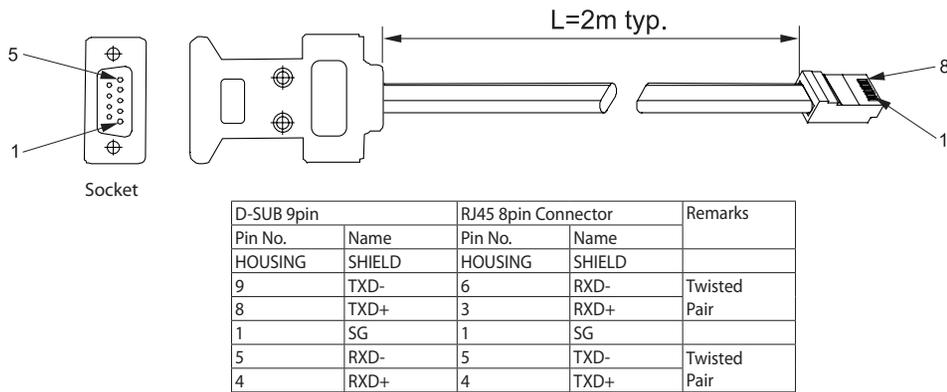


Fig.1-4: D-SUB 9pin / RJ45 connector, RS485 cable (P/N: GEN/485-9)

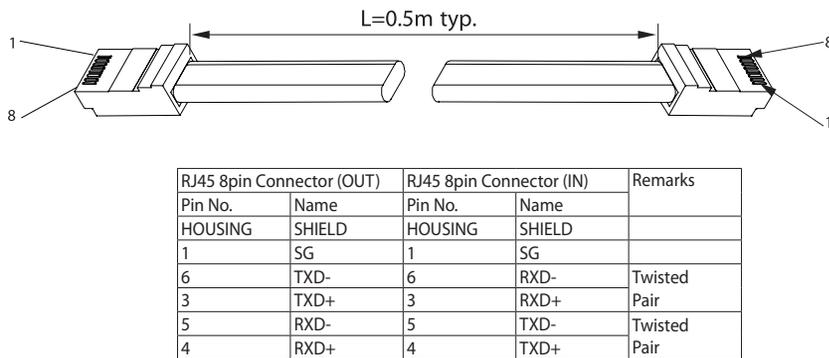


Fig.1-5: RJ45 / RJ45 connector with a shield, RS485 Linking cable (P/N: GEN/RJ45)

**CHAPTER 2: INSTALLATION**

**2.1 General**

This chapter contains instructions for initial inspection, preparation for use. Connection to PC, setting the communication port and linking EVA2400 power supplies are described in CHAPTER 4.

**⚠ ⚠ WARNING:**

- EVA2400 power supplies series are designed and manufactured as embedded power supply. Access to Hazardous parts (output/sensing) shall be prevented after installation.
- Do not drop or insert anything into this product. It might cause a failure, fire and electric shock.

**NOTE:**

EVA2400 power supplies series generate magnetic fields which might affect the operation of other instruments. If your equipment is susceptible to magnetic fields, do not position it adjacent to the power supply.

**2.2 Preparation for Use**

When using the power supply, you should be connected to the AC input requirements of CHAPTER 7 of the specification within this Instruction manual. Table 2-1 below, describes the basic setup procedure. Follow the instruction manual in Table 2-1 in the sequence given to prepare the power supply for use.

No.	Item	Description	Reference
1	Inspection	Initial physical inspection of the power supply	Sec. 2.3
2	Installation	Installing the power supply. Ensuring adequate ventilation.	Sec. 2.4
3	AC source	AC source requirements. Connecting the power supply to the AC source.	Sec. 2.5
4	Test	Turn-on checkout procedure.	Sec. 2.6
5	Load connection	Load wire requirements. Single or multiple loads.	Sec. 2.7
6	Default setting	The power supply setting at shipment.	Sec. 4.3.1

Table 2-1: Basic setup procedure

**2.3 Initial Inspection**

Prior to shipment the power supply was inspected and found free of mechanical or electrical defects. Upon unpacking of the power supply, inspect for any damage that may have occurred in transit. The inspection should confirm that there is no exterior damage to the power supply such as broken connectors. Keep all packing material until the inspection has been completed. If damage is detected, file a claim with carrier immediately and notify TDK-Lambda sales.

**2.4 Installation**

**2.4.1 Cooling**

The power supply is fan cooled. The air intake is at the fan panel and the exhaust is at the rear panel. Upon installation allow cooling air to reach the fan ventilation inlets. Allow minimum 100mm (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 +70 deg C. Need de-rating for above 45 deg C operation.

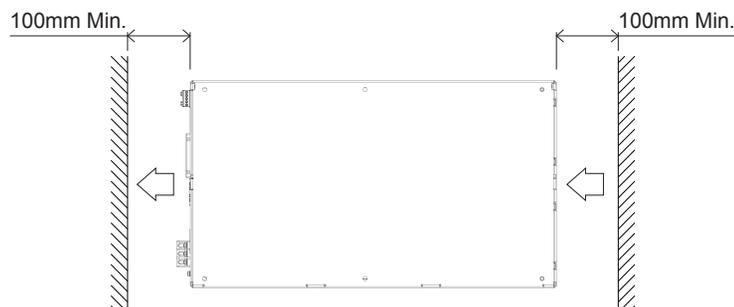
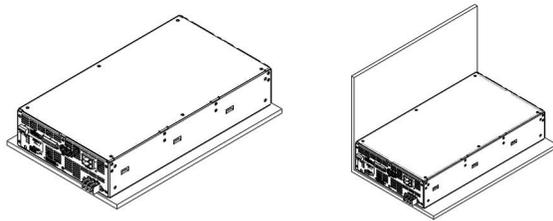


Fig.2-1: Cooling space

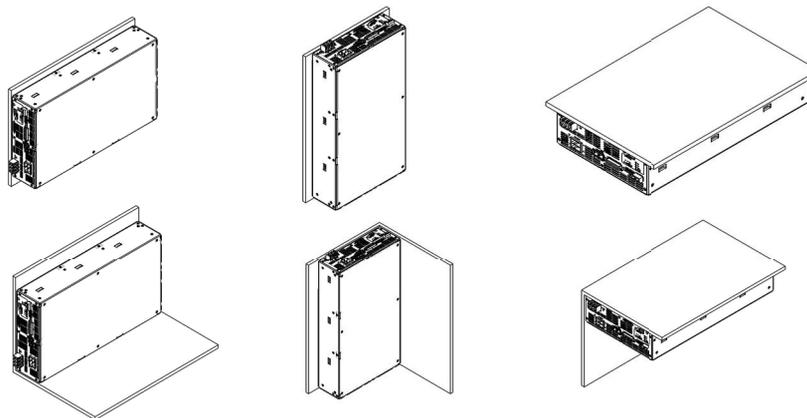
**2.4.2 Mounting Directions**

The power supply has been provided M4-screw holes on the top, bottom (6 each), left and right surfaces (4 each) that are intended to be attached to customer's equipment. The power supply weighs about 7.5kg. To ensure secure mounting on the customer's equipment, it is recommended to affix on two surfaces (with 10mm screws).

(1) Recommended standard mounting method.



(2) Optional mounting method.



Mounting method prohibited due to risk of deformation and damage of the screw.

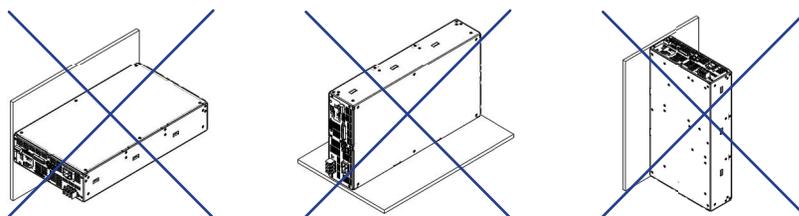


Fig. 2-2: Mounting Directions

**⚠ CAUTION:**

- The maximum allowable penetration for screw is 6mm.
- Recommended torque for mounting screw: M4 screw: 1.27N\*m  
Over torquing may damage unit or accessories. Such damage is not covered under manufacturers warranty.

**2.4.3 Rack Mounting**

In case of mounting to a rack, the screw holes on the surface of left and right side could be used for installing rack mounting brackets.

**2.5 AC Source Requirements**

EVA 2400 power supplies series designed for use in TT, TN power distribution systems. The power supply can be operated from a nominal 190V to 240V, single phase, 47~63Hz. Please refer to CHAPTER 7 in details.

**2.5.1 AC Input Power Connection**

**⚠ ⚠ 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 terminal.
- An appropriately rated protective device such as circuit breaker, type B plug on power cord, ...etc., shall be provided in the final installation. The protective device for one-phase units shall disconnect both supply lines simultaneously. The protective device must be easily accessible.
- Turn the AC input power off before making or changing AC input connection. Ensure that all connections are securely tightened before applying power.
- Even if it turns off AC input, voltage remains in the some components inside the power supply. In the case of re-wire connection, please carry out after waiting 2 minutes or more, in order to avoid electric shock hazard.

**⚠ ⚠ WARNING:**

- Connection of the power supply to an AC power source should be made by an electrician or other qualified personnel.
- The power supply shall be connected to the AC source via protective device (circuit breaker, fuses, ...etc.) rated 30A max.

**⚠ CAUTION:**

**MULTI POLE FUSING:** EVA2400 power supply units have fuses in supply conductors. To prevent potential risk of shock hazard during servicing, the unit shall be fully disconnected from the supply.

**2.5.2 AC Input Terminal**

The AC Input terminal is a 3-terminal located on the rear panel. AC Input terminal P/N: T7273 (Emuden) Use suitable terminals and tightening torque as follows:

- Tightening torque: 1.27 N\*m (M4 Screw)
- The suitable terminal: 3.5-R4 (JST), or equivalent

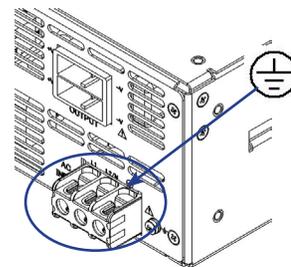


Fig. 2-3: AC Input terminal

**2.5.3 AC Input Cable**

**⚠ WARNING:**

AC input cable is not provided with the power supply. Please prepare it depending on customer applications and the specifications of the power supply. The AC Input cable requirements are as follows:

1. Min 3x12 AWG (3 wire include safety ground), standard copper
2. 300V, 60°C minimum, rated for 25A
3. Length: 3m maximum

**2.6 Turn-On Checkout Procedure**

**2.6.1 General**

The following procedure ensures that the power supply is operational and may be used as a basic incoming inspection check. Refer to CHAPTER 4 for Serial Communication control.

**2.6.2 Prior to Operation**

1. PC set-up (Refer to Section 4.2)
  - Baud rate setting: 9600bps
2. Ensure that the power supply is configured to the default setting:
  - Setup switch (SW1): All positions at OFF (“Down”) position.
  - Address switch (SW2): All positions at OFF (“Down”) position. Address is 0 setting; Refer to Section 4.3.2
  - Sense connector (J2): Refer to Section 2.8
3. RS232 or RS485 selection: (SW1-6)  
 To select between RS232 or RS485 set the Setup switch SW1-6 position to:  
 OFF(Down) for RS232 ON(Up) for RS485
4. Connect the unit to RS232 or RS485 Bus (Refer to Section 4.4)
5. Connect the unit to an AC source as described in Section 2.5.1
6. Connect the DVM to the output terminals

**2.6.3 Constant Voltage Check**

Please change the output voltage in reference to the command of the Table 2-2.

1. Turn on the output by turning AC power on and check the OUT-LED illuminates.  
 Default: Output voltage: 0V, Auto-restart mode.
2. Send the address command via RS232/485 communication port. Address command : “ADR 0” \*1)  
 Check an “OK” response from the power supply.
3. Then set the output voltage in 10% of rated output voltage using “PV” command.
4. After that, compare the value of DVM with the value of the power supply using command “MV?” and verify the same.
5. Using command “PV” and “MV?”, try to verify the output voltage varies.  
 At that time, check the CV-LED illuminates and ensure that the power supply is operated under CV condition.
6. Set the output voltage to 0V using “PV” command.
7. Turn the AC power off.

Model	EVA150-16	EVA300-8	EVA600-4	Remarks
Rated output voltage	150V	300V	600V	-
10% of rated output voltage	15V	30V	60V	-
Output voltage setting command. Ex.: 10% of rated output voltage	PV 15	PV 30	PV 60	*1)
Readback command for output voltage	MV?			-

\*1) In commands with an argument, a space must be between the command and the argument.

Table 2-2: Constant Voltage Check

**2.6.4 Constant Current Check**

Please change the output voltage and output current in reference to the command of the Table 2-2 and Table 2-3.

1. Ensure that the AC power is turned off and the DVM connected to the output terminals shows 0V.
2. Connect a DC shunt across the output terminals. Ensure that the shunt and the wires’ current ratings are higher than the power supply rating. Connect a DVM to the shunt.
3. Turn on the output by AC turn on and check the OUT-LED illuminates.
4. Send the address command via RS232/485 communication port. Address command : “ADR 0” \*1)  
 Check an “OK” response from the power supply.
5. Then set the output voltage in 10% of rated output voltage using “PV” command. (Refer to Table 2-2)
6. The output current is set in 105% of rated output current in default. After that, compare the indicated value of DVM and the readback value of the power supply using an input command “MC?” and verify the same.
7. Using command “PC” and “MC?” try to verify the output current varies. At that time, check the CC-LED illuminates and ensure that the power supply is operated under CC condition.
8. Set the output current in 105% of rated output current using “PC” command.
9. Set the output voltage to 0V using “PV” command.
10. Turn the AC power off.
11. Remove the shunt from the power supply output connector.

Model	EVA150-16	EVA300-8	EVA600-4	Remarks
Rated output current	16A	8A	4A	-
Maximum output current limit setting (105% of rated output current)	16.8A	8.4A	4.2A	-
Output current limit setting command. Ex.: 10% of rated output current	PC 1.6	PC 0.8	PC 0.4	*1)
Readback command for output current	MC?			-

\*1) In commands with an argument, a space must be between the command and the argument.

