FPS-S1U RACK INSTRUCTION MANUAL

	FPS-S1U RACK SPECIFICATIONS		
1	Number of power supply modules (*1)	---	Maximum 3 x FPS1000 modules of the same output voltage rating.
2	Maximum output power (*2)	W	3000
3	Input voltage / frequency range (*3)	---	85~265Vac continuous, 47~63Hz, Single phase
4	Maximum input current (at 100/200Vac)	A	12.0/6.0 for each FPS1000 unit installed
5	AC input connector	---	FPS-S1U :IEC inlet for each power supply module . FPS-S1U/P :None
6	Output terminals	---	Bus-bars.Refer to outline drawing.
7	Remote sensing (*4)	V	Possible.
8	Parallel operation	---	Possible. Up to 3 racks with max 8 FPS 1000 units of the same voltage and current rating.
9	Series operation (*5)	---	Possible. Up to 2 racks of the same voltage and current rating
10	Remote On/Off control	---	Separate control for each FPS 1000 unit , By electrical signal or dry contact ON: 0~0.6V or short. OFF: 2~15V or open.
11	DC_OK signal	---	Separate control for each FPS1000 unit, Open collector signal. On when Vout ≥80% +/-5%. Max.sink current: 10mA
12	AC fail signal	---	Separate control for each FPS1000 unit ,Open collector signal. Refer to Instruction Manual
13	Over Temperature alarm signal	---	Separate control for each FPS1000 unit ,Open collector signal. Refer to Instruction Manual
14	Vout voltage trimming	---	Possible, via separate control for each FPS1000 unit .Refer to Instruction Manual.
15	Auxiliary power supply	---	11.2~12.5VDC.Maximum output current:0.25A*Number of installed FPS1000 units.
16	Operating temperature	---	0~50°C: 100% load. Derate 2%/°C, 50°C to 60°C.
17	Storage temperature	---	-30~85°C
18	Operating humidity	---	10~90% RH, no condensation.
19	Storage humidity	---	10~90% RH, no condensation.
20	Vibration	---	Built to meet ETS 300 019
21	Shock	---	Built to meet ETS 300 019
22	Applicable safety standards	---	UL60950-1, EN60950-1
23	Withstand voltage	---	Input-Output: 3000Vrms, 1min. Input-Ground: 2000Vrms, 1min. Output-Ground: 500Vrms, 1min.
24	Insulation resistance	---	More than 100Mohm at 25°C and 70% RH. Output-Ground: 500Vdc
25	Weight (Typ)	Kg	3.7
26	Size (W*H*D)	---	440x44x351mm. Refer to Outline Drawing.
27	Warranty	Yr	Two Years

Notes:

*1: The Output of all the FPS1000 modules are connected in parallel in the rack.

*2: For input voltage lower than 100Vac, maximum output power derated by 10% of the power rating.

*3: For cases where conformance to to various safety standards (UL, EN etc.) is required, to be described as 100-240Vac (50/60Hz).

*4: Remote sensing can compensate up to 1V drop on each load wire.

*5: Not apllicable for units with I^2C bus option.

