TDK·Lambda

GENERAL SAFETY INSTRUCTIONS

High Voltage Warning

Dangerous voltages are present within the power supply.

Critical Components

This product is not authorized for use as a critical component in nuclear control systems, life support systems or equipment for use in hazardous environments without the express written approval of the Engineering Director of TDK-Lambda Americas.

Servicing

This product is not customer serviceable.
Unit repairs shall only be carried out by TDK- Lambda Americas or their Authorized agents.

Contact: TDK-Lambda Americas
          401 Mile of Cars Way, Suite 325
          National City, CA 91950
          Tel 619-575-4400
          Fax 619-575-7185

Safety Class of Protection

The unit is designed for the following parameters: Material Group IIIb, Pollution Degree 2, Overvoltage Category II, Class 1 (earthed), Indoor use. The unit is considered as fixed and rated IPX0. The CPFE1000F-12 and CPFE1000F-28 are classed as having SELV outputs. The CPFE1000F-48 is classed as having a NON SELV output. All outputs are capable of providing hazardous energy (>240VA). The final equipment should provide protection to service personnel against inadvertent contact with the PSU output terminals.

Installation

This product is designed for use within other equipment which restricts access to Authorized competent personnel only. The unit covers/chassis must not be made user accessible.

The appliance may be mounted in any orientation except inverted (baseplate uppermost). The customer has to ensure the baseplate temperature remains below certain limits.

CPFE1000F-12: Input   85V-265V baseplate temperature limited to 85°C
CPFE1000F-28 & CPFE1000F-48: Input   85V-170V baseplate temperature limited to 70°C.
CPFE1000F-28 & CPFE1000F-48: Input 170V-265V baseplate temperature limited to 85°C.
The mains input connector is not acceptable for use as field wiring terminals.
The appliance must be securely mounted and the baseplate properly bonded to the main protective earth contact before any connection to AC mains supply is made.

The ventilation openings must not be impeded – ensure a space at least 5cm between any obstruction and the ventilation openings.

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.

⚠ WARNING

- Do not make unauthorized changes to power supply unit, otherwise you might have electric shock and void your warranty.
- Do not touch this unit and the internal components in operation or shortly after shut down. They might have high voltage or high temperature and as the unit dissipates its heat so the surface of the unit is hot. You might receive electric shock or burn.

- When the unit is operating, keep your hands and face away from it; you might be injured by an accident.
- Do not use unit under unusual conditions such as emission of smoke or abnormal smell and sound etc. It might cause fire and electric shock. In such case, please contact us; do not repair by yourself, as it is dangerous for the user.
- Do not drop or insert anything into unit. It might cause failure and fire.
- Do not operate these units under condensation condition. It might cause fire and electric shock.

⚠ CAUTION

- As a component part, compliance with the standard will be based upon installation in the final application. This product must be installed in a restricted access location, accessible to authorized competent personnel only. These AC to DC converters have reinforced insulation between the input and the output. The outputs of these products are energy hazards. All models with an output greater than 28V model are considered to be non-SELV. As such, the instructions for use must refer to these energy hazardous outputs and Non-SELV outputs in that the outputs must not be accessible to the operator. The installer must also provide protection against inadvertent contact by a service engineer.
- The equipment has been evaluated for use in a Pollution Degree 2 environment.
- This power supply is primarily designed and manufactured to be used and enclosed in other equipment.
- Confirm connections to input/output terminals and signal terminals are correct as indicated in the instruction manual.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be used within specifications, otherwise the unit will be damaged.
- For application equipment, which requires very high reliability (Nuclear related equipment, traffic control equipment, medical equipment, etc.), please provide fail safety function in the equipment.
- Do not use the product in environment with strong electromagnetic field, corrosive gas and conductive substance.
- Do not operate and store this unit at an environment where condensation occurs. In such case, waterproof treatment is necessary
- Never operate the unit under over current or shorted conditions for 30 seconds or more and out of Input Voltage Range as specification. Insulation failure, smoking, burning or other damage might occur to the unit.
- The output voltage of this power supply unit is considered to be a hazardous energy level (The voltage is 2V or more and the electric power is 240VA or more). Prevention from direct contact with output terminal is highly necessary. While installing or servicing this power supply unit, avoid dropping tools by mistake or direct contact with output terminal. This might cause an electrical shock. While repairing this power supply unit, the AC input power must be switched off and the input and output voltage should be level.
- To maintain the SELV output for outputs less than 28VDC, under fault conditions, the output must be connected to earth in the final application.
- The application circuits and their parameter are for reference only. Be sure to verify effectiveness of application circuits and their parameters before finalizing circuit design.
- Do not inject abnormal voltage to output terminal and signal terminal from the outside. The injection of reverse voltage or over voltage exceeding nominal output voltage to output terminals might cause damage to internal components.
- This information in this document is subject to change without prior notice. For actual design-in, please refer to the latest publications of data sheet, etc., for the most up-to date specifications of the unit.