Table 2-3: Constant Current Check

### 2.6.5 OVP Check

Refer to Section 3.4 for description of the OVP function prior to performing the procedure below. Please change the output voltage and OVP level in reference to the command of the Table 2-4.

1. Ensure that the AC power is turned off and the DVM connected to the output terminals shows 0V.
2. Turn on the output by turning AC power on and check the OUT-LED illuminates.
3. Send the address command via RS232/485 communication port. Address command : "ADR 0" \*1)  
Please confirm an "OK" response from the power supply.
4. Then set the output voltage in 10% of rated output voltage using "PV" command.
5. Check the OVP level using an "OVP?" command. Default: OVP level is set at the maximum
6. Send the OVP level in 50% of rated voltage using "OVP" command.
7. Adjust the output voltage toward it's maximum and check that the output voltage cannot be increased more than 95% of the OVP level. (Error message: Refer to 4.6)
8. Set the OVP level to maximum using "OVPM" command.
9. Set the output voltage to 0V using "PV" command.
10. Turn the AC power off.

Model	EVA150-16	EVA300-8	EVA600-4	Remarks
10% of rated output voltage	15V	30V	60V	-
Output voltage setting command. Ex.: 10% of Rated output voltage	PV 15	PV 30	PV 60	*1)
Readback command for output voltage	MV?			-
Readback command for OVP setting level	OVP?			-
OVP level setting command. Ex.: 50% of Rated output voltage	OVP 75	OVP 150	OVP 300	*1)
Maximum OVP level setting command	OVPM			-

\*1) In commands with an argument, a space must be between the command and the argument.

Table 2-4: OVP Check

### 2.6.6 UVL Check

Refer to Section 3.5 for description of the UVL function prior to performing the procedure below. Please change the output voltage and UVL level in reference to the command of the Table 2-5.

1. Ensure that the AC power is turned off and the DVM connected to the output terminals shows 0V.
2. Turn on the output by turning AC power on and check the OUT-LED illuminates.
3. Send the address command via RS232/485 communication port. Address command : "ADR 0" \*1)  
Check an "OK" response from the power supply.
4. Then set the output voltage in 10% of rated output voltage using "PV" command.
5. Check the UVL level by command "UVL?". Default: UVL setting level is 0V.
6. Set the UVL level in 100% of output voltage setting "UVL" command.  
Check that the UVL cannot be set (UVL available below 95% of Output voltage setting).  
(Error message: Refer to 4.6)
7. Set the UVL level to 0V using "UVL" command.
8. Set the output voltage to 0V using "PV" command.
9. Turn the AC power off.

Model	EVA150-16	EVA300-8	EVA600-4	Remarks
10% of rated output voltage	15V	30V	60V	-
Output voltage setting command. Ex.: 10% of rated output voltage	PV 15	PV 30	PV 60	*1)
Readback command for UVL setting level	UVL?			-
UVL level setting command. Ex.: 95% of output voltage setting	UVL 13.5	UVL 28.5	UVL 57	*1)

\*1) In commands with an argument, a space must be between the command and the argument.

Table 2-5: UVL Check

## 2.7 Connecting the Load

### **WARNING:**

- Turn the AC power off before making or changing any connection and wiring. 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.
- Hazardous voltages exist (more than 40V) 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.

### 2.7.1 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 2.7.2)
- 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 2.7.2)
- Noise and impedance effects of the load wiring. (Refer to Section 2.7.4)

### 2.7.2 Current Carrying Capacity

Two factors must be considered when selecting the wire size:

- 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.
- Wire size should be selected to enable voltage drop per lead to be less than 1.0V at the rated current. It is recommended to minimize the voltage drop (1V typical maximum) to prevent excessive output power consumption from the power supply and poor dynamic response to load changes.

Please refer to Tables 2-6 and 2-7 for maximum wire length to limit voltage drop in American and European dimensions respectively.

Wire size AWG	Resistivity Ohm/km	Maximum wire length in meters to limit voltage drop to 1V or less					
		10A	20A	50A	100A	200A	400A
14	8.287	12.2	6.1	2.4	1.2	0.6	-
12	5.213	18.3	9.1	3.7	1.8	0.9	-
10	3.2789	30.5	15.2	6.1	3.0	1.5	0.6
8	2.0620	48.8	24.4	9.8	4.6	2.4	1.2
6	1.2969	76.2	38.1	15.2	7.6	3.7	1.8
4	0.8156	121.9	61.0	24.4	12.2	6.1	3.0
2	0.5131	182.9	91.4	41.1	18.3	9.1	4.6
0	0.3225	304.8	152.4	61.0	30.5	15.2	7.6

Table 2-6: Maximum wire length for 1.0V drop on lead (in meters) AWG size

Cross sect. area (mm <sup>2</sup> )	Resistivity Ohm/km	Maximum wire length in meters to limit voltage drop to 1V or less					
		10A	20A	50A	100A	200A	400A
2.5	8.21	12.0	6.0	2.4	1.2	0.6	0.3
4	5.09	18.6	9.8	4.0	2.0	1.0	0.5
6	3.39	29.4	14.8	5.8	2.9	1.5	0.7
10	1.95	51.2	25.6	10.2	5.1	2.5	1.3
16	1.24	80.0	40.0	16.0	8.0	4.0	2.0
25	0.795	125.0	62.0	25.2	12.6	6.3	3.1
35	0.565	177.0	88.0	35.4	17.7	8.8	4.4

Table 2-7: Maximum wire length for 1.0V drop on lead (in meters)

For currents not shown in Tables 2-6 and 2-7, use the the formula:  
 Maximum Length=1000/(current×resistivity) (unit:current:A,resistivity:Ω/1000m)

**2.7.3 Wire Termination**

The wires should be properly terminated with terminals securely attached. Do NOT use unterminated wires for load connection at the power supply.

**2.7.4 Noise and Impedance Effects**

- To minimize the noise pickup or radiation, the load wires should be twisted pairs to the shortest possible length. Twisting the load wires reduces the parasitic inductance of the cable which could produce high frequency voltage spikes at the load and the output of power supply, because of current variation in the load itself.
- Where shielding is used, connect the shield to the chassis via rear panel Ground screw.
- The impedance introduced between the power supply output and the load could make the ripple and noise at the load worse than the noise at the power supply rear panel output. Additional filtering with bypass capacitors at the load terminals may be required to bypass the high frequency load current.

**2.7.5 Inductive Loads**

Inductive loads can produce voltage spikes that may be harmful to the power supply. Diode or surge suppressor should be connected across the output.

- The diode voltage and current rating should be greater than the power supply maximum output voltage and current rating. Connect the cathode to the positive output and the anode to the negative output of the power supply.
- Where positive load transients such as back EMF from a motor may occur, connect a surge suppressor across the output to protect the power supply. The breakdown voltage rating of the suppressor must be approximately 10% higher than the maximum output voltage of the power supply.

**2.7.6 Capacitive Loads**

The power supply has pre-load circuit inside for tune-up performance. This pre-load draws current from output terminal. In battery charger system, to avoid discharging the battery, additional diode on output is recommended.

- 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.

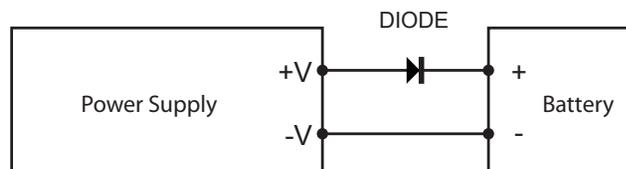


Fig 2-4: Capacitive loads connection

**2.7.7 Making the Load Connections**

The output connector is the 1-112309-2 of Dynamic Connector series manufactured by Tyco electronics. The two left terminals are the positive outputs and the other two right terminals are the negative outputs. Max. 30A per terminal  
 The load wire requirements are as follows:

- Wires: AWG12~AWG10
- Connector Housing: 1-917807-2 (Tyco Electronics)
- Output pin: 316041-2 (Tyco Electronics)

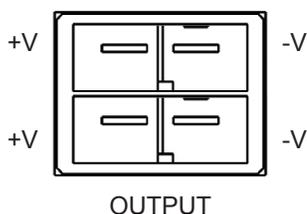


Fig 2-5: Output connector

**2.7.8 Connecting Single Load**

The following Figure 2-6 shows recommended load connections for a single load. The load wire should be as short as possible. And also use twisted and/or shielded wires to minimize noise pick-up if possible.

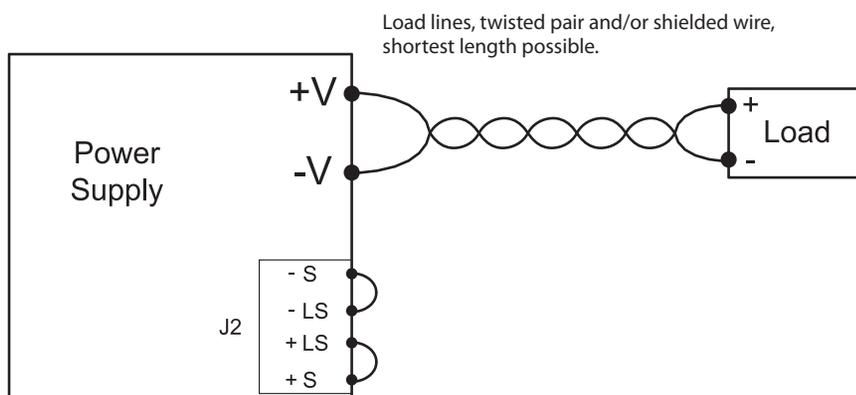
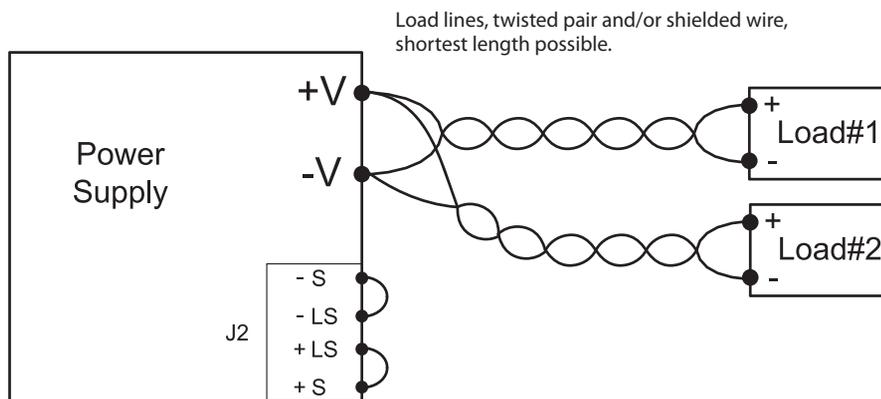


Fig. 2-6: Connecting single load

**2.7.9 Connecting Multiple Loads**

The following Fig.2-7 show multiple loads connected to one supply. Each load should be connected to the power supply's output terminals using separate pairs of wires. Each load wires should be as short as possible. And also use twisted or shielded wires to minimize noise pick-up if possible. If distribution terminals are used, the power supply output terminals should be connected to the distribution terminal by a pair of twisted and/or shielded wires.



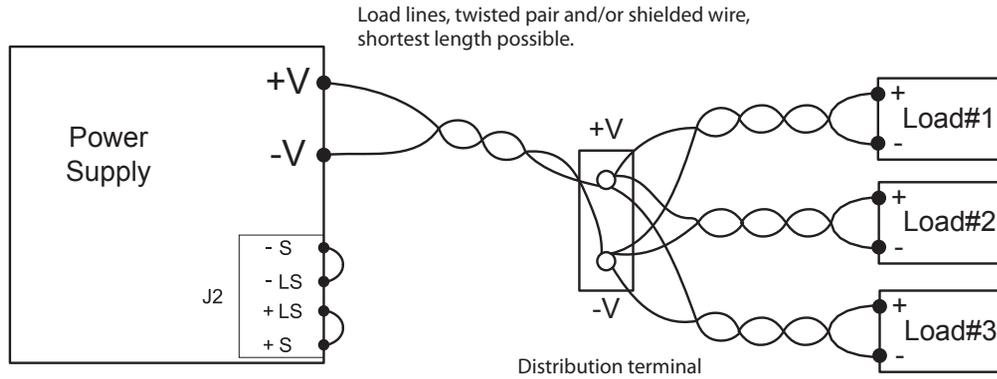


Fig. 2-7: Connecting multiple loads

### 2.7.10 Grounding Outputs

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

**⚠ WARNING:**

- The power supply shall not float outputs more than +/-600VDC above/below chassis ground.  
\* If you request to use the power supply exceeded the limit described above, please contact TDK-Lambda.

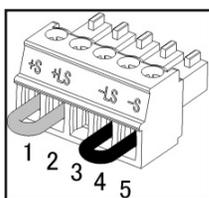
#### OUTPUT TERMINAL GROUNDING

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

### 2.8 Sense Connector (J2)

The Sense plug is connected to J2 connector. The power supply operates in local sensing. J2 connector should be correctly installed. In case of the inappropriate wiring or connecting of J2 connector, please note that the output voltage cannot be the same as the set value. In addition, EVA2400 series does not support the remote sensing function.