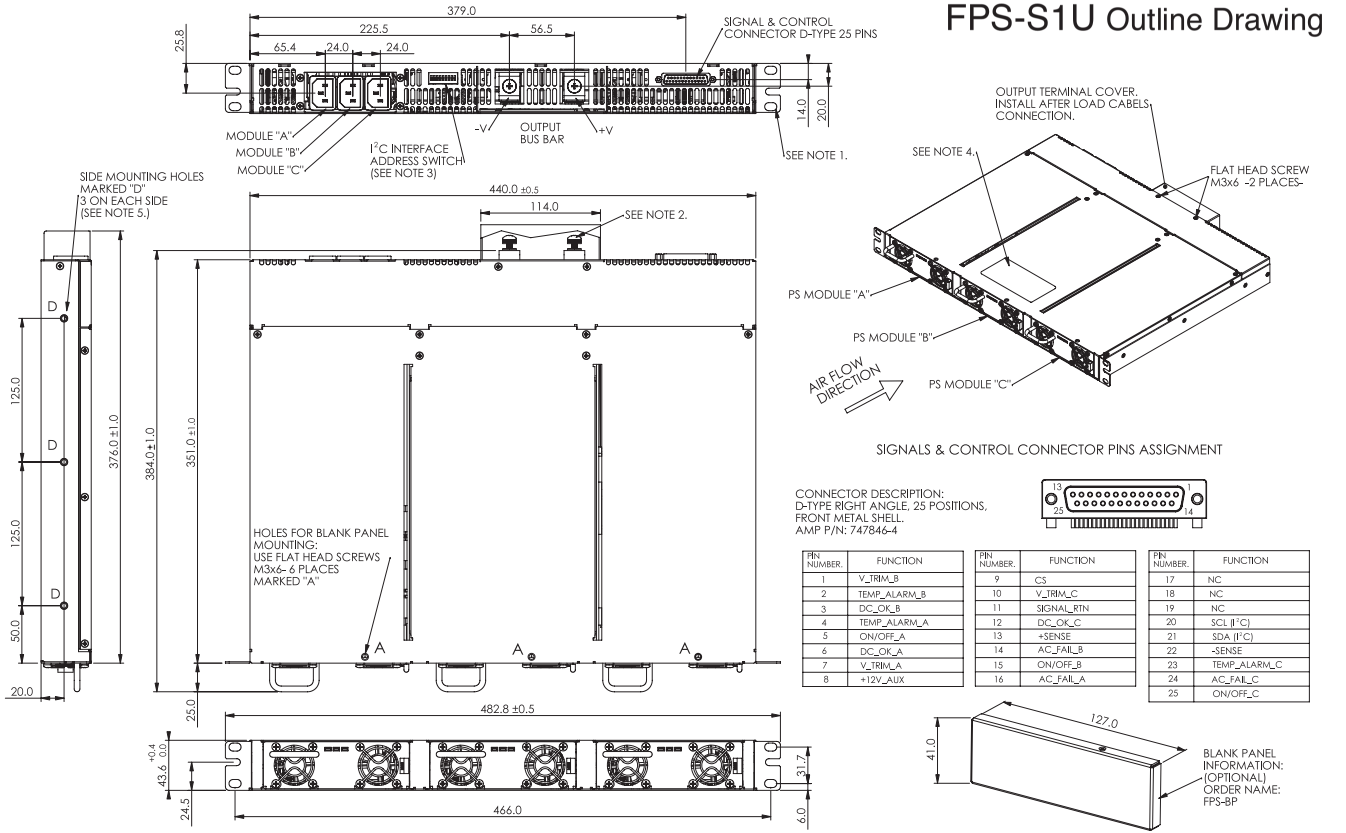
REAR PANEL IN/OUT CONNECTOR PINS FUNCTION DESCRIPTION

Refer to the following table for description of the control and supervisory signals provided at the rear In/Out connector.
Refer to Fig. 1-1~6-1 for typical connections for operation.

Pin No	Function	Description
1	V_TRIM_B	Connection for output voltage trimming of FPS1000 unit "B". The voltage can be trimmed within its range specifications.
2	TEMP_ALARM_B	Open collector signal, referenced to pin 11 (Signal Return). On when the internal temperature of FPS1000 unit "B" is within safe limit, Off approx. 10°C below Thermal shut down. The maximum sink current is 10mA and the maximum external voltage is 15V.
3	DC_OK_B	Open collector signal, referenced to pin 11 (Signal Return). On when the output voltage of FPS1000 unit "B" is higher than Vout ≥ 80% +/-5%. The maximum sink current: 10mA and the maximum external voltage is 15V.
4	TEMP_ALARM_A	Open collector signal, referenced to pin 11 (Signal Return). On when the internal temperature of FPS1000 unit "A" is within safe limit, Off approx. 10°C below Thermal shut down. The maximum sink current is 10mA and the maximum external voltage is 15V.
5	ON/OFF_A	Turns the output of FPS1000 unit "A" to On and Off by electrical signal or dry contact between pin 5 and pin 11 (Signal Return). 0~0.6V or Short: On, 2~15V or Open: Off. The maximum sink current is 2.6 mA
6	DC_OK_A	Open collector signal, referenced to pin 11 (Signal Return). On when the output voltage of FPS1000 unit "A" is higher than Vout ≥ 80% +/-5%. The maximum sink current: 10mA and the maximum external voltage is 15V.
7	V_TRIM_A	Connection for output voltage trimming of FPS1000 unit "A". The voltage can be trimmed within its range specifications.
8	+12V_AUX	Auxiliary voltage output, 11.2~12.5V, referenced to pin 11 (Signal Return). The maximum load current is 0.25A. This output has built in Oring diode and is not controlled by the On/Off control.
9	CS	Current sharing signal. When FPS-S1U racks are connected in parallel, the CS pins of the units should be connected to allow current balance between units.
10	V_TRIM_C	Connection for output voltage trimming of FPS1000 unit "C". The voltage can be trimmed within its range specifications.
11	SIGNAL_RETURN	Return for the following control and supervisory signals: On/Off, DC_OK, Over_temperature Alarm, AC_Fail, Auxiliary 12V supply. The Signal return is isolated from the output terminals.
12	DC_OK_C	Open collector signal, referenced to pin 11 (Signal Return). On when the output voltage of FPS1000 unit "C" is higher than Vout ≥ 80% +/-5%. The maximum sink current: 10mA and the maximum external voltage is 15V.
13	+SENSE	Positive sensing. The +Sense signal should be connected to the positive terminal of the load. The +Sense and -Sense leads should be twisted pair to minimize noise pick-up effect. The maximum load wires drop compensation is 1V/wire.
14	AC_FAIL_B	Open collector signal, referenced to pin 11 (Signal Return). On when the input voltage of FPS1000 unit "B" is ≥85Vrms. The maximum sink current is 10mA, and the maximum external voltage is 15Vdc.
15	ON/OFF_B	Turns the output of FPS1000 unit "B" to On and Off by electrical signal or dry contact between pin 15 and pin 11 (Signal Return). 0~0.6V or Short: On, 2~15V or Open: Off. The maximum sink current is 2.6 mA
16	AC_FAIL_A	Open collector signal, referenced to pin 11 (Signal Return). On when the input voltage of FPS1000 unit "A" is ≥85Vrms. The maximum sink current is 10mA, and the maximum external voltage is 15Vdc.
17	NC	Not connected
18	NC	Not connected
19	NC	Not connected
20	SCL (I^2C)	Serial Clock used in the I^2C interface option. Refer to the I^2C interface description in the FPS1000 Instruction Manual.
21	SDA (I^2C)	Serial Data used in the I^2C interface option. Refer to the I^2C interface description in the FPS1000 Instruction Manual.
22	-SENSE	Negative sensing. The -Sense signal should be connected to the negative terminal of the load. The -Sense and +Sense leads should be twisted pair to minimize noise pick-up effect. The maximum load wires drop compensation is 1V/wire.
23	TEMP_ALARM_C	Open collector signal, referenced to pin 11 (Signal Return). On when the internal temperature of FPS1000 unit "C" is within safe limit, Off approx. 10°C below Thermal shut down. The maximum sink current is 10mA and the maximum external voltage is 15V.
24	AC_FAIL_C	Open collector signal, referenced to pin 11 (Signal Return). On when the input voltage of FPS1000 unit "C" is ≥85Vrms. The maximum sink current is 10mA, and the maximum external voltage is 15Vdc.
25	ON/OFF_C	Turns the output of FPS1000 unit "C" to On and Off by electrical signal or dry contact between pin 25 and pin 11 (Signal Return). 0~0.6V or Short: On, 2~15V or Open: Off. The maximum sink current is 2.6 mA