Note :

CE Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Low Voltage Directive and RoHS Directive.

UKCA Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Electrical Equipment (Safety) Regulations and Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment Regulations."

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1. Timing Sequence
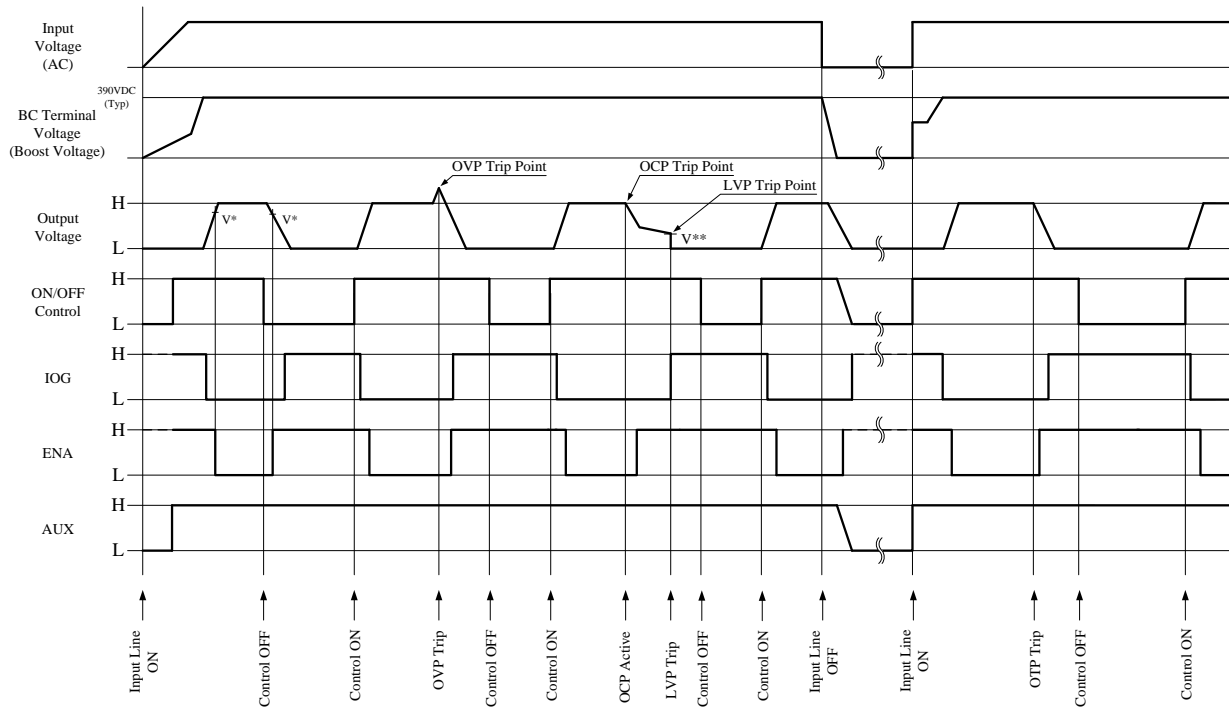
Note: BC Terminal Voltage is an internal factory measurement test point that is not accessible to the user.