(1) Sense plug



Between J2-1 and J2-2, Between J2-4 and J2-5: Short

Contact	Signal name	Function
J2-1	+S	Remote(+)sense
J2-2	+LS	Local(+)sense
J2-3	NC	Not connected
J2-4	-LS	Local(-)sense
J2-5	-S	Remote(-)sense

(2) Connection with J2 connector

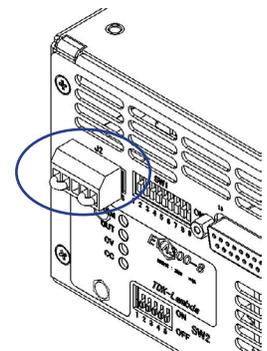


Fig. 2-8: Wiring of a Sense plug and J2 connector

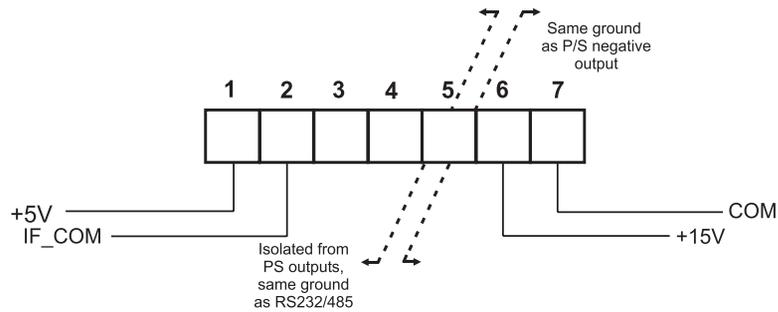
**⚠ ⚠ WARNING:**

Do not make contact -S to +V or +S to -V. The power supply may be damaged.

**2.9 Auxiliary Power Supply (J4)**

Contact	Signal name	Function	Reference
1	+5V	5V+-5% max current: 0.2A	
2	IF_COM	Isolated Interface Common Return for the SO,ENA control, PS_OK signal, and RS232/485.	Sec. 5.2.2
3-5	NC	Not connected	
6	+15V	15V+-5% max current: 0.2A	
7	COM	Control Common. Return for VMON, IMON, CV/CC, LOC/REM. Referenced internally to the negative output potential.	Sec. 5.2.2

Table 2-8: Connector functions description



**⚠ CAUTION:**

The COM terminal (J4-7) is referenced internally to the -V potential of the power supply. Do not attempt to bias any of these terminals relative to the -V or any other potential

## CHAPTER 3: FUNCTIONAL DESCRIPTION

### 3.1 Introduction

This chapter describes the operating modes.

In addition, refer to CHAPTER 4 and CHAPTER 5 for the Serial Communication via RS232/485 and the Analog signal control.

### 3.2 Standard Operation

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

#### 3.2.1 Constant Voltage Mode (CV)

- In constant voltage mode, this product 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 CV-LED and OUT-LED on the rear panel illuminates.
- Adjustment of the output voltage can be made when the power supply output is enabled (Output ON) or disabled (Output OFF).

#### NOTE:

- If after completing the adjustment, the returned voltage has a different value than the setting the power supply may be at current limit. Check the load condition and the power supply current limit setting.
- The maximum and minimum setting values of the output voltage are limited by the Over Voltage Protection (OVP) and Under Voltage Limit (UVL) setting. Refer to Section 3.4 and 3.5 for more details.

#### 3.2.2 Constant Current Mode (CC)

- 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 CC-LED and OUT-LED on the rear panel illuminates.
- Adjustment of the output current limit can be made when the power supply output is enabled (Output ON) or disabled (Output OFF).

#### 3.2.3 Automatic Crossover

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

### 3.3 Start-Up Mode (Auto-Restart and Safe-Start Mode)

There are two different modes to start the power supply after turning on the AC power. These modes can be switched via serial communication only.

- Auto-Restart mode:  
In this mode, the power supply restores its last operation setting. Upon start-up, the output is enabled with last setting.
- Safe start mode:  
In this mode, the power supply restores its last operation, setting and sets the output to OFF state. At start-up, the output is disabled and the output voltage and current are zero. To enable the output and restore the last output voltage and output current limit value, send "OUT 1" command via the RS232/485 communication port.

### 3.4 Over Voltage Protection (OVP)

The OVP circuit protects the load in the event of a setting error or a failure of the power supply. This protection circuit monitors the voltage at the output sensing point. When the OVP is activated the power supply output shut down and the ALARM-LED blinks.

#### 3.4.1 Setting the OVP Level

The OVP level of default is set with the maximum of the Table 3-1. Setting the OVP can be changed via serial communication only. The OVP can be set when the power supply output is Enabled (ON) or Disabled (OFF).

OVP setting Value has lower and upper limit. The minimum setting level is approx. 105% of the set output voltage. The OVP setting values can't be under the output voltage setting level.

Model	EVA150-16	EVA300-8	EVA600-4	Remarks
OVP setting range	15-165V	30-330V	60-660V	Default: 110% of rated output voltage

Table 3-1: OVP setting range

### 3.4.2 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. The Serial communication via RS232/485
  - Auto-restart mode: There are two methods to reset the OVP circuit.
    1. Send "OUT 1" command via the RS232/485 communication port.
    2. Turn the power supply OFF , wait until the rear panel LED turns off, turn the power supply ON.
  - Safe start mode:
    1. Send "OUT 1" command via the RS232/485 communication port.
    2. Turn the power supply OFF , wait until the rear panel LED turns off, then turn the power supply ON.  
Send "OUT 1" command via the RS232/485 communication port.

• Analog signal control

When the setting of Auto-restart mode. There are two methods to reset the OVP circuit:

1. Turn the power supply OFF, wait until the rear panel LED turns off, turn the power supply ON.
2. Turn the power supply output OFF and then on using the SO control. (Refer to Section 5.5.2)

### 3.5 Output Voltage Limit (UVL)

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

#### 3.5.1 Setting the UVL Level

Default of UVL is set to 0V. The UVL setting value can be changed via serial communication only. Setting the UVL can be made when the power supply output is enabled (ON) or disabled (OFF). UVL setting Value has lower and upper limit. The minimum UVL setting level is 0V. UVL setting value are limit at the maximum level to approximately 95% of the output voltage setting. Attempting to adjust the UVL above this limit will result Error code. Does not available in Analog signal control.

### 3.6 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 ALARM-LED blinks.

#### 3.6.1 Resetting the OTP Circuit

To reset the OTP circuit after it activates.

Turn the power supply output ON with the Auto-restart mode or Safe start mode.

- Auto-restart mode:  
The power supply recovers to it's last setting automatically when the over temperature condition is removed.
- Safe start mode:  
The power supply stays off after the over temperature conditions has been removed. The ALARM-LED continue to blink. To reset the OTP circuit, send "OUT 1" command via the RS232/485 communication port.

### 3.7 Output ON/OFF Control

The output ON/OFF control is performed by the following method.

The output is disabled, the output voltage and current fall to zero and the OUT- LED turns off.

1. Serial communication via RS232/485:  
"OUT" command can be sent to enable or disable the power supply output. (Refer to Section 4.7)
2. Analog signal control:  
Independent remote ON/OFF (SO: Shut-Out) and Enable/Disable. Isolated from the output with opto-coupler. (Refer to Section 5.5)

### 3.8 Last Setting Memory

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

- Output voltage setting (PV setting)
- Output current limit setting (PC setting)
- Start-up mode (Auto-restart mode or Safe start mode)
- OVP setting
- UVL setting

### 3.9 Series Operation

The power supply does NOT support Series operation.

### 3.10 Parallel Operation

Up to four units of the same VOLTAGE and CURRENT rating can be connected in parallel operation. One of the units operates as a Master and the remaining units are Slaves. The Slave units are Analog programmed by the Master unit. The Slave units may be connected to the computer (PC) for voltage, current and status readback only.

#### 3.10.1 Parallel Connection

Fig. 3-1 shows the parallel connection. Refer to Section 5.2.2 for the J1 connector terminals and function.

- Load wiring:
  - Each load wires should be as short as possible. And also use twisted wires. The positive and negative wire resistance should be close as possible to each other to achieve current balance between power supplies.
- Wiring between Master and Slave :
  1. Connect J1-25(P) of the Master and J1-10(IPGM) of the Slave.
  2. Connect J1-12(COM) of the Master and J1-23(IPGM\_RTN) of the Slave.
- Wiring of Slave:
  1. Short J1-8(LOC/REM) and J1-12 (COM)
- Wiring to serial communication port:
 

When performing serial communication , please refer to Section 4.4 .

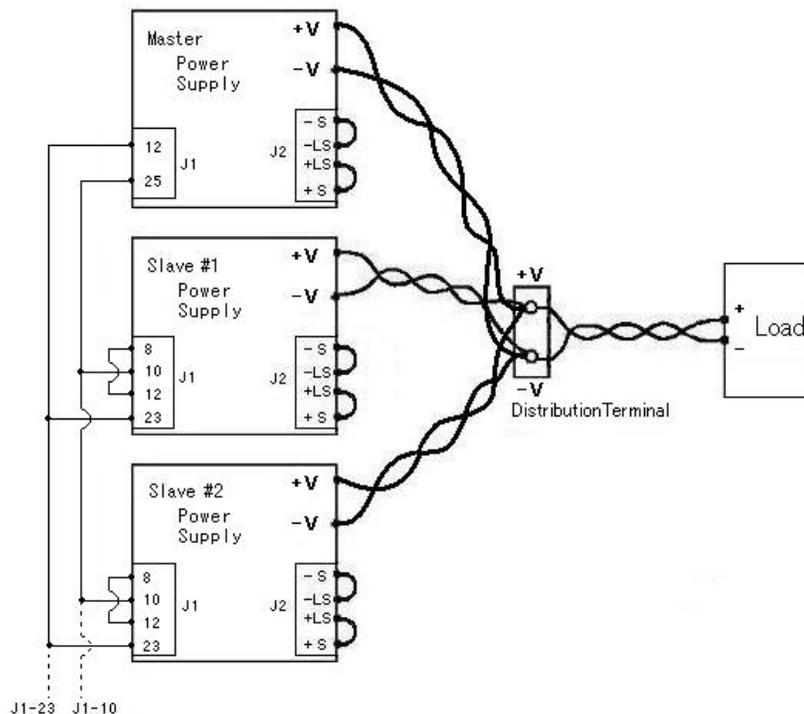


Fig. 3-1: Parallel connection

**⚠ CAUTION:**

Make sure that the connection between -VO terminals is reliable to avoid disconnection during operation.

Disconnection may cause damage to the power supply.

**3.10.2 Setting up the Master Unit**

Set the Master unit output voltage and output current limit by Serial communication or Analog signal control. Program the output current limit to the desired load current limit divided by the number of parallel units. The Master unit is Constant Voltage mode operation.

**3.10.3 Setting up the Slave Units**

1. Set the Slave units output voltage by Serial communication or Analog signal control:  
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.
1. The output current setting for each Slave unit is not necessary:  
The output current limit of each of the Slave units is controlled by the Master with Analog signal programming.
- Set the Function switch (SW1) of Slave units (Refer to Section 5.2.1):  
SW1-2: ON (Up)  
SW1-3: OFF(Down)  
SW1-4: OFF(Down)

**NOTE:**

- During operation the Slave units operate as a controlled current source following the Master output current. It is recommended that the power system is designed so that each unit supplies up to 95% of its current rating because of the imbalance which may be caused by cabling and connections voltage drop.
- 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 the power supplies.

**3.10.4 Setting the OVP Level**

Set the OVP level of Master unit and Slave units via serial communication. The operation of the power supply varies according to the OVP setting level of each the power supply.

- The OVP of the Slave units should be programmed to a higher value than the Master OVP:  
When the Master unit shut down, it programs the Slave units to zero output voltage.  
The ALARM-LED of the Master unit blinks. The CC-LED and OUT-LED of the Slave units continue illuminates.
- When any one of the Slave units is set lower than the Master unit:  
Slave unit shuts down and the Alarm-LED blinks.  
The remaining Slave units and the Master unit supply all the load current.

**3.10.5 Monitoring via Serial Communication**

Via serial communication, the output voltage and output current value of Master and each of the Slave units can be monitored. However, the power supply cannot readback the total current value of the entire system.

**3.11 Daisy-Chain Connection (Multiple Output System)**

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 Auto-restart or Safe start mode.

**3.11.1 Daisy-Chain Connection**

Figure 3-2 shows the Daisy-chain connection. The Fig.3-2 shows connection of three units, however the same connection method applies to systems with a larger number of units. If a fault occurs in one of the units its PS\_OK signal will be set

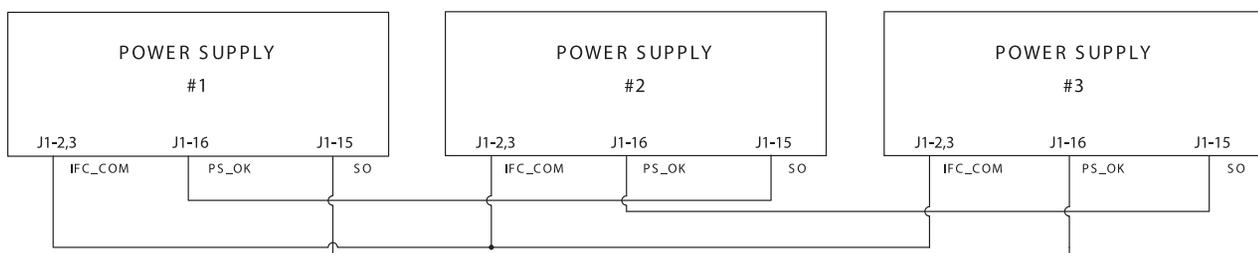


Fig.3-2: Daisy-chain connection

to low level. The other units will shut down by SO control. Refer to Section 5.5.2 for the details the SO control.

### **3.11.2 Setting Up the Power Supply**

The Setup switch SW1-5 should be set to OFF (Down) position to enable the Daisy-chain operation. Other SW1 positions can be set according to the application requirements. Refer to Section 5.2 for the SW1 and J1 connector.

### 4.1 Introduction

This chapter describes the operation of the power supply via the serial communication port. Details of the initial set-up, operation via RS232 or RS485, the command set and the communication protocol.

### 4.2 Serial Communication Test Set-up

The set-up of the computer (PC) is necessary in operating the power supply via serial communication. This Section explains the set up method of the serial communication.