Table 1: Rear In/Out connector pins function description (J1)

FPS-S1U Outline Drawing



SIGNALS & CONTROL CONNECTOR PINS ASSIGNMENT

CONNECTOR DESCRIPTION:
D-TYPE RIGHT ANGLE, 25 POSITIONS,
FRONT METAL SHELL.
AMP P/N: 747846-4

PIN NUMBER.	FUNCTION
1	V_TRIM_B
2	TEMP_ALARM_B
3	DC_OK_B
4	TEMP_ALARM_A
5	ON/OFF_A
6	DC_OK_A
7	V_TRIM_A
8	+12V_AUX

PIN NUMBER.	FUNCTION
9	CS
10	V_TRIM_C
11	SIGNAL_RTN
12	DC_OK_C
13	+SENSE
14	AC_FAIL_B
15	ON/OFF_B
16	AC_FAIL_A

PIN NUMBER.	FUNCTION
17	NC
18	NC
19	NC
20	SCL (I²C)
21	SDA (I²C)
22	-SENSE
23	TEMP_ALARM_C
24	AC_FAIL_C
25	ON/OFF_C

NOTES
1. MOUNTING HOLES FOR 19" RACK. USE M6x12 TO FIX THE UNIT TO A RACK.
2. M6x16 SCREWS FOR LOAD WIRES FIXING. USE M6 LUG FOR THE LOAD WIRES. RECOMMENDED TIGHTENING TORQUE 42~56 Kgf.cm
3. REFER TO INSTRUCTION MANUAL FOR SETTING DETAILS.
4. MODEL NAME , VOLTAGE AND CURRENT RATING AND SAFETY APPROVALS SYMBOLS WILL BE SHOWN HERE ACCORDING TO THE SPECIFICATIONS.
5. MOUNTING HOLES M5 FOR MOUNTING BRACKETS . USE M5x8 SCREWS TO FIX THE BRACKETS TO THE CHASSIS. SCREWS MUST NOT PENETRATE THE CHASSIS MORE THAN 6 mm.
6. THE FPS-S1U RACK IS SHOWN WITH 3 FPS1000 UNITS INSTALLED.

FPS-S1U RACK SAFETY INSTRUCTIONS

SAFETY APPROVALS

UL 60950-1 and CSA22.2 No.60950-1 - UL Recognized. C-UL for Canada.
IEC 60950-1 - CB Report and Certificate.
EN 60950-1 - CE mark.
Marking by the CE Symbol indicates compliance to the Low Voltage Directive of the European Union.
A "Declaration of Conformity" in accordance with the preceding directives and standards has been made and is on file at our EU representative TDK LAMBDA UK, located at Kingsley Avenue, Ilfracombe, Devon EX34 8ES, UK.
A "Declaration of Conformity" may be accessed via company website www.uk.tdk-lambda.com/technical-data

SAFETY INSTRUCTIONS

CAUTION**:** The following safety precaution must be observed during all phases of operation, service and repair of this equipment.Failure to comply with the safety precautions or warnings in this document violates safety standards of design, manufacture andintended 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.

Vorsicht**:** Die folgenden Sicherheitsvorschriften müssen vor Inbetriebnahme und in jedem Betriebszustand bei Serviceoder Reparatur beachtet werden. Missachtung der Sicherheitsvorschriften und Warnhinweise aus diesem Handbuch führenzur Verletzung der bestehenden Sicherheitsstandards. Bei Betrieb des Gerätes ausserhalb dem bestimmungsgemässen Einsatz können die im Gerät integrierten Schutzfunktionen beeinträchtigt werden. TDK-Lambda ist nicht haftbar fürSchäden, die durch Missachtung dieser Sicherheitsvorschriften entstehen können.