2. Output Voltage Adjustment Range

Output Voltage Adjustment Range:

+/-20% of the typical voltage rating

When increasing or decreasing the output voltage, care must be taken such as not to exceed the maximum output power. If remote sensing is used, this must also be considered as not to exceed the maximum output power.
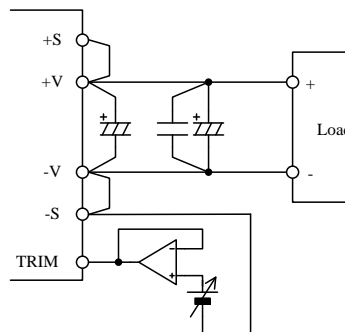
2.1 Output Voltage Adjustment by voltage adjustment potentiometer.

A multi-turn potentiometer is located between the (+) and (-) output studs. Turning the adjustment screw on the potentiometer clockwise increases the output voltage; likewise, turning the screw counter clockwise decreases the output voltage. Note: Care must be taken as not to adjust the output voltage higher than the highest voltage specified within the specified voltage range; doing so may cause the over voltage protection (OVP) circuit to activate thus immediately reducing the output voltage to zero.

2.2 Output Voltage Adjustment by applying external voltage

By applying an external voltage at the TRIM terminal, the output voltage can be adjusted within the same output voltage adjustment range of +- 20% of the nominal output voltage. Exceeding the maximum specified output voltage will cause activation of the Over Voltage Protection (OVP) circuit.

Likewise, exceeding the minimum output voltage will cause activation of the Low Voltage Protection (LVP) circuit. The nominal output voltage is present without using the external output voltage adjustment circuit.

**Fig. 2-1 Output Voltage Adjustment
by applying external voltage**

Model	Adjustment Range	Typical External Voltage Range
CPFE1000F-12	9.6 – 14.4V	0.65 – 1.0V
CPFE1000F-28	22.4 – 33.6V	0.65 – 1.0V
CPFE1000F-48	38.4 – 57.6V	0.67 – 1.0V

Note: The Trim terminal voltage must be limited to 1.00V maximum; otherwise, the over-voltage protection circuit will activate and shut down the output voltage.

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3. Ripple and Noise

Ripple and Noise is measured according to the description below in accordance with JEITA-9131B (Sections 7.16, 7.17 and 7.18).

The measurement connection is shown in Fig. 3-1.

(Ceramic Capacitor: 2.2µF and Electrolytic Capacitor : Refer to Table 1-2) must be connected within 50mm from the output terminals. Then, connect coaxial cable with JEITA attachment across the ceramic capacitor electrodes. Use 100MHz bandwidth oscilloscope or equivalent.

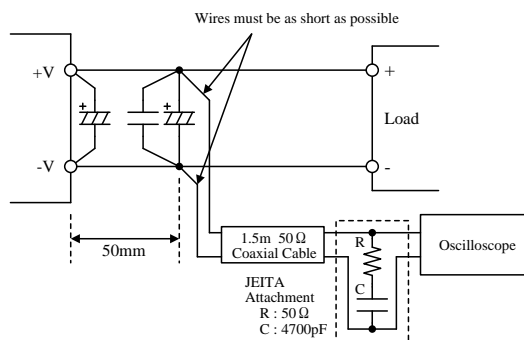In general, output ripple voltage and output spike noise voltage can be reduced by increasing external capacitance.

Fig. 3-1
Output Ripple Voltage (including Spike Noise)
Measurement Method

4. Maximum Line Regulation

Maximum line regulation is defined as the maximum output voltage change when the input voltage is gradually changed within the specification range.

5. Maximum Load Regulation

Maximum load regulation is defined as the maximum output voltage change when output load current is gradually changed within specification range.

6. Over Current Protection (OCP)

The CPFE1000Fxx is equipped with an OCP feature; constant current limiting. The output will enter hiccup mode when the output current is between 105 to 140% of its output current rating. OCP value is fixed and cannot be adjusted externally.

The power supply is also protected from a short circuit on the output. If the short circuit condition lasts longer than 15 seconds, the output voltage will recover within 20 seconds after the short is removed.

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7. Over Voltage Protection (OVP)

The CPFE1000Fxx is equipped with OVP feature. The unit will shutdown if the voltage on the output is between 125% to 145% of nominal output voltage.