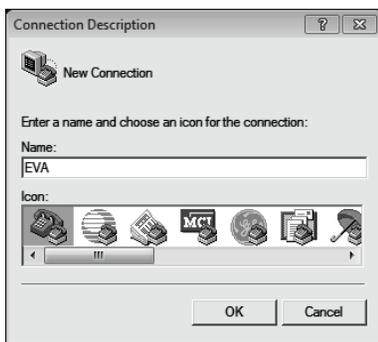
#### 4.2.1 Equipment

For communication with the power supply, PC with Microsoft Windows Hyperterminal installed or equivalent is needed.  
 \* Microsoft™ , Windows™ and Hyperterminal™ are trademarks of Microsoft Corporation.

#### 4.2.2 PC set-up

Setting the HyperTerminal.

1. Start the HyperTerminal



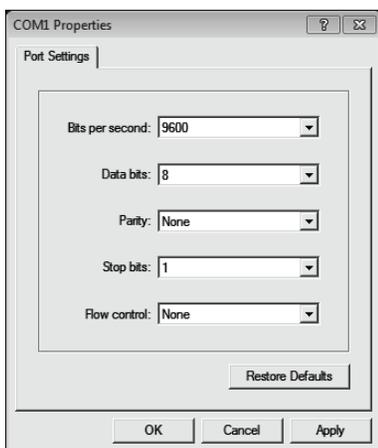
Enter name and select an ICON. Then click OK.

2. Select "Connect using"



Select the port to connect to PC via communication such as COM1 or COM2. Then click OK.

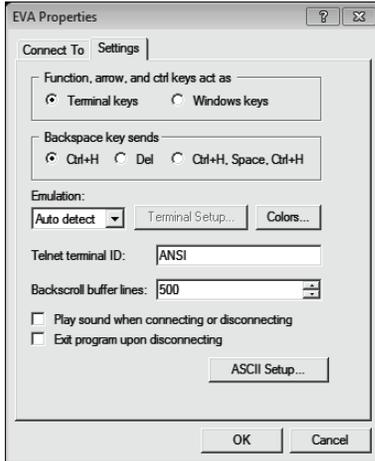
3. The COM port properties box appears, configure the selected port properties.



Set up parameters as follows:  
 Bits per second: 9600  
 Data Bits: 8  
 Parity: None  
 Stop Bits: 1  
 Flow control: None  
 Then, Click OK.

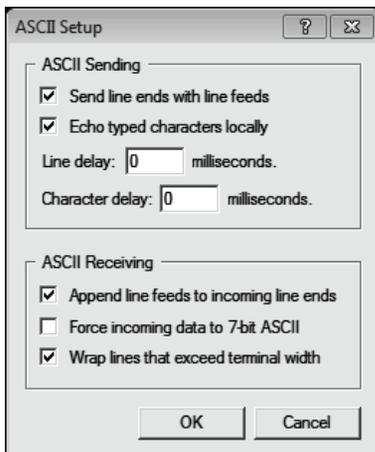
\* The baud rate of the power supply is fixed to 9600. Please set the baud rate to 9600.

4. "Files" => "properties", select the "setting" Tab



Set up the parameters as follows.  
 Function key: "Terminal keys"  
 Back Space: "Ctrl+H"  
 Emulation: "Auto detect"  
 Telnet terminal ID(N): "ANSI"  
 Buffer: "500"

5. Click the "ASCII Set up and Configure" ASCII Set up



Check the check boxes as follows.

- Send line ends with line feeds
- Echo typed characters locally
- Append line feeds to incoming line ends
- Wrap lines that exceed terminal width

Then click OK.

### 4.2.3 Serial Communication Test

Testing the operation of the PC that is set up. As an example, the test based on Section 2.6.3 (Constant Voltage Check)  
**Procedure:**

1. Setting the power supply  
 Refer to Section 2.6.2 (1) ~ (6).
2. Testing based on Section 2.6.3 (1) ~ (7) (Constant Voltage Check)  
 Communication test
  - PC: write: "ADR 0"  
 Power supply response: "OK"
  - PC: write: "PV n" n: Sets the output voltage value.  
 Power supply response: "OK"
 After that, compare the value of DVM with the value of the power supply using command "MV?" and verify the same.
4. Set the output voltage to 0V using "PV" command.
5. Turn the AC power off.

## 4.3 Power Supply Set-up

Setting of the power supply to perform serial communication.

### 4.3.1 Default Setting

The power supply is shipped with the following setting:

- Address switch (SW2): 0
- Baud rate: 9600 (Fixed)
- Output voltage setting: 0V
- RS232/485: RS232
- Output current limit setting: Maximum
- Output: ON(0V)
- Start-up mode: Auto-restart mode
- OVP: Maximum
- UVL: 0V

**4.3.2 Address Setting**

The power supply address can be set to any address between 0 and 30. If multiple units are controlled via serial communication, please set a different address for each power supply.

Follow the instructions described below to set the address.

1. Before AC turn on, set address with SW2 (5 position DIP SW).

Default is 00000 (All down, Address is 0).

Ex.) Set the "5" address.

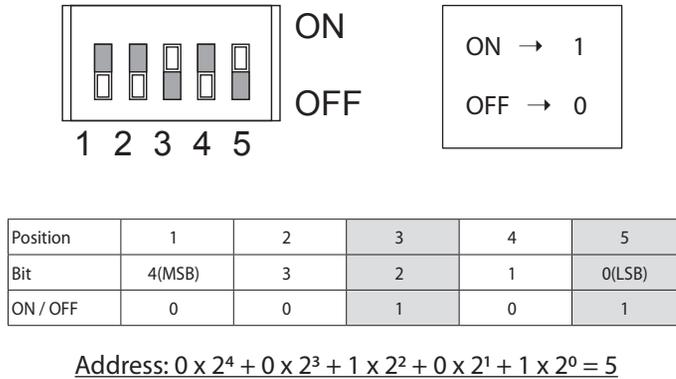


Fig. 4-1: SW2 - Setting of the Address

**4.3.3 RS232 or RS485 Selection**

To select between RS232 or RS485 set the Function switch SW1-6 position to: OFF(Down) for RS232 ON(Up) for RS485.

**4.3.4 Baud Rate**

The baud rate is fixed to 9600. The baud rate cannot be changed.

**4.4 Connecting Power Supplies to RS232 or 485 BUS**

**4.4.1 RS232/485 Connector (J3)**

The RS232/485 interface is accessible through the rear panel RS232/485 IN and RS485 OUT connection.

The connectors are 8 connect RJ-45. The IN and OUT connectors are used to connect power supplies in a RS232 or RS485 chain to a controller. Refer to Fig.4-2 for IN/OUT connectors.

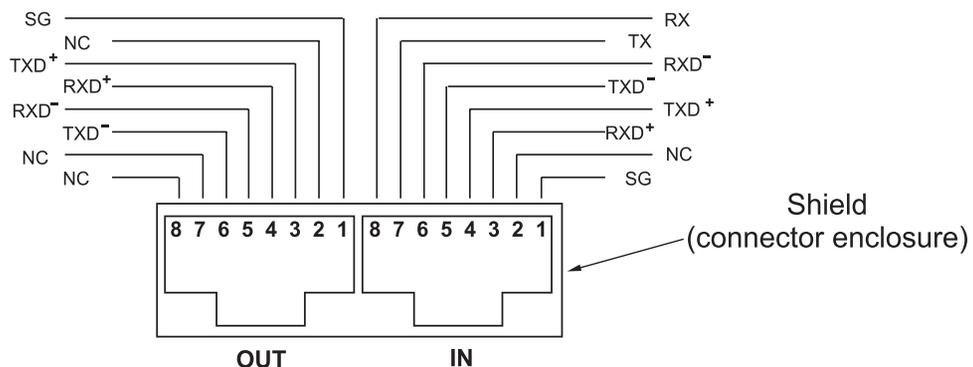


Fig. 4-2: J3 rear panel IN/OUT connector pinout

**NOTE:**

Tx and Rx are used for RS232 communication. Txd +/- and Rxd +/- are used for RS485 communication. Refer to RS232 and RS485 cable description of Section 1.4.2 for the details.

#### 4.4.2 Single Power Supply Connection

- Connect rear panel IN connector to the controller RS232 or RS485 port using a suitable shielded cable: Refer to RS232 and RS485 cable description of Section 1.4.2 for the details.
- To select between RS232 or RS485 set the Setup switch SW1-6 position to: OFF(Down) for RS232 ON(Up) for RS485

#### 4.4.3 Multiple Power Supply Connection

Daisy-chain up to 31 units can be connected to RS232/485 bus. The first unit connects to the controller via RS232 or RS485 and the other units are connected with RS485 bus, the user must set all Slave supplies to a unique address. The power supplies cannot have the same address. Refer to Fig. 4-3 for typical connection.

- First unit connection:  
Refer to Section 4.4.2. to connect the first unit to the controller.
- Other units connection:  
The other units on the bus are connected via their RS485 interface.  
Using the Linking cable supplied with each unit (Refer to Fig.1-5 P/N: GEN/RJ45), connect each unit OUT connector to the next unit IN connector. The communication method chooses RS485. SW1-6: ON (Up).

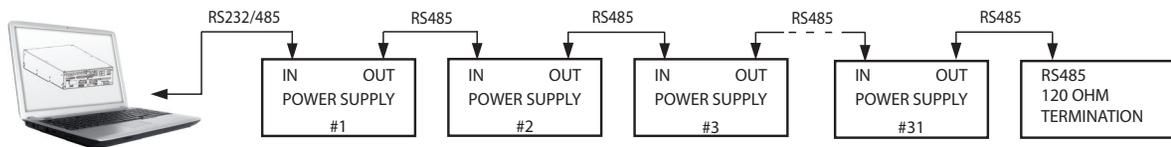


Fig. 4-3: Multiple power supply RS232/485 connection

- It is recommended when using several power supplies in Daisy-chain system to connect a 120 ohm resistive termination at the last unit's RS485 OUT connector.  
Ex.) Connect 120 ohm resistor (rated power more than 0.5W) between TXD+ and TXD-, and also between RXD+ and RXD-.

### 4.5 Communication Interface Protocol

#### 4.5.1 Data Format

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

#### 4.5.2 Addressing

The Address is sent separately from the command. It is recommended to add a 100 msec software delay between query or sent command to next unit addressing. Refer to Section 4.7.2 for details.

#### 4.5.3 End of Message

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

#### 4.5.4 Command Repeat

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

#### 4.5.5 Checksum

The user may optionally add a checksum to the end of the command. The checksum is “\$” followed by two hex characters. If a command or a query has checksum, the response will also have one. There is no CR between the command string and the “\$” sign. Ex.) STT?\$3A\$STAT?\$7B

#### 4.5.6 Acknowledge

The power supply acknowledges received commands by returning “OK” message. If an error is detected, the power supply will return an error message. The rules of checksum apply also to the acknowledgement. (Refer to Section 4.6)

**4.5.7 Error Message**

If an error is detected in a command or query, the power supply will respond with an error message. Refer to Section 4.6 for details.

**4.5.8 Backspace**

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

**4.6 Error Message**

The power supply will return error messages for illegal commands and illegal programming parameters.

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

Table 4-1: Programming error message

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

Table 4-2: Commands error message

**4.7 Command Set Description**

**4.7.1 General Guides**

- Any command or argument may be in capital letters or small letters.
- In commands with an argument, there must be a space between the command and the argument. (ex.: PV 50)
- For any command that sets a numeric value, the value may be up to 12 characters long.
- Carriage Return (CR): If the CR character (ASCII 13) is received by itself, the power supply will respond with "OK" and "CR".

**4.7.2 Command Set Categories**

This product's command set is divided into four categories as follows:

- Initialization control commands
- ID control commands
- Output control commands
- Status control commands

1. Initialization control commands

Command	Description
ADR n	ADR is followed by address that can be 0 to 30 and is used to access the power supply. When sending "ADR n" command after several commands, the power supply response might be delayed. Please set "ADR n" command to 100ms to 200ms time blank after several commands.
CLS	Clear status. Sets FEVE and SEVE registers to zero. (Refer to Section 4.8)
RST	Reset command. Brings the power supply to a safe and known state: <ul style="list-style-type: none"> <li>• Output voltage setting: 0V</li> <li>• Output current limit setting: 0A</li> <li>• OVP: Maximum</li> <li>• UVL: 0V</li> <li>• Output: OFF</li> <li>• Start-up mode: Safe start mode.</li> </ul> The conditional registers (FLT and STAT) are updated, the other registers are not changed.

Table 4-3: Initialization control commands

## 2. ID control commands

Command	Description
IDN?	Returns the power supply model identification as an ASCII string: (LAMBDA, EVA300-8)
REV?	Returns the software version as an ASCII string.
SN?	Returns the unit serial number. Up to 12 characters.
DATE?	Returns date of last test. Date format: yyyy/mm/dd

Table 4-4: ID control commands

## 3. Output control commands

### • Output control commands

Command	Description
PV n	Sets the output voltage value in Volts. The range of voltage value is described in Table 4-7. The maximum number of characters is 12. See the following examples for PV n format: PV 150, PV 150.0, etc...
PV?	Reads the output voltage setting. Returns the string "n" where "n" is the exact string sent in the PV n command.
MV?	Reads the actual output voltage. Return 5 digits string. Ex.) 009.99, 050.00, 149.99, 300.01, etc...
PC n	Sets the output current value in Amperes. The range of current values is described in Table 4-8. The maximum number of characters is 12. See the following examples for PC n format: PC10, PC10.0, PC010.00, etc...
PC?	Reads the output current setting. Returns the string "n" where "n" is the exact string sent in the PC n command.
MC?	Reads the actual output current. Returns 5 digits string. Ex.) 06.001, 16.992, etc
OUT n	Turns the output to ON or OFF. Recover from Safe-Start, OVP. OUT 1 (or OUT ON)-Turn ON OUT 0 (or OUT OFF)-Turn OFF
OUT?	Returns the output ON/OFF status string. ON - output ON OFF - output OFF
OVP n	Sets the OVP level. The OVP setting range is given in Table 4-9. The number of characters after OVP is up to 12. The minimum setting level is approx. 105% of the set output voltage. Attempting to program the OVP below this level will result in execution error response ("E04"). The OVP setting stays unchanged.
OVP?	Returns the setting "n" where "n" is the exact string in the user's "OVP n".
OVM	Sets OVP level to the maximum level. Refer to Table 4-9.
UVL n	Sets under voltage limit. Refer to Table 4-10 for UVL programming range. The maximum number of characters is 12. Value of "n" is below 95% of PV setting.
UVL?	Returns the setting "n" where "n" is the exact string in the user's "UVL n"
AST n	Sets the Auto-restart mode or Safe start mode. AST 1 (or AST ON): Auto-restart mode AST 0 (or AST OFF): Safe start mode
AST?	Returns the string start-up mode status "ON": Auto-restart mode "OFF" Safe start mode
SAV	Saves present settings. The settings are the same as power-down last settings. These settings are erased when the supply power is switched off and the new "last settings" are saved.
RCL	Recalls last settings. Settings are from the last power-down or from the last "SAV" command.
MODE?	Returns the power supply operation mode. When the power supply is ON (OUT 1) it will return "CV" or "CC". When the power supply is OFF (OUT 0) it will return "OFF".