CAUTION**:** FPS-S1U units are not authorized for use as critical component in nuclear control systems, life support systems or equipment for use in hazardous environments without the express written approval of the managing director of TDK-Lambda.

Vorsicht: Dieses Produkt ist nicht für die Verwendung als kritische Komponente in nuklearen Steuerungssystemen, lebenserhaltenden Systemen oder Geräte für den Einsatz in gefährlichen Umgebungen, ohne die ausdrückliche schriftliche Genehmigung durch TDK-Lambda zugelassen.

INSTALLATION (OVERVOLTAGE) CATEGORY& ENVIRONMENTAL CONDITIONS

The FPS-S1U units have been evaluated to Overvoltage category II.
The FPS-S1U units intended for use in the following operation conditions:
* Indoor use * Pollution degree 2 * Max. operational altitude: 3000m above sea level
*Ambient temperature: -10°C-50°C at 100% load, up to 70°C with output de-rating applied (See Specification)

GROUNDING

FPS-S1U units are Class I product. To minimize electrical shock hazard, the FPS-S1U units must be connected to an electrical ground. The instruments must be connected to the AC power supply mains through a three conductor power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. For instruments designed to be hard-wired to the supply mains, the protective earth terminal must be connected to the safety electrical ground before any other 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.

Erdungskonzept: Dieses Produkt ist ein Gerät der Schutzklasse 1. Zur Vermeidung von gefährlichen Energieinhalten und Spannungen, ist das Gehäuse an eine Schutzerde anzuschliessen. Der PE-Anschluss ist an einen festen Erder anzuschliessen. Bei Festverdrahtung des Gerätes ist sicherzustellen, dass der PE Anschluss als erstes angeklemmt wird. Jede mögliche Unterbrechung des PE-Leiters oder Trennung der PE Verbindung kann einen möglichen elektrischen Schlag hervorrufen, der Personenschäden zur Folge hätte.

LIVE CIRCUITS

Operating personnel must not remove the FPS-S1U units cover.
No internal adjustment or component replacement is allowed by non-TDK Lambda qualified service personnel. Never replace components with power cable connected. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.
Restricted Access Area: FPS-S1U units should only be installed in a Restricted Access Area. Access should be available to service personnel only.

Spannungsführende Teile: Die Geräteabdeckung darf nicht durch Endanwender geöffnet werden. Interne Modifikationen, sowie Bauteileaustausch ist nur durch TDK-Lambda qualifiziertes Personal erlaubt. Vor Austausch von Bauteilen ist das Netzkabel bzw. die Versorgungsspannung zu trennen. Energieversorgungsanschlüsse sind immer zu trennen, um Personenschäden durch gefährliche Energieinhalte und Spannungen auszuschliessen. Die Stromkreise sind zu entladen, externe Spannungsquellensind zu entfernen, bevor auf Bauteile bzw. Komponenten Ebene gearbeitet wird.

PARTS SUBSTITUTIONS & MODIFICATIONS

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

AC INPUT

CAUTION

Risk of electrical shock and energy hazard.
Disconnecting one power supply line disconnects only one power supply module. To isolate the unit completely, disconnect all power supply lines. Terminal blocks should only be used by professional workers to connect
AC cables.

ATTENTION

Risque de choc et de danger e'lectriques. Le de'branchement d'une seule alimenttation stabilise'e ne de'branche uniquement qu'un module "Alimentation Stabilise'e". Pour isoler completement le module en cause, il faut de'brancher toutes les alimentations stabilise'es.

ACHTUNG

Spannungsfuehrende Teile - Gefahr durch elektrischen Schlag order hohe Energieinhalte. Alle Netzstecker der einzelnen Komponenten bzw. der Einschuebe muessen
getrennt werden, damit das System “spannungsfrei” ist. Die Eingangsklemme der Stromversorgung ist nur innerhalb eines Gesamtsystemes zu verwenden.

Do not connect FPS-S1U units to mains supply exceeding the input voltage and frequency rating. The input voltage and frequency rating is: 100-240V~, 50/60Hz. For safety reasons, the mains supply voltage fluctuations should not exceed +/-10% of nominal voltage.
The leakage current of the end use equipment not exceed 3.5mA.

ENERGY HAZARD

The main outputs of FPS-S1U units are capable of providing hazardous energy. Due to hazardous energy level the output and connections therefore must not be user accessible. Manufacturer's final equipment must provide protection to service personnel against inadvertent contact with output bus bars.

FUSE

There are no fuses in the FPS-S1U rack.

OVERCURRENT PROTECTION

A readily accessible branch circuit over-current protective device rated 20A max. per each input must be incorporated in the building wiring.

Überstromschutz
Eine leicht zugängliche Vorsicherung mit 20A max. pro Eingang muss in der Hausinstallation vorgesehen werden

SYMBOLS

CAUTION Risk of Electrical Shock.

Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual.

Indicates hazardous voltage.