8. Over Temperature Protection (OTP)

The CPFE1000Fxx is equipped with OTP feature. Upon detection of an over temperature condition, the OTP circuit will shut down the output. The OTP activates at following baseplate temperatures:

CPFE1000F-xx: $> 90°C$ (also see derating specifications)

Upon activation of the OTP , the baseplate must be allowed to cool. The output voltage will recover after the base plate temperature is at 10°C below the OTP set point (95°C typical).

9. Remote Sensing (+S, -S terminals)

This unit has remote sensing terminals to compensate for voltage line drop from the output terminals to the output load. When remote sensing is not required, leave the sense terminals disconnected.

Note that line drop (voltage drop due to wiring) compensation voltage range must be such that the output voltage is within the output voltage adjustment range and that the voltage between -V and -S must be within 0.5V.

Consider power loss due to line drop and use this unit within the maximum allowable output power. Reduce the effect of noise induced into the remote sensing lines by using shielded lines, a twist pair, or a parallel pattern, etc.

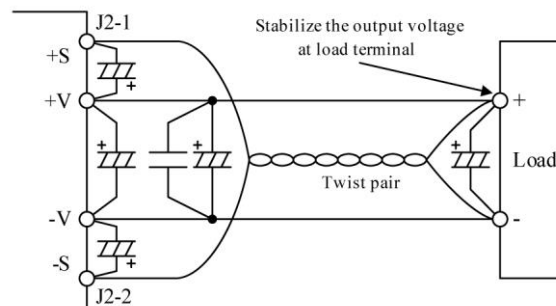When remote sensing lines are long, add the electrolytic capacitor as shown in Fig 9-1. (if needed)



Fig. 9-1 Remote Sensing is used

10. ON/OFF Control
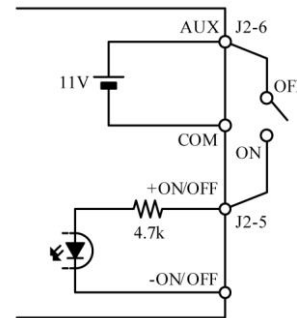
(+ON/OFF, -ON/OFF terminal)

The CPFE1000Fxx is equipped with a ON/OFF control function. Without turning the input supply on and off, the output can be enabled and disabled using this function.

The ON/OFF control circuit is isolated from input circuit of the power supply by a photo-coupler.

Fig. 10-1 and Fig. 10-2 are examples of how to connect to the ON/OFF control. When the ON/OFF control is not used, short +ON/OFF to AUX as shown in figure 10-3. (factory set)
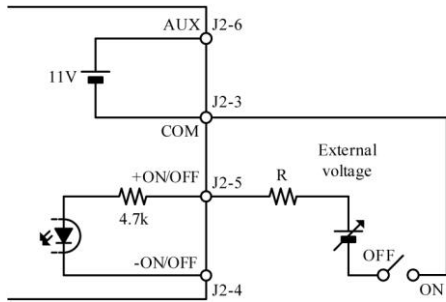
**Fig. 10-1 ON/OFF Control
Connection Example 1
（ON/OFF Control by External Voltage）**

**Fig. 10-2 ON/OFF Control
Connection Example 2
（ON/OFF Control by Built-in AUX）**

Select the external voltage and external resistance per the ON/OFF terminal current shown in the table below.

ON/OFF terminal current	Output Voltage
2.5mA (+/-0.5mA)	ON
Less than 0.15mA	OFF

Recommended ON/OFF Terminal Current
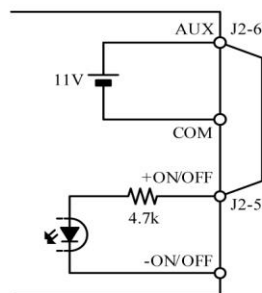
**Fig. 10-3 ON/OFF Control
Connection Example 3
（ON/OFF Control is not used）**

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11. Parallel Operation (CS terminal)

By connecting the CS terminal of each CPFE1000Fxx, output current can be equally drawn from each unit. A maximum of 6 units of the same model can be connected.

Maximum output current is derated by parallel operation units as shown in Table 11-1.