Table 4-5: Output control commands

• **Global output control commands**

All units, even if not the currently addressed unit, receiving a global command will execute the command. No response to the PC issuing the command will be returned to the PC. The PC issuing the command will be responsible to delay and any other communications until the command is executed. 200ms minimum is the suggested delay. If the command contains an error, out of range values for example, no error report will be sent to the issuing PC.

Command	Description
GRST	Reset. Brings the Power Supply to a safe and known state: <ul style="list-style-type: none"> <li>• Output voltage setting: 0</li> <li>• Output current limit setting: 0</li> <li>• OVP: Maximum</li> <li>• UVL: 0V</li> <li>• Output: OFF</li> <li>• Start-up mode: Safe start mode</li> </ul>
GPV n	Sets the output voltage value in Volts. The range of voltage values is within rated voltage. 'n' may be up to 12 characters plus decimal point.
GPC n	Sets the output current value in Amperes. The range of current values is within rated current. 'n' may be up to 12 characters plus decimal point.
GOUT	Turns the output to ON or OFF: GOUT 1/ON" = turn ON GOUT 0/OFF" = turn OFF
GSAV	Saves present settings. The settings are the same as power-down last settings. These settings are erased when the supply power is switched off and the new 'last settings' are saved.
GRCL	Recall last settings. Settings are from last power-down or from last 'SAV' or 'GSAV' command.

\* Set range of the parameter

Table 4-6: Global output control commands

Model	Minimum (V)	Maximum (V) (Rated voltage)
EVA150-16	15.00	150.00
EVA300-8	30.00	300.00
EVA600-4	60.00	600.00

Table 4-7: Output voltage programming range

Model	Minimum (A)	Maximum (A) (Rated current)
EVA150-16	00.000	16.000
EVA300-8	0.0000	8.0000
EVA600-4	0.0000	4.0000

Table 4-8: Output current limit programming range

**NOTE:**

The power supply can accept values higher by 5% than the table values, however it is not recommended to operate the power supply over its voltage and current rating and performance is not guaranteed.

Model	Minimum (V)	Maximum (V)
EVA150-16	15.00	165
EVA300-8	30.00	330
EVA600-4	60.00	660

Table 4-9: OVP programming range

Model	Minimum (V)	Maximum (V)
EVA150-16	0	142
EVA300-8	0	285
EVA600-4	0	570

Table 4-10: UVL programming range

4. Status control commands

Refer to Section 4.8 (STATUS, ERROR and SQR REGISTERS) for definition of the registers.

Command	Description
STT?	Reads the complete power supply status. Returns ASCII characters representing the following data, separated by commas: <ul style="list-style-type: none"> <li>• MV [ actual (measured) voltage ]</li> <li>• PV [ programmed (set) voltage ]</li> <li>• MC [ actual (measured) current ]</li> <li>• PC [ programmed (set) current ]</li> <li>• SR [ status register, 2-digit hex ]</li> <li>• FR [ fault register, 2-digit hex ]</li> </ul> Example response: MV (45.201), PV (45), MC (4.3257), PC (10), SR (15), FR (00)
FLT?	Reads Fault Conditional Register. Return 2-digit hex.
FENA	Set Fault Enable Register using 2-digit hex.
FENA?	Reads Fault Enable Register. Returns 2-digit hex.
FEVE?	Reads Fault Event Register. Returns 2-digit hex. Clears bits of Fault Event Register.
STAT?	Reads Status Conditional Register. Returns 2-digit hex.
SENA	Sets Status Enable Register using 2-digit hex.
SENA?	Reads Status Enable Register. Returns 2-digit hex.
SEVE?	Reads Status Event Register. Returns 2-digit hex. Clears bits of Status Event register

Table 4-11: Status control commands

4.8 Status, Error and SQR Registers

4.8.1 General

This section describes the various status error and SRQ (Service Request) Registers structure. The Registers can be read or set via RS232/485 commands. Refer to Fig.4-4 for the Status and Error Registers Diagram.

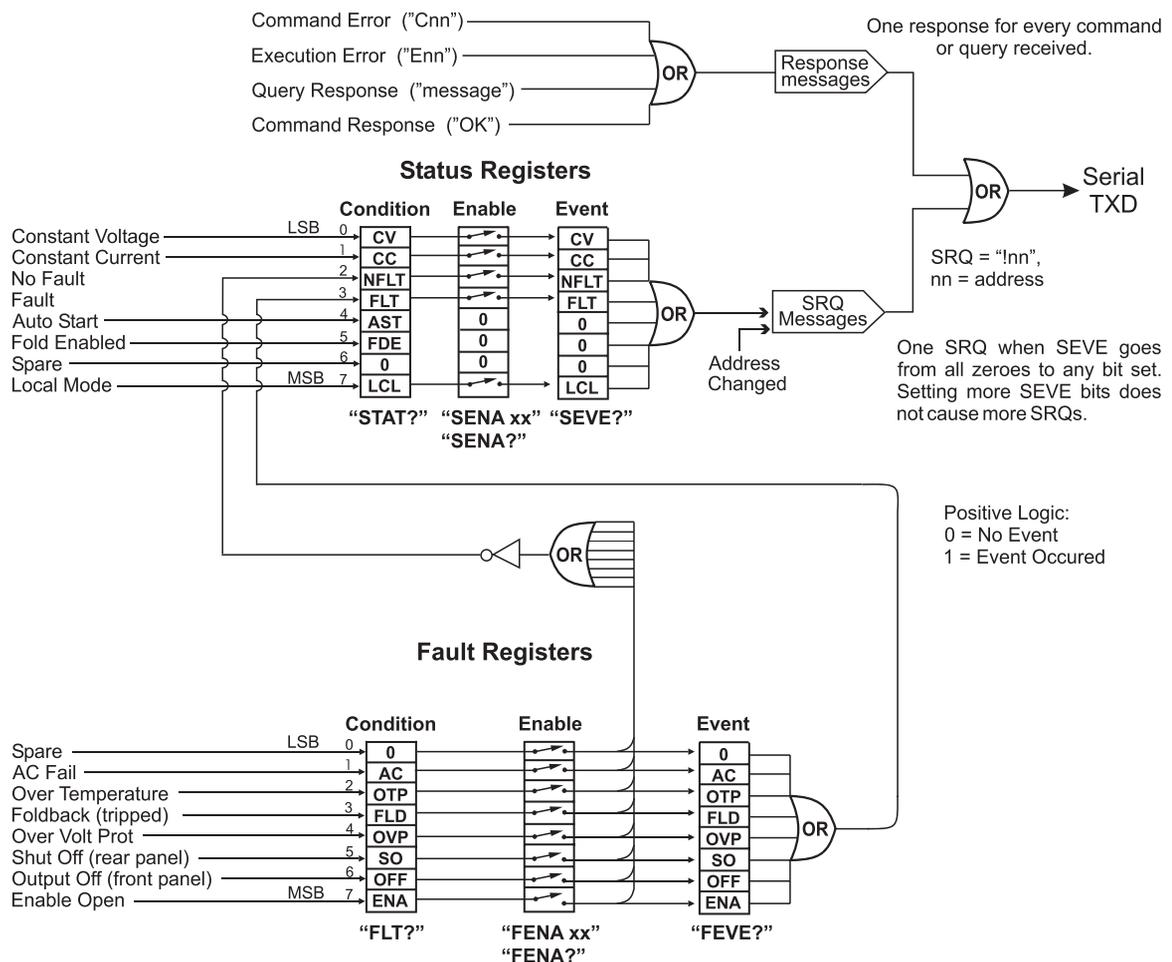


Fig. 4-4: Status and Error Registers Diagram

**4.8.2 Conditional Registers**

The description of the Status Condition Register and Fault Condition Register as shown in Fig. 4-4. 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 4-12 for description of the Status Condition Register bits and Table 4-13 for the Fault Condition Register bits.

Bit	Status name	Status symbol	Bit Set Condition "1"	Bit Reset condition "0"
0(LSB)	Constant Voltage (CV)	CV	Output is ON and the supply in CV	Output is ON and the supply is not in CV.
1	Constant Current (CC)	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. Refer to Table 4-5. "OUT n" command.	One or more faults are active and fault reporting is enabled. (using "FENA xx")
3	Fault Active	FLT	One or more faults are enabled and occur.	Fault Even Register cleared. (FEVE?)
4	Auto-restart	AST	Supply is Auto-restart mode	Supply is Safe start mode
5	-	-	-	-
6	-	-	-	-
7(MSB)	-	-	-	-

\* Reads the Status Condition Register

Table 4-12: Status Condition Register

Response example:

Conditions: Auto-restart mode, CC operating, No Fault.

When send "STAT?" command, It is replied to the SR (Status Register) with "16" (two columns of hex digits).

Method to identify contents of this SR: Convert "16" into binary.

"16" → 0 0 0 1 0 1 1 0

It has been set "1" to 1st, 2nd and 4th bit from the LSB of the Status Condition Register.

Bit	7	6	5	4	3	2	1	0
Status symbol	-	-	-	AST	FLT	NFLT	CC	CV
Convert into binary	0	0	0	1	0	1	1	0

Bit	Fault name	Fault symbol	Bit Set Condition "1"	Bit Reset condition "0"
0 (LSB)	-	-	-	-
1	AC Fail	AC	AC fail has occurred.	The AC Input returns to normal.
2	Over Temperature	OTP	OTP shutdown has occurred.	The supply cools down
3	-	-	-	-
4	Over Voltage Protection	OVP	OVP shutdown has occurred.	The supply output is turn ON by "OUT 1"command.
5	Shut-Off	SO	Shutdown by SO control has occurred. (Refer to 5.5.2)	"SO" condition removed.
6	-	-	-	-
7(MSB)	Enable Open	ENA	Enable terminals(J1-1 & J1-14) opened. (Shutdown) (Refer to 5.5.1)	Enable terminals(J1-1 & J1-14) closed.

\* Reads the Fault Condition Register

Table4-13: Fault Condition Register

Conditions: Shutdown by Enable/Disable control has occurred.

When send "FLT?" command, It is replied to the FR (Fault Register) with "80" (two columns of hex digits)

Method to identify contents of this FR: Convert "80" into binary.

"80" → 1 0 0 0 0 0 0 0

It has been set "1" to 7<sup>th</sup> bit from the LSB of the Fault Condition Register.

Bit	7	6	5	4	3	2	1	0
Fault Symbol	ENA	-	SO	OVP	-	OTP	AC	-
Convert into binary	1	0	0	0	0	0	0	0

### 4.8.3 SRQ (Service Request): Enable Register and Event Register

The description of the Enable Register and Event Register as shown in Fig. 4-4. When a change is detected in a Register bit which is enabled, the power supply will generate a SRQ message. The SRQ message is: “!nn” terminated by CR, where the nn is the power supply address. Refer to Tables 4-14 to 4-17 for details of the enable fault SRQs.

#### 1. Status Enable Register

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

Bit	Status name	Status symbol	Bit Set Condition “1”	Bit Reset condition “0”
0(LSB)	Constant Voltage (CV)	CV	*1) User command: “SENA nn” is received, where nn is hexadecimal bits.	*2) 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)	CC		
2	No Fault	NFLT		
3	Fault Active	FLT	Always zero	Always zero
4	Auto-restart	AST		
5	-	-		
6	-	-		
7(MSB)	-	-	-	-

Table 4-14: Status Enable Register

#### 2. Status Event Register

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.

Bit	Status name	Status symbol	Bit Set Condition “1”	Bit Reset condition “0”
0(LSB)	Constant Voltage (CV)	CV	Changes in status occurs and it is enable. 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. (The Fault Event Register is not cleared by RST)
1	Constant Current (CC)	CC		
2	No Fault	NFLT		
3	Fault Active	FLT	Always zero	
4	-	0		
5	-	0		
6	-	0		
7(MSB)	-	-	-	

Table 4-15: Status Event Register

#### 3. Fault Enable Register

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

Bit	Fault name	Fault symbol	Bit Set Condition “1”	Bit Reset condition “0”
0(LSB)	-	-	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	-	-		
4	Over Voltage Protection	OVP		
5	Shut-Off	SO		
6	-	-		
7(MSB)	Enable Open	ENA		

Table 4-16: Fault Enable Resistor

4. Fault Event Register

The Fault Register will be set when a condition occurs and it is enabled. The Register is cleared when "FEVE?", "CLS", or "RST" commands are received.