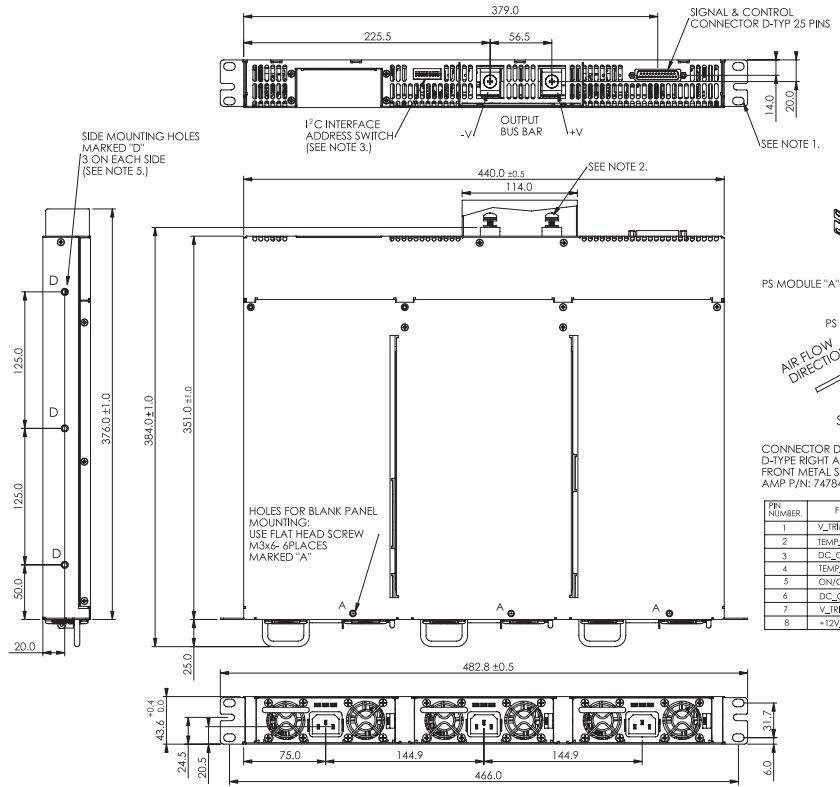
Indicates ground terminal.

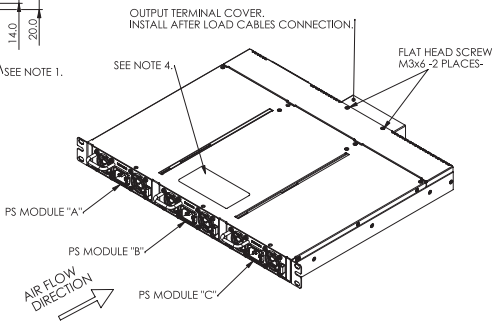
Protective Ground Conductor Terminal

WARNING — Denotes hazard. An attention to a procedure is called. Not following the procedure correctly could result in personal injury. A WARNING sign should not be skipped and all indicated conditions must be fully understood and met.

CAUTION — Denotes hazard. An attention to a procedure is called. Not following the procedure correctly could result in damage to the equipment.

FPS-S1U/P Outline Drawing





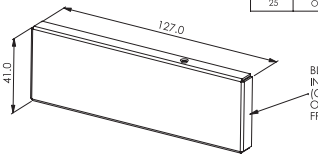
SIGNALS & CONTROL CONNECTOR PINS ASSIGNMENT

CONNECTOR DESCRIPTION:
D-TYPE RIGHT ANGLE, 25 POSITIONS,
FRONT METAL SHELL,
AMP P/N: 747846-4

PIN NUMBER.	FUNCTION
1	V_TRIM_B
2	TEMP_ALARM_B
3	DC_OK_B
4	TEMP_ALARM_A
5	ON/OFF_A
6	DC_OK_A
7	V_TRIM_A
8	+12V_AUX

PIN NUMBER.	FUNCTION
9	CS
10	V_TRIM_C
11	SIGNAL_RTN
12	DC_OK_C
13	+SENSE
14	AC_FAIL_B
15	ON/OFF_B
16	AC_FAIL_A

PIN NUMBER.	FUNCTION
17	NC
18	NC
19	NC
20	SCL (I²C)
21	SDA (I²C)
22	- SENSE
23	TEMP_ALARM_C
24	AC_FAIL_C
25	ON/OFF_C



NOTES
1. MOUNTING HOLES FOR 19" RACK. USE M6x12 TO FIX THE UNIT TO A RACK.
2. M6x16 SCREWS FOR LOAD WIRES FIXING. USE M6 LUG FOR THE LOAD WIRES. RECOMMENDED TIGHTENING TORQUE 42~56 Kgf.cm
3. REFER TO INSTRUCTION MANUAL FOR SETTING DETAILS.
4. MODEL NAME , VOLTAGE AND CURRENT RATING AND SAFETY APPROVALS SYMBOLS WILL BE SHOWN HERE ACCORDING TO THE SPECIFICATIONS.
5. MOUNTING HOLES M5 FOR MOUNTING BRACKETS . USE M5x8 SCREWS TO FIX THE BRACKETS TO THE CHASSIS. SCREWS MUST NOT PENETRATE THE CHASSIS MORE THAN 6 mm.
6. THE FPS-S1U/P RACK IS SHOWN WITH 3 FPS1000/P UNITS INSTALLED.

TDK·Lambda

FPS-S1U RACK CONNECTIONS FOR OPERATION

1. REMOTE SENSING*

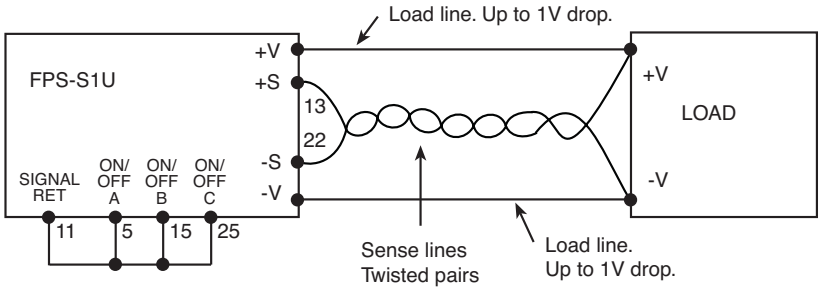
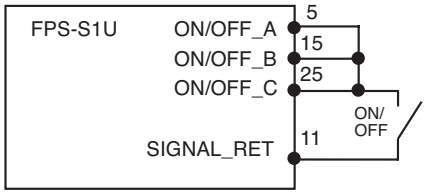


Fig 1-1

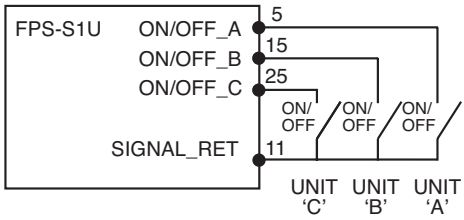
* In Local sense applications, the +/- sense have to be connected to the +/-V terminals of the FPS-S1U prior to operating the FPS1000 units plugged in.

2. ON/OFF CONTROL



On/Off by single On/Off control

Fig 2-1



Individual unit On/Off control

Fig 2-2

3. OUTPUT VOLTAG TRIMMING

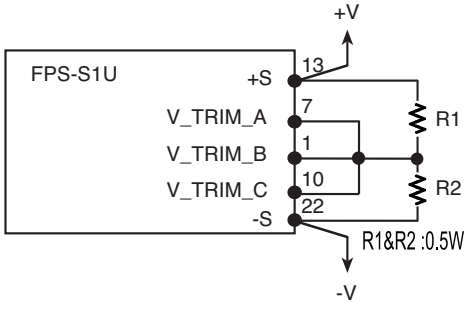


Fig 3-1

FPS1000-12

$R_2 = 0.0324 * V_{out}^2 - 1.1298 * V_{out} + 9.9342$

R1(KΩ)= 5(KΩ)-R2(KΩ)

FPS1000-24

$R_2 = 0.0785 * V_{out}^2 - 5.819 * V_{out} + 105.132$

R1(KΩ)=20(KΩ)-R2(KΩ)

FPS1000-32

$R_2 = 0.0463 * V_{out}^2 - 4.5805 * V_{out} + 109.49$

R1(KΩ)=20(KΩ)-R2(KΩ)

FPS1000-48

$R_2 = 0.0497 * V_{out}^2 - 7.2795 * V_{out} + 259.04$

R1(KΩ)=50(KΩ)-R2(KΩ)

4. SUPERVISORY SIGNALS

Signals are accessible at the J1-DB25 Female connector on the rear panel of the rack.
Fig 4-1 shows typical connection for FPS1000 unit 'A' Inside the rack.
Units 'B' and 'C' connections (refer to Table 1).

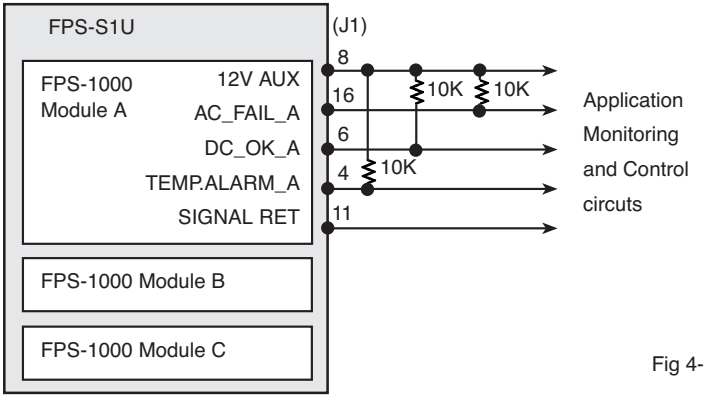


Fig 4-1

Note: AC_FAIL, DC_OK and TEMP.ALARM are open collector signals.

5. PARALLEL OPERATION

5.1. Remote sensing and current balance

Up to 3 FPS-S1U racks with up to 8 FPS1000 installed units of the same output voltage rating can be connected in parallel. The built-in Oring diodes on the main output and on the +12V auxiliary voltage in each FPS1000 unit allow N+1 operation. By connecting the CS signal between the paralleled units, automatic current balance is achieved, with +/-10% accuracy. For input voltages less than 100Vac, maximum output Power derated by 10% of the Power rating.