Bit	Fault name	Fault symbol	Bit Set Condition "1"	Bit Reset condition "0"
0(LSB)	-	-	Fault condition occurs and it is enabled. That 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 clears the Fault Event Register. (The Fault Event Register is not cleared by RST)
1	AC Fail	AC		
2	Over Temperature	OTP		
3	-	-		
4	Over Voltage Protection	OVP		
5	Shut-Off	SO		
6	-	-		
7(MSB)	Enable Open	ENA		

Table 4-17: Fault Event Register

**CHAPTER 5: ANALOG SIGNAL CONTROL**

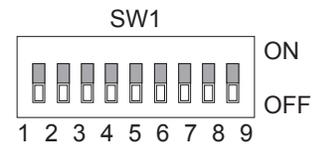
**5.1 Introduction**

This chapter describes operation using the Analog signal control. Setup switch (SW1) and Analog control connector (J1) settings are required in order to perform the Analog signal control. The SW1 selects the method for programming the output voltage and output current limit. The power supply can be set for programming and monitoring of output voltage and current limit using the J1. Even in Analog signal control mode, the power supply can be monitored via the serial communication port.

**5.2 Configuration**

**5.2.1 Setup Switch (SW1)**

The Setup switch is a 9-position DIP switch. Refer to Table 5-1 for description of SW1 position functions.



Position	Function	OFF (Down) (Factory default)	ON (Up)
SW1-1	Output voltage Analog programming	Output voltage programmed by Serial communication	Output voltage programmed by analog external voltage or external resistor. Voltage/Resistor selection via SW1-7.
SW1-2	Output current limit Analog programming	Output current limit programmed by Serial communication	Output current limit programmed by analog external voltage or external resistor. Voltage/Resistor selection via SW1-8.
SW1-3	Programming range (External Voltage / Resistive)	0~5V / 0~5kohm	* Not supported.
SW1-4	Output voltage and current monitoring range	0~5V	* Not supported.
SW1-5	SO (Shut-Off) logic select (Refer to Section 5.5.2)	ON: High (2~15V) or Open OFF: Low (0~0.6V) or Short	ON: Low (0~0.6V) or Short OFF: High (2~15V) or Open
SW1-6	RS232/485 select	RS232 interface	RS485 interface
SW1-7	Output voltage Analog programming	Output voltage programming by external voltage	Output voltage programmed by external resistor.
SW1-8	Output current limit Analog programming	Output current limit programming by external voltage	Output current limit programmed by external resistor.
SW1-9	Enable /Disable control (Refer to Section 5.5.1)	Enable/Disable control is not active	Enable/Disable control is active

Table 5-1: SW1 position functions

**⚠ CAUTION:**

Before making any changes to the SW1 setting, disable the power supply output. Ensure that the output voltage falls to zero and OUT-LED is OFF. Then use any small flat-bladed screwdriver to change the SW1 setting.

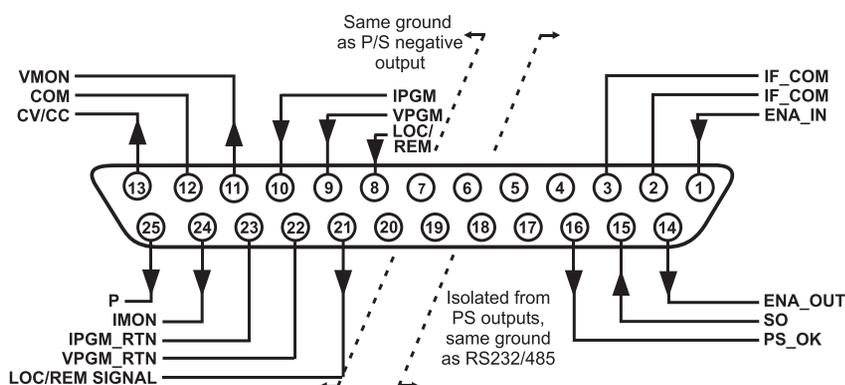
**5.2.2 Analog Control Connector (J1)**

The J1 Analog control connector is a D-SUB 25pin subminiature connector. Refer to Table 5-2 for description of the connector functions.

J1 contact	Signal name	Function	Reference
J1-1	ENA_IN	Enable/Disable the power supply output by dry contact (Short/Open) with ENA_OUT.	Sec. 5.5.1
J1-2 J1-3	IF_COM	Isolated Interface Common. (Return for the SO control,PS_OK signal.)	Sec. 5.4.3, 5.5.2
J1-4~7	N/C	No connection	
J1-8	LOC/REM	Input for selecting between Serial communication control or Analog Signal control of output voltage and output current limit. (Return: COM)	Sec. 5.3
J1-9	VPGM	Input for analog voltage/resistance programming of the output voltage. (Return: VPGM_RTN)	Sec. 5.3
J1-10	IPGM	Input for analog voltage/resistance programming of the output current limit. (Return: IPGM_RTN)	Sec. 5.3
J1-11	VMON	Output for monitoring the power supply output voltage. (Return: COM)	Sec. 5.4.1
J1-12	COM	Control Common. Return for VMON, IMON, CV/CC, LOC/REM signal. Referenced internally to the negative output potential.	Sec. 5.3, 5.4.1, 5.4.2, 5.4.4
J1-13	CV/CC signal	Output for Constant Voltage / Constant Current Mode indication. (Return: COM)	Sec. 5.4.2
J1-14	ENA_OUT	Enable/Disable the power supply output by dry contact (Short/Open) with ENA_IN.	Sec. 5.5.1
J1-15	SO (Shut-off)	Input for Shut-off control of the power supply output. (Return: IF_COM)	Sec. 5.5.2
J1-16	PS_OK signal	Output for indication of the power supply status. (Return: IF_COM)	Sec. 5.4.3
J1-17~20	N/C	No connection	
J1-21	LOC/REM signal	Output for indication of the power supply in Serial communication control or Analog signal control mode. (Return: COM)	Sec. 5.4.4
J1-22	VPGM_RTN	Return for VPGM input. Connected internally to J1-12 (COM) terminal.	Sec. 5.3
J1-23	IPGM_RTN	Return for IPGM input. (Referenced internally to the negative output potential.)	Sec. 5.3
J1-24	IMON	Output for monitoring the power supply output current. (Return: COM)	Sec. 5.4.1
J1-25	P	Output for current balance in parallel operation. Connected internally to J1-24 terminal.	Sec. 3.10

Table 5-2: J1 connector terminals and functions

Describes the specifications of the J1 connector



- J1 connector type: 5747461-3 (Tyco Electronics)
- J1 connector D-SUB 25pin Plug kit: 749809-9 (Tyco Electronics)
- Wire dimension range: AWG 26~22
- Manual pistol grip tool:  
Handle: 58074-1 (Tyco Electronics)  
Head: 58063-2 (Tyco Electronics)

Please note the following content.

**⚠ ⚠ 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.
- It is essential to use plastic body plug to conform with Safety Agency requirements.

**⚠ CAUTION:**

- Before making any connection, turn the AC OFF, disable the power supply output. Ensure that the output voltage falls to zero and LED has turned OFF.
- If a shield is required for J1 wires, connect the shield to a power supply chassis Ground screw.
- The programming return terminals (J1-12, J1-22 and J1-23) are referenced to the -V potential of the power supply. Do not connect these terminals to any potential other than -V, as it may damage the power supply.
- Use isolated power supply to control power supply to avoid voltage generated between -V and programming return.
- To prevent ground loops and to maintain the isolation of the power supply when programming from J1 connector, use an ungrounded programming source.

**NOTE:**

- Radiated emissions, FCC requirements: FCC requirements for radiated emissions, use shielded cable for the analog control signals. In case of using unshielded cable, attach an EMI ferrite suppressor to the cable, as close as possible to the power supply.
- Communication (RS232/485): In Analog signal control, the power supply parameters can be programmed and readback via the communication port except output voltage programming and output current limit programming.

**5.3 Programming of Output Voltage and Output Current Limit**

When performing analog programming, following settings are required.

- J1 setting
- SW1 setting

**5.3.1 External Voltage Programming of Output Voltage and Output Current Limit**

The power supply can be variable output voltage and output current limit proportional to the voltage of the external power supply. Perform the following procedure to set the power supply to external voltage programming.

1. Turn the power supply AC OFF.
2. Perform the connection as shown in Figure 5-1 and the settings shown in Tables 5-3 and 5-4.
  - Short the LOC / REM control (J1-8) and COM (J1-12) or TTL low level.
  - Set up the SW1 positions 1 and 2.  
Output voltage programming : SW1-1 (ON)  
Output current limit programming : SW1-2 (ON)
  - Set up the SW1 positions 3,4,7 and 8 : OFF (Down)
3. Connect the external power supply to the mating plug of J1 as shown in Fig.5-1. Observe correct polarity for the external supply.
4. Set the external supply to the desired levels and turn the power supply ON. And then adjust the external supply to change the power supply output if required.

Fig. 5-2 shows the relationship between the applied voltage and the power supply output.

**J1 connector, rear panel view**

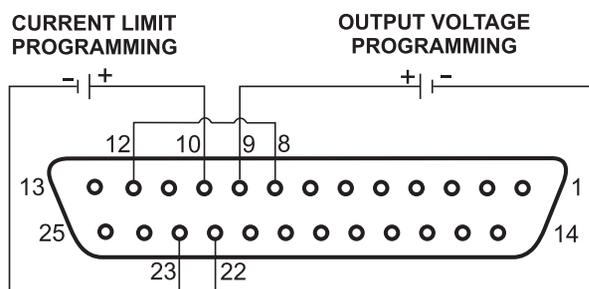


Fig.5-1: External voltage programming connection

	LOC/REM control setting	SW1-1 setting	Control operations
Output voltage programming	Short or TTL Low level (0~0.6V)	ON (Up)	Analog programming control
		OFF (Down)	Serial communication control.
	Open or TTL High level (2~15V)	ON or OFF	

Table 5-3: Setting the output voltage programming by applying external power supply

	LOC/REM control setting	SW1-2 setting	Control operations
Output current limit programming	Short or TTL Low level (0~0.6V)	ON (Up)	Analog programming control
		OFF (Down)	Serial communication control.
	Open or TTL High level (2~15V)	ON or OFF	

Table 5-4: Setting the output current programming by applying external power supply

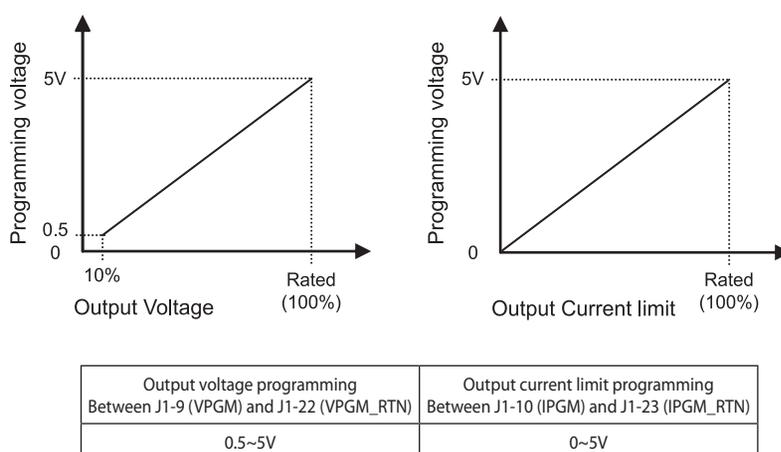


Fig.5-2: The relationship between the programming voltage and the power supply output

**NOTE:**

- SW1 positions 5, 6, and 9 are not required for external voltage programming of output voltage and output current limit. Their setting can be determined according the application.
- The control circuits allow the user to set the output voltage and output current limit up to 5% over the model-rated maximum value. The power supply will operate within the extended range, however it is not recommended to operate the power supply over its voltage and current rating and performance is not guaranteed.
- In Analog signal control, the power supply output voltage and output current limit setting cannot be via the communication port. Analog signal control have priority than Serial communication control.
- Analog signal control may require additional bypass capacitor to avoid miss operation.

**⚠ CAUTION:**

To maintain the isolation of power supply and prevent ground loops, use an isolated external power supply when operating the power supply via Analog programming at J1 connector. The ground of the external power supply should be connected to J1-23 ((IPGM\_RTN) and J1-22 (VPGM\_RTN).

### 5.3.2 Resistive Programming of Output Voltage and Output Current Limit

Internal current sources supply 1mA to generate control voltage across the programming resistors. The control voltage is used as a programming voltage for the power supply. The power supply can be variable the output voltage and output current limit proportional to the external resistors. 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 power supply AC OFF.
2. Perform the connection as shown in Figure 5-3 and the settings shown in Tables 5-5 and 5-6.
  - Short the LOC / REM control (J1-8) and COM (J1-12) or TTL low level.
  - Set up the SW1 positions 1,2,7 and 8.  
 Output voltage programming : Combination of SW1-1 (ON) and SW1-7 (ON)  
 Output current limit programming : Combination of SW1-2 (ON) and SW1-8 (ON)
  - Set up the SW1 positions 3 and 4 : OFF (Down)
3. Connect the programming resistors to the mating plug of J1 as shown in Fig.5-3.
4. Set the programming resistors to the desired resistance and turn the power supply ON.  
 Adjust the resistors to change the power supply output if required.

Fig. 5-4 shows the relationship between the external resistors and the power supply output.

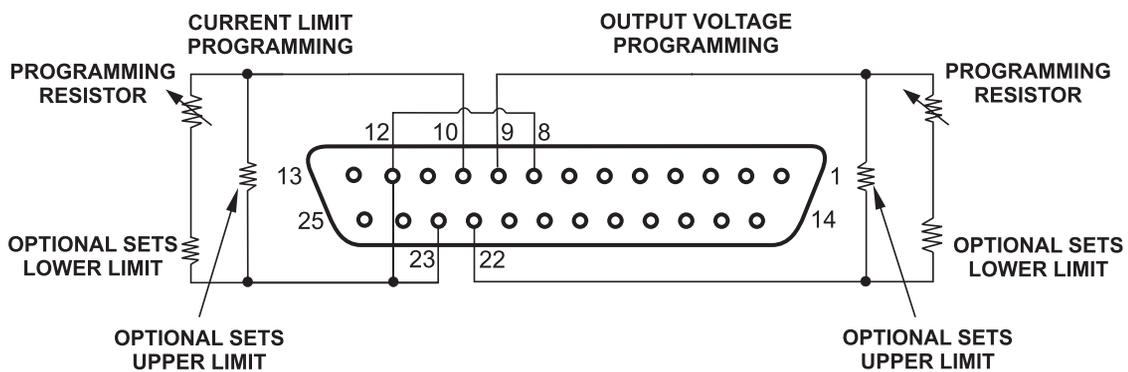


Fig. 5-3: Resistive programming connection

	LOC/REM control setting	SW1-1 and SW1-7 setting	Control operations
Resistive programming of output voltage	Short or TTL Low level (0~0.6V)	ON (Up)	Analog programming control
		OFF (Down)	Serial communication control.
	Open or TTL High level (2~15V)	ON or OFF	

Table 5-5: Setting the output voltage programming by the external resistors

	LOC/REM control setting	SW1-2 and SW1-8 setting	Control operations
Resistive programming of output current limit	Short or TTL Low level (0~0.6V)	ON (Up)	Analog programming control
		OFF (Down)	Serial communication control.
	Open or TTL High level (2~15V)	ON or OFF	

Table 5-6: Setting the output current limit programming by the external resistors

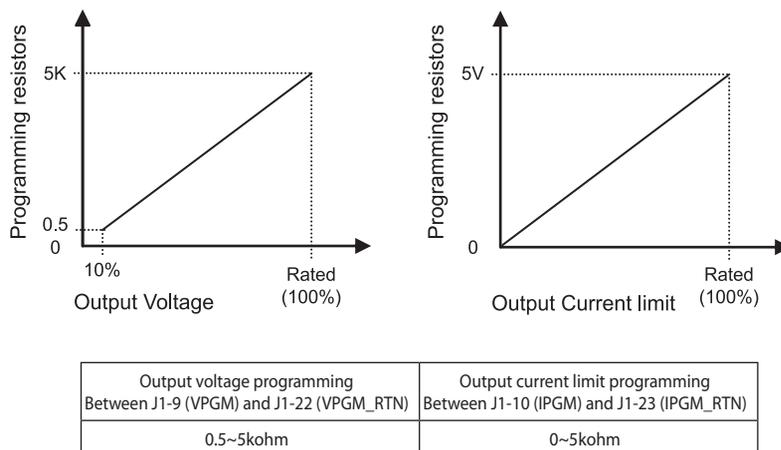


Fig.5-4: The relationship between the programming resistors and the power supply output

**NOTE:**

- SW1 positions 5, 6, and 9 are not required for Resistive programming of output voltage and output current limit. Their setting can be determined according the application.
- The control circuits allow the user to set the output voltage and output current limit up to 5% over the model-rated maximum value. The power supply will operate within the extended range, however it is not recommended to operate the power supply over its voltage and current rating and performance is not guaranteed.
- In Analog signal control, the power supply output voltage and output current limit setting cannot be via the communication port.
- 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 50 ppm.
- In Analog signal control, the power supply output voltage and output current limit setting cannot be via the communication port. Analog signal control have priority than Serial communication control.
- Analog signal control may require additional bypass capacitor to avoid miss operation.

**5.4 Monitoring**

**5.4.1 Output Voltage and Output Current**

The J1 connector provides analog signals for monitoring the output voltage and output current. Table 5-7 is the range of output voltage and current monitoring. The range of monitoring signal voltage are from 0 to 5V. The monitoring signals represent 0 to 100% of the power supply output voltage and output current. This signal is proportional to the 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.

Signal name	Signal function	Monitor terminals		Monitoring range	SW1-4 setting
		Signal (+)	Return (-)		
VMON	Output voltage monitor	J1-11	J1-12	0~5V	OFF (Down)
IMON	Output current monitor	J1-24	J1-12		

Table 5-7: Output voltage and Output current monitoring range

**5.4.2 CV/CC Output Signal**

CV/CC Output signal indicates the operating mode of the power supply, Constant Voltage or Constant Current. CV/CC Output 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). To use this output, connect a pull-up resistor to voltage source of 30Vdc maximum. Choose the pull-up resistor to maintain the sink current less than 10mA. Table 5-8 shows the logic of CV / CC Output signal.

	CV/CC Output signal
Constant Voltage (CV) operation	Open (High)
Constant Current (CC) operation	ON (Low) (maximum sink current: 10mA)

Table 5-8: Logic of CV/CC Output signal

**⚠ CAUTION:**

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

**5.4.3 Power Supply OK Signal (PS\_OK Signal)**

PS\_OK signal indicates fault condition in the power supply. PS\_OK Signal is a TTL signal output at J1-16, referenced to IF\_COM at Table 5-9 shows the logic of PS\_OK Signal.

	PS_OK signal
Normal operation	High (4~5V) (maximum source current: 2mA)
Fault condition in the power supply	Low (0~0.6V) (maximum sink current: 1mA)

Table 5-9: Logic of PS\_OK signal

The following faults will set the PS\_OK Signal to Fault state:

- OTP
- OVP
- AC Fail
- Enable/Disable open (Power supply is disabled)
- SO (Shut-Off : Power supply is shut off)
- Output OFF by Serial communication control

**5.4.4 LOC/REM Signal**

The terminal J1-21 is an open collector output that indicates if this product controlled via Serial communication or Analog signal control. To use this output, connect a pull-up resistor to voltage source of 30Vdc maximum. Choose the pull-up resistor so that the sink current will be less than 10mA when the output is in low state. J1-12 (COM) is the reference potential. Table 5-10 shows the logic of LOC/REM signal.

J1-8 (LOC/REM)	SW1-1 (Output voltage programming)	SW1-2 (Output current limit programming)	LOC/REM signal
Short or TTL Low	ON (Up)	ON (Up)	ON (Low) (maximum sink current: 10mA)
	ON (Up)	OFF (Down)	
	OFF (Down)	ON (Up)	
	OFF (Down)	OFF (Down)	Open (High)
Open or TTL High	ON or OFF	ON or OFF	

\* Refer to Tables 5-3 to 5-6 for details.

Table 5-10: Logical LOC/REM signal

**⚠ CAUTION:**

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

## 5.5 Output ON/OFF Control

### 5.5.1 Enable/Disable Control

This function is enabled or disabled by SW1 Setup switch position 9.

The terminal 1 and 14 of J1 serve as Output Enable/Disable by switch or relay. This function is available when output command is "ON". Refer to Table 5-11 for Enable/disable function and SW1-9 setting.

SW1-9 setting	Enable/Disable input Between J1-14 and J1-1	Power supply Output	ALARM- LED indicator
OFF (Down) (Default)	Open or Short	ON	OFF
ON (Up)	Open	OFF	Blinking
	Short	ON	OFF

Table 5-11: Output Enable/disable function 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.
- The maximum terminal voltage between J1-14 (ENA\_OUT) and J1-1 (ENA\_IN) is 6V.

**NOTE:**

When Output OFF by the Enable/disable function, "OUT 1" command disabled and the power output cannot be ON, also cannot change the start-up mode (Auto-restart mode or Safe start mode).

### 5.5.2 Output Shut-OFF (SO) Control

J1 terminal 15 is the SO signal input and terminals 2 and 3, IF\_COM are the signal return. The SO function will be activated only when a transition from ON to OFF is detected after applying AC power to unit. (Thus, in Auto-restart mode, output will be enabled after applying AC power, even if SO is in OFF level). Refer to Table 5-12 for SO control logic and SW1-5 setting. The SO terminals accept a 2.5V to 15V signal or Open-Short contact to disable or enable the power supply output. The SO control logic can be selected by SW1 setup.

This function is useful for connecting the power supplies in a "Daisy-chain" (Refer to Section 3.11). Also the SO control can be used also to reset the OVP (Refer to Section 3.4).

SW1-5 setting	SO signal level Between J1-15 and J1-2,3	Power supply Output	ALARM- LED indicator
OFF (Down) (Default)	Low (0~0.6V) or Short	Shut-Off	OFF
	High (2~15V) or Open	ON	OFF
ON (Up)	High (2~15V) or Open	Shut-Off	OFF
	Low (0~0.6V) or Short	ON	OFF

Table 5-12: SO logic selection

**⚠ CAUTION:**

In Auto-restart mode, the output will be enabled after applying AC power, even if SO is in Off level.

**NOTE:**

With the Output OFF by the "OUT 1" command, the SO function cannot be used. Use in status of output ON.

**CHAPTER 6: MAINTENANCE**

**6.1 Introduction**

This chapter provides information about maintenance, calibration and troubleshooting.

**6.2 Periodic Maintenance**

In order to maintain the good performance of this product over time, please clean regularly. The intake and exhaust holes covered with dust may cause temperature rise in this product. And may not deliver expected performance. To clean, disconnect the unit from the AC supply and allow 2 minutes for discharging internal voltage. The metal surfaces should be cleaned using mild solution of detergent and water. The solution should be applied to 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.

**6.3 Adjustments and Calibration**

No internal adjustment or calibration is required.

**6.4 Fan Life Expectancy**

The fan-life has limitations. Therefore periodic maintenance by replacing a life-expired fan is required. Please note that fan-life depends on the environment (temperature, humidity, dust, etc.). The built-in fan replacement is charged. Please contact TDK-Lambda sales office. The following Figure 6-1 shows the life of fan.

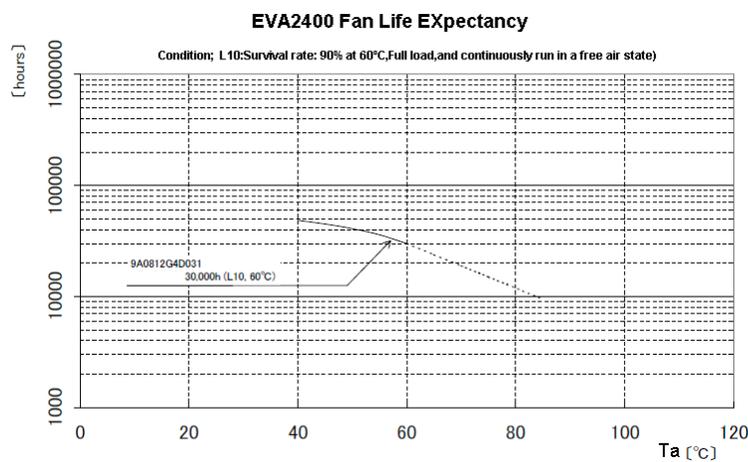


Figure 6-1: Fan life expectancy

**6.5 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 Instruction manual. In case of failure, unusual or erratic operation of the unit, contact a TDK-Lambda sales or service facility nearest you.

**6.6 Troubleshooting**

If the power supply appears to operating improperly, use the troubleshooting guide to determine whether the power supply, load or external control circuits are the cause. Configure the power supply for basic operation and perform tests in Section 2.6 to determine if the problem exists within the power supply. Table 6-1 provides the basic checks that can be performed to diagnose problems.

Symptom	Check	Action	Reference
No output. All indicators are blank. No fan working.	Is the AC power cord defective?	Check continuity, replace if necessary.	Sec. 2.5
	Is the AC input voltage within range?	Check input AC voltage. Connect to appropriate voltage source.	Sec. 2.5
No output. All indicators are blank.	When Serial communication is used Is the unit in Safe start mode ? Is the unit in Cont off ? The reply of "AST?" is "AST 0" The reply of "mode?" is "OFF"	Send the command: "OUT 1" to turn on.	Sec. 2.6, 3.3, 4.7
	When Analog signal control is used Is the unit in Safe start mode ?	Send the command: "AST 1" by communication port.	Sec. 3.3, 4.7
	Is the Output off by SO (Shut-Off) ? The reply of "FLT?" is "20" (SO).	Check J1 connector for Output Shut-Off connection.	Sec. 5.5.2, 4.7
Output is present momentarily but shuts off quickly. Rear panel "ALARM- LED" is blinking.	Does the AC source voltage sag when load is applied? The reply of "FLT?" is "02" (AC).	Check input AC voltage. Connect to appropriate voltage source.	Sec. 2.5, 4.7
	Over Voltage Protection circuit is tripped. The reply of "FLT?" is "10" (OVP).	Check load connections. If Analog signal control is used, check if the OVP is set lower than the output.	Sec. 3.4, 4.7
No output. Rear panel "ALARM- LED" is blinking.	Is the Output off by Enable/Disable? The reply of "FLT?" is "80" (ENA)	Check J1 connector for Enable/Disable connection.	Sec. 5.5.1
	The reply of "FLT?" is "04" (OTP).	Check if air intake and exhaust are blocked. Check if the unit is installed adjacent to heat generating equipment.	Sec. 3.6, 4.7
Output voltage will not adjust. Rear panel "CC- LED" is on.	Is the unit in constant current mode?	Check current limit setting and load current.	Sec. 3.2
Output current will not adjust. Rear 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.	Sec. 3.4, 3.5
Large ripple present in output.	Is the voltage drop on the load wire high?	Minimize the drop on the load wires.	Sec. 2.7
Poor Load regulation. Rear panel "CV- LED" is on.	Is J2 fitted correctly?	Fit J2 correctly.	Sec. 2.8

Table 6-1: Troubleshooting guide

CHAPTER 7: SPECIFICATIONS

7.1 Output Rating

MODEL	-	EVA 150-16	EVA 300-8	EVA 600-4
Rated Output Voltage (*1)	V	150	300	600
Rated Output Current (*2)	A	16	8	4
Rated Output Power (*1)	W	2400		

7.2 Input Characteristics

MODEL	-	EVA 150-16	EVA 300-8	EVA 600-4
Input Voltage Range / Frequency (*3)	-	Single Phase AC 170 ~ 265V / 47 ~ 63Hz		
Efficiency (Typ.) (*4)	%	88		
Maximum Input Current (*4)	A	16.6		
Power Factor (Typ.) (*4)	-	0.99		
Inrush Current (*5)	A	Less than 50		

7.3 Constant Voltage Mode

MODEL	-	EVA 150-16	EVA 300-8	EVA 600-4
Maximum Line Regulation (*6)	-	0.1% of rated output voltage + 20mV		
Maximum Load Regulation (*7)	-	0.15% of rated output voltage + 50mV		
Ripple and Noise (p-p, 20MHz) (*8)	mVp-p	150	300	450
Ripple (r.m.s, 5Hz~1MHz)	mVRMS	50	100	150
Temperature Coefficient	ppm/deg C	100		
Warm-up drift	-	Less than 0.2% of Rated Output Voltage over 30min following power on.		
Remote Sense Compensation	-	No Remote sense available		
Up-prog. Response time (0-Vomax) (*9)	ms	100	150	300
Down-prog. Response time (Vomax-0)	Full Load (*9)	200	300	600
	No Load (*10)	2500	3500	6500
Transient Response Time	-	Less than 2ms. (Time for output voltage to recover within 0.5% of its rated output, at 10~90% of rated output current. Output set-point: 10~100%, Local sense.)		
Hold-up time (Typ.)	-	10ms Typical. At rated output power.		