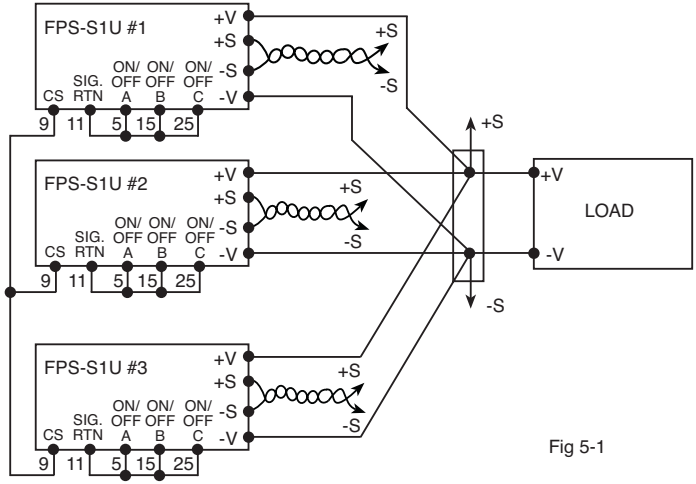


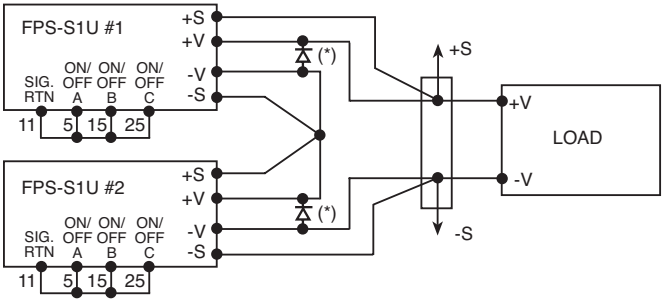
Fig 5-1

6. SERIES OPERATION

Up to 2 units of the same voltage and current rating can be used for increased output voltage It is recommended that diodes be connected in parallel with each unit output to prevent revese voltage. Each diode should be rated to at least the power supply rated output voltage and output current.

CAUTION

Series operation is not applicable for units with I^2C bus option.



(*) Diodes are user supplied

Fig 6-1

FPS-S1U RACK REAR PANEL DIP SWITCH SETTING

MODULES LOCATION

Up to 3xFPS1000 module of the same output voltage rating
Can be pluged into FPS-S1U rack

Module 'A' is on the left ,module 'C' is on the right
For modules location refer to Fig. 7-1

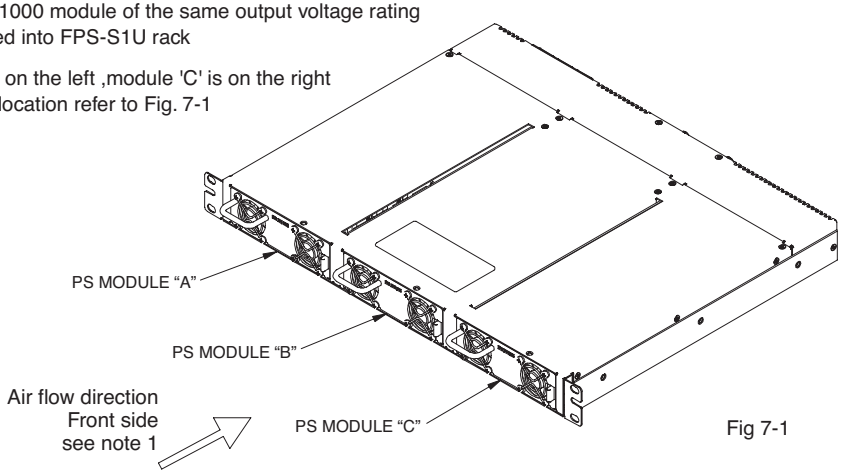


Fig 7-1

Note1: Forced air cooling allow minimum 50mm of unrestricted air space at the rear of the unit.
Do not obsruct air flow to the unit front panel

I^2C BUS INTERFACE OPTION

ADDRESSING (A0, A1, A2).

The rear panel 9 positions DIP switch is used to select the I^2C bus address for the individual FPS1000/S units inside the rack.Each unit should have its own I^2C address to communicate over the I^2C bus. Each address is made of three DIP switch positions as shown in Fig. 7-2. Which can be used to address single Power supply with 8 different addresses.

The DIP switch down position is logic level "1" and the up position is logic level "0".

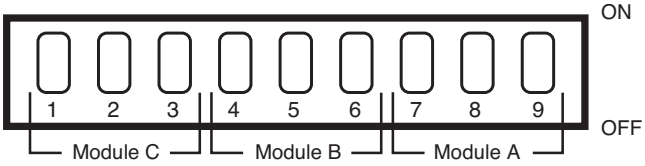


Fig 7-2

Fig. 7-2: I^2C address SW1 DIP switch - Rear Panel poit view

Note: Address are applicable when modules FPS1000/S (I^2C option) are used

I²C BUS INTERFACE OPTION

INTRODUCTION

The I²C interface option includes facilities to monitor operating parameters of the power supply. The parameters are then transferred to the host PC if demanded, over a standard I²C bus.
The following data can be monitored for the individual units connected to the I²C bus:
1. Status of the unit.
2. Actual output voltage, output current and internal temperature of the unit.
3. Manufacturing related data (model, serial number, manufacturing date etc…).

ADDRESSING (A0, A1, A2).

Three address lines allow up to eight FPS1000 units to be addressed on a single I²C bus. The address lines are internally pulled-up to +5V by resistors. Addressing of a unit is achieved by hard-wiring an address line to the -Sense to set it to "0" or leaving the address line open to set it to "1".

SERIAL CLOCK

This line is clocked by the processor which controls the I²C bus. It should be connected to +5V (referenced to -Sense) via a pull-up resistor of 2KΩ. The I²C interface is designed to run with a serial clock speed of 100KHz.

SERIAL DATA

This line is a bidirectional data line. It should be connected to +5V (referenced to -Sense) via a pull-up resistor of 2KΩ.

OPERATION AND FUNCTIONS

1. DIGITAL STATUS

Digital status functions are provided by a PCF8574, 8-bit Register. It provides a single 8-bit word when read by the I²C controller.
Fault is indicated by "1" and Good level is indicated by "0". The register information is as follows:

BIT	FUNCTION	MEANING
0	Output Fail	Output voltage is < 80% +/-5% of Vo rated
1	Over Temperature Protection	Internal temperature is over 80°C. Supply turns off.
2	Temperature Alarm	Internal temperature is over 70°C. Supply is on.
3	Fan Fail	Failure of an internal fan.
4	AC Input Fail	Input voltage < 85Vac
5	Not Used	Always "0".
6	Not Used	Always "0".
7	Not Used	Always "0".

PCF8574 slave address:

Bit	7	6	5	4	3	2	1	0
Value	0	1	0	0	A2	A1	A0	R/W

2. EEPROM FUNCTIONS

A 256 bytes EEPROM is included in the I²C option. The EEPROM type is AT24C02 and it is programmed at the factory with the following data:

ADDRESS	BYTES	DATA
0	4	Number of fields
4	16	Manufacturer
20	20	Serial number
40	16	Revision
56	16	Country of manufacture
72	16	Model name
88	16	Output voltage
104	16	Date of manufacture
254	2	Checksum

The slave EEPROM address is:

Bit	7	6	5	4	3	2	1	0
Value	1	0	1	0	A2	A1	A0	R/W

3. ANALOG FUNCTIONS

Analogue functions are provided by a single PCF8591, 4-channel 8-bit A/D converter. When this device is read by the serial bus controller it provides an 8-bit word with the following information:
Channel 1: Output voltage, channel 2: Output current, channel 3: Internal temperature.

The PCF8591 slave address is:

Bit	7	6	5	4	3	2	1	0
Value	1	0	0	1	A2	A1	A0	R/W

The PCF8591 device initially requires a control byte to be written to the configuration register. The control byte is as follows:

Bit	7	6	5	4	3	2	1	0
Value	0	A	0	0	0	B	C	D

When a single channel is to be read, A,B,C and D should be determined as follows:

A/D channel	A	B	C	D
Voltage	0	0	0	0
Current	0	0	0	1
Temperature	0	0	1	0

To read all channels with a single control byte, A and B have to be "1", C and D have to be "0". This control byte sets the A/D so that on every read data from each channel is read. Note that on each read. a conversion is started for a particular channel and the result which will be displayed and will be of the previous read. (i.e. the previous channel).
Thus second read cycle gives result of the actual channel.
Note: the first result from a sequence of reads should not be considered.

A/D SCALING

The A/D readback has to be scaled to obtain a correct value for the voltage, current and the temperature. Note that the voltage reading is made inside the power supply unit before the "Oring" diode and is typically 0.5V higher than the actual output voltage.
The following scaling should be employed:

VALUE=BYTE VALUExRESOLUTION

Refer to the following table for the scaling of the A/D channels:

FPS1000-12/S	Range	Resolution	Accuracy
Voltage	0~15V	0.0586 V/Bit	+/-2% of full scale
Current	0~80A	0.312 A/Bit	+/-10% of full scale
Temperature	0~100°C	0.391°C/Bit	+/-3°C of full scale

FPS1000-24/S	Range	Resolution	Accuracy
Voltage	0~30V	0.1171V/Bit	+/-2% of full scale
Current	0~50A	0.1953A/Bit	+/-10% of full scale
Temperature	0~100°C	0.391°C/Bit	+/-3°C of full scale

FPS1000-32/S	Range	Resolution	Accuracy
Voltage	0~40V	0.1563V/Bit	+/-2% of full scale
Current	0~50A	0.1953A/Bit	+/-10% of full scale
Temperature	0~100°C	0.391°C/Bit	+/-3°C of full scale

FPS1000-48/S	Range	Resolution	Accuracy
Voltage	0~60V	0.2344V/Bit	+/-2% of full scale
Current	0~25A	0.0977A/Bit	+/-10% of full scale
Temperature	0~100°C	0.391°C/Bit	+/-3°C of full scale

The measurement range is from 0 to the maximum value listed in the range column. The resolution or scale of reading is linear over the entire range and provides a linear output on the A/D converter.

Model: FPS1000-48 /S
Measurements and calculation examples
Output voltage readback
1. Output voltage (at the output terminals): 48.0V
2. Voltage before the "Oring" diode: 48.0V+0.5V=48.5V
3. Hex readback: CE (1100 1110).
4. Convert the hex readback to decimal: 206
5. Calculate measured Vout: Vout=206*0.2344=48.286V

CAUTION

Series operation is not applicable for units with I²C bus option.