7.4 Constant Current Mode

MODEL	-	EVA 150-16	EVA 300-8	EVA 600-4
Maximum Line Regulation (*6)	-	0.1% of rated output current + 20mA		
Maximum Load Regulation (*11)	-	0.15% of rated output current + 50mA		
Ripple (r.m.s, 5Hz~1MHz) (*12)	mA	60	30	15
Temperature coefficient	ppm/deg C	100		
Warm-up drift	-	Less than 0.4% of Rated Output Current over 30min following power on.		

7.5 Auxiliary Outputs

Output Voltage: 15V (*14)	15V±5%, 0.2A Max Load Ripple & Noise: 100mVp-p. Referenced internally to the negative output potential.
Output Voltage: 5V (*14)	5V±5%, 0.2A Max Load Ripple & Noise: 100mVp-p. Referenced internally to IF_COM potential.

7.6 Analog Programming and Monitoring

Vout Voltage Programming	10~100%, Programming Voltage: 0.5~5V Accuracy and Linearity: +1% of rated Vout.
Iout Voltage Programming (*13)	0~100%, Programming Voltage: 0~5V Accuracy and Linearity: +1% of rated Iout.
Vout Resistor Programming	10~100%, Programming Resistor: 0.5~5 kohm full scale. Accuracy and Linearity: +2% of rated Vout.
Iout Resistor Programming (*13)	0~100%, Programming Resistor: 0~5 kohm full scale. Accuracy and Linearity: +2% of rated Iout.
ON/OFF Control	By electrical Voltage: 0~0.6V / 2~15V or dry contact. SW1-5 User Selectable Logic
Default SO Control: SW1-5 Down	Default: OFF: Low (0~0.6V) or Short ON: High (2~15V) or Open
Output Current Monitor (*13)	Monitoring Voltage: 0~5V, Accuracy: ±1%
Output Voltage Monitor	Monitoring Voltage: 0~5V, Accuracy: ±1%
Power Supply OK Signal	500 ohm series resistance. OK: H (4 ~ 5V) Fail: L (0~0.6V)
Parallel Operation	Possible, up to 4units in Master/Slave mode with two wires current balance connection.
Series Operation	No Series Operation available
CV/CC Output signal	Open Collector. Maximum Voltage: 30V, Maximum sink current 10mA. CV mode: Open (High), CC mode: ON (Low)
Enable/Disable input (At SW1-9: Up)	Dry contact. Maximum voltage at Enable/Disable input: 6V. Output OFF: Open, Output ON : Short
Local/Remote Analog Control (At SW-1 and /or SW1-2: Up)	By electrical signal or Open/Short: Local(Serial communication control): High (2~15V) or Open Remote (Analog signal control): Low (0~0.6) or Short
Local/Remote Analog Indicator (At SW-1 and /or SW1-2: Up)	Open Collector. Maximum Voltage: 30V, Maximum sink current 10mA. Local (Serial communication control): Open, Remote (Analog signal control): ON

7.7 Programming and Read Back (RS232/485)

MODEL	-	EVA 150-16	EVA 300-8	EVA 600-4
Vout Programming Accuracy	-	Within 150mV	Within 300mV	Within 600mV
Iout Programming Accuracy (*13)	-	Within 48mA	Within 24mA	Within 12mA
Vout Programming Resolution	-	Within 18mV	Within 36mV	Within 72mV
Iout Programming Resolution	-	Within 1.92mA	Within 0.96mA	Within 0.48mA
Vout Readback Accuracy	-	300mV	600mV	1200 mV
Iout Readback Accuracy (*13)	-	96mA	48mA	24mA
Vout Readback Resolution	-	Within 18mV	Within 36mV	Within 72mV
Iout Readback Resolution	-	Within 1.92mA	Within 0.96mA	Within 0.48mA

**7.8 Protection Functions**

Over Voltage Protection (OVP)	Inverter shut-down, manual reset by AC input recycle or by communication port command.
Over Voltage Trip Point	10%~110% of rated output voltage. (Default: 110%) Preset by communication port.
Output Under Voltage Limit (UVL)	Prevents from adjusting Vout below limit. Preset by communication port. Does not available in Analog programming.
Over Temperature Protection (OTP)	Inverter-shut-down. User selectable latched or non latched (depends on start mode) Preset by communication port.

**7.9 Rear Panel Indications**

Indications CV Mode	Green LED for CV Mode operation
Indications CC Mode	Green LED for CC Mode operation
Indications OUT Indicator	Green LED, Lights when the Output is "ON"
Indications ALARM Indicator	Red LED, Blinks in case of fault condition (OVP, OTP, Output OFF by Enable, AC Fail)

**7.10 Environmental Conditions**

Operating Temperature	-10 ~ +45 deg C	--- 2400W (100% Load)
	+50 deg C	--- 2000W (83% Load)
	+60 deg C	--- 1200W (50% Load)
	+70 deg C	--- 240W (10% Load)
	+45 ~ +70 deg C	--- Derate load by 3.6% /deg C
Storage Temperature	-20 ~ +85 deg C	
Operating Humidity	20 ~ 90% RH (No condensation)	
Storage Humidity	10 ~ 95% RH (No condensation)	
Altitude	Maximum 2000 m	

**7.11 Mechanical**

Cooling	-	Forced air cooling by internal fans.
Weight (Typ.)	kg	Less than 7.5
Size (W x H x D)	mm	250 x 86 x 445 (W x H x D) Refer to Outline Drawing.
Vibration	-	MIL-810F, method 514.5 No operating, 10.2m/s <sup>2</sup> (1.04G) constant 10 ~ 500Hz X,Y,Z each 1Hr.
Shock	-	Less than 196.1m/s <sup>2</sup> (20G), half sine, 11ms. Unit is Unpacked, No operating.

**7.12 Safety**

Withstand Voltage	Primary - Secondary Hazardous	4000VDC (1min.) * Secondly Hazardous: Output / 15Vdc AUX. / Non Insulated Control)
	Primary - SELV (*15)	4242VDC (1min.) * SELV: Communication / 5Vdc AUX. / Insulated Control
	Primary - Ground	2828VDC (1min.)
	Secondary Hazardous - SELV (*15)	3550VDC (1min.) * Secondly Hazardous: Output / 15Vdc AUX. / Non Insulated Control) * SELV: Communication / 5Vdc AUX. / Insulated Control
	Secondary Hazardous - Ground	2828VDC (1min.) * Secondly Hazardous: Output / 15Vdc AUX. / Non Insulated Control)
Isolation Resistance (Secondary Hazardous - Ground)	More than 100 Mohm (at 25 deg C, 70%RH)	
Safety	UL 60950-1: 2007(Ed.2), IEC 60950-1: 2005 (Ed.2), EN 60950-1: 2006(Ed.2)+A11: 2009	

**7.13 EMC**

Immunity	Design to meet IEC61000-4-2 (Level3, 2), -3 (Level2), -4 (Level3), -5 (Level3), -6 (Level2), -8 (Level1), -11
Conductive Emission	Design to meet EN55022-classA, FCC Part15-classA, VCCI-classA
Radiated Emission	Design to meet EN55022-classA, FCC Part15-classA, VCCI-classA

**NOTES:**

- \*1: Minimum voltage is guaranteed to maximum 10% of the rated output voltage.
- \*2: Minimum current is guaranteed to maximum 1% of the rated output current.
- \*3: For cases where conformance to various safety standards (UL, IEC etc.) is required, to be described as 190~240VAC (50/60Hz).
- \*4: At 200VAC input with rated output power.
- \*5: Not including EMI filter inrush current, less than 0.2ms.
- \*6: At 170~265VAC, constant load
- \*7: From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.
- \*8: For 150V, 300V models: measured with JEITA RC-9131A (1:1) probe. For 600V model: measured with 10:1 probe.
- \*9: From 10% to 90% or 90% to 10% of rated output voltage, with rated, resistive load.
- \*10: From 90% to 10% of rated output voltage.
- \*11: For load voltage change, equal to the unit voltage rating, constant input voltage.
- \*12: The ripple is measured at 10~100% of rated output voltage and rated output current.
- \*13: The Constant Current programming readback and monitoring accuracy does not include the warm-up and load regulation thermal drift.
- \*14: Measured with JEITA RC-9131A (1:1) probe.
- \*15: SELV (Safety Extra Low Voltage): When Main Output is floating at any Output Voltage, or main output is grounded and output voltage ≤400Vdc, Communication, 5Vdc AUX and insulated Control circuits meet all requirements of the Standard for SELV circuits.  
When Main Output is grounded and Output Voltage >400Vdc, Communication, 5Vdc AUX and insulated Control circuits are Hazardous.

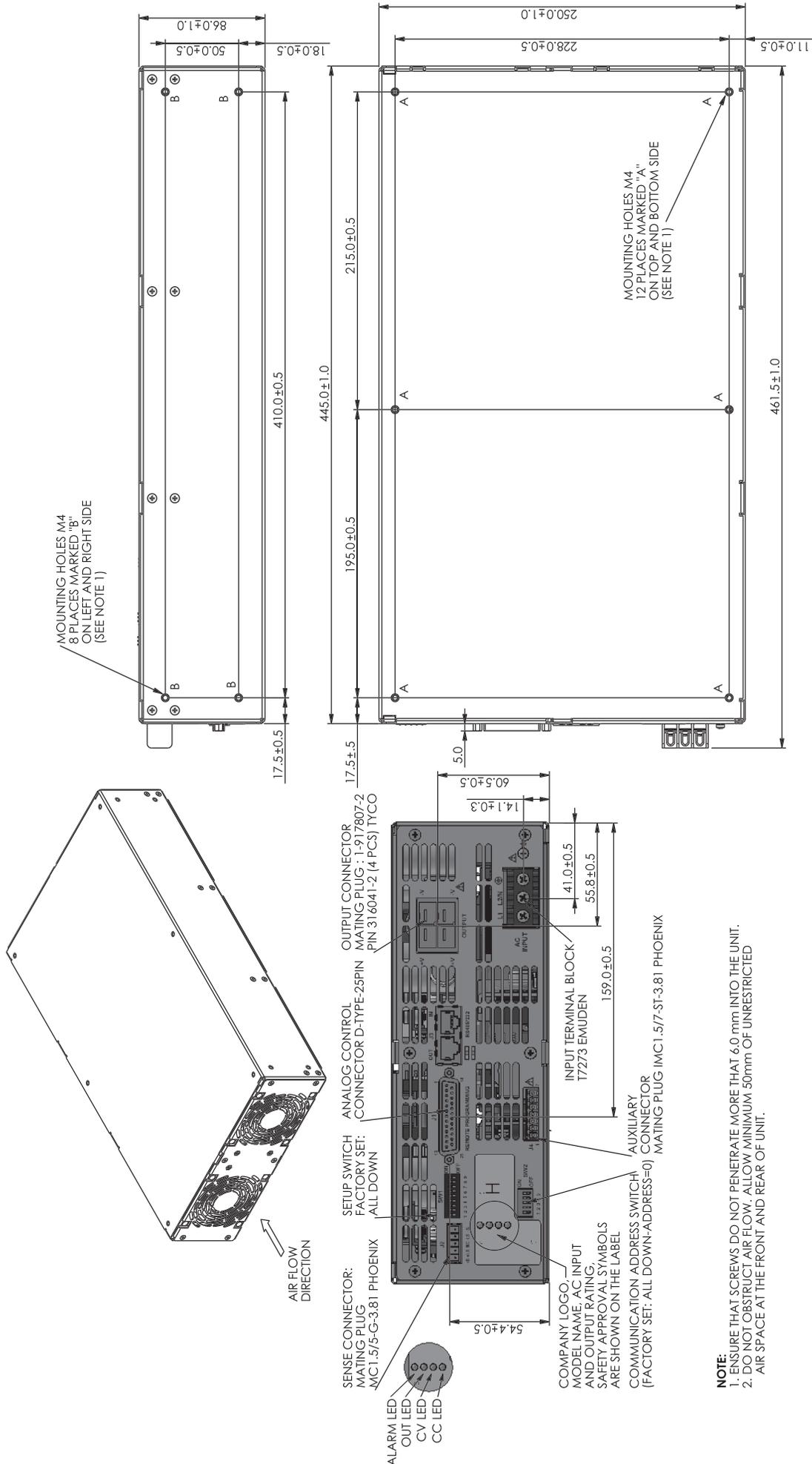
### **7.14 Supplemental Characteristics**

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.  
EMI characteristics (Conductive Emission and Radiated Emission) included in the Evaluation Data.
2. Reliability Data: Reliability performance of the power supply.
3. EN61000 Data: Performance of the power supply under EN61000 test conditions.

The supplemental characteristics data is held in each TDK-Lambda sales and service facility. For further details, please contact the TDK-Lambda office nearest you. And we also provide the information on our web site. (<http://www.tdk-lambda.com>).

**7.15 EVA2400 Outline Drawing**



**NOTE:**  
 1. ENSURE THAT SCREWS DO NOT PENETRATE MORE THAN 6.0 mm INTO THE UNIT.  
 2. DO NOT OBSTRUCT AIR FLOW; ALLOW MINIMUM 50mm OF UNRESTRICTED AIR SPACE AT THE FRONT AND REAR OF UNIT.