Note that usage of power module at out-of-rated condition might result in power module temperature abnormal rise or damage.

Parallel units	Maximum output current
～3 units	90% of nominal output current
4～6 units	85% of nominal output current

Table 11-1 Condition for Parallel Operation

Set the accuracy of the output voltage within +/-1% when adjust the output voltage for parallel operation.

When adjusting the output voltage by applying external voltage at the TRIM terminal, insert approximately a 10k ohm resistor between TRIM terminal and external source.

Moreover, external circuits are necessary for TRIM terminal at each individual module.
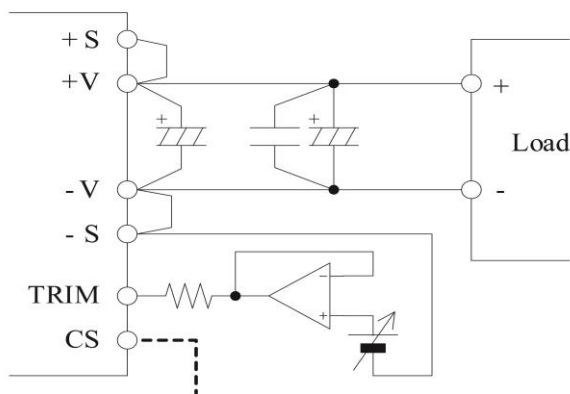
Fig. 11-1 Output Voltage Adjustment by applying external voltage
(For parallel operation)

Fig. 11-2 Parallel Operation

9

11a. Parallel for Redundant Operation:

In cases where an end product or system cannot tolerate any downtime, a redundant power supply or system configuration should be consid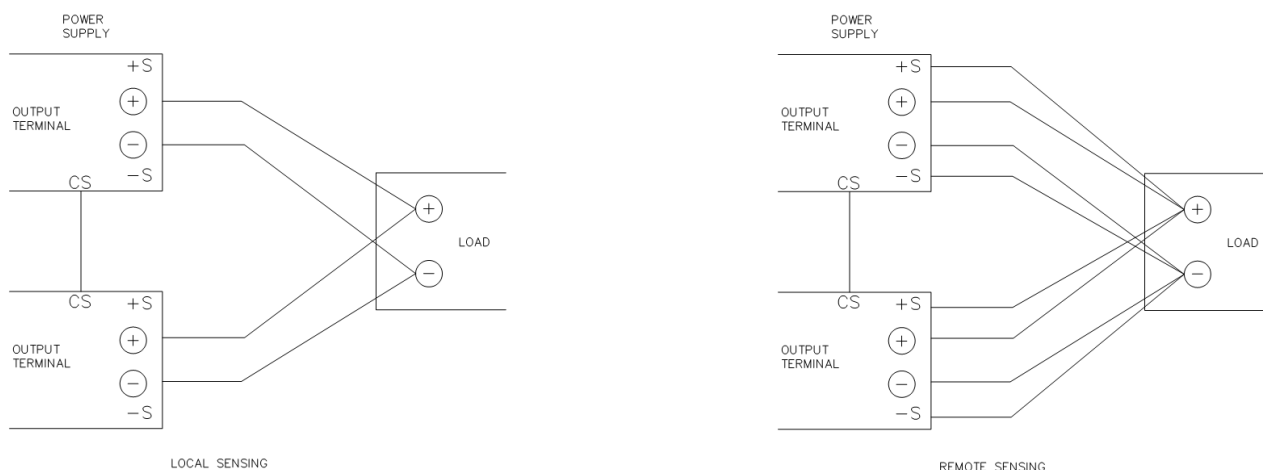ered. There are a number of ways to construct redundant or fault-tolerant power system. The most common method is to have at least one supply with sufficient output power to fully satisfy the system's power requirements. Then a second power supply of the exact same rating is provided as a back-up in the event one of the two supplies fails. This forms a basic N+1 redundant and fault tolerant power system. "N" equals the number of supplies required to fully power the system and "+1" equals one back-up or redundant supply that will take over for a failed supply. Parallel for redundant operation can be achieved by isolating the outputs using oring diodes. With this method the output load must not exceed the maximum load current of "N" supplies and remote sensing around these diodes is not allowed.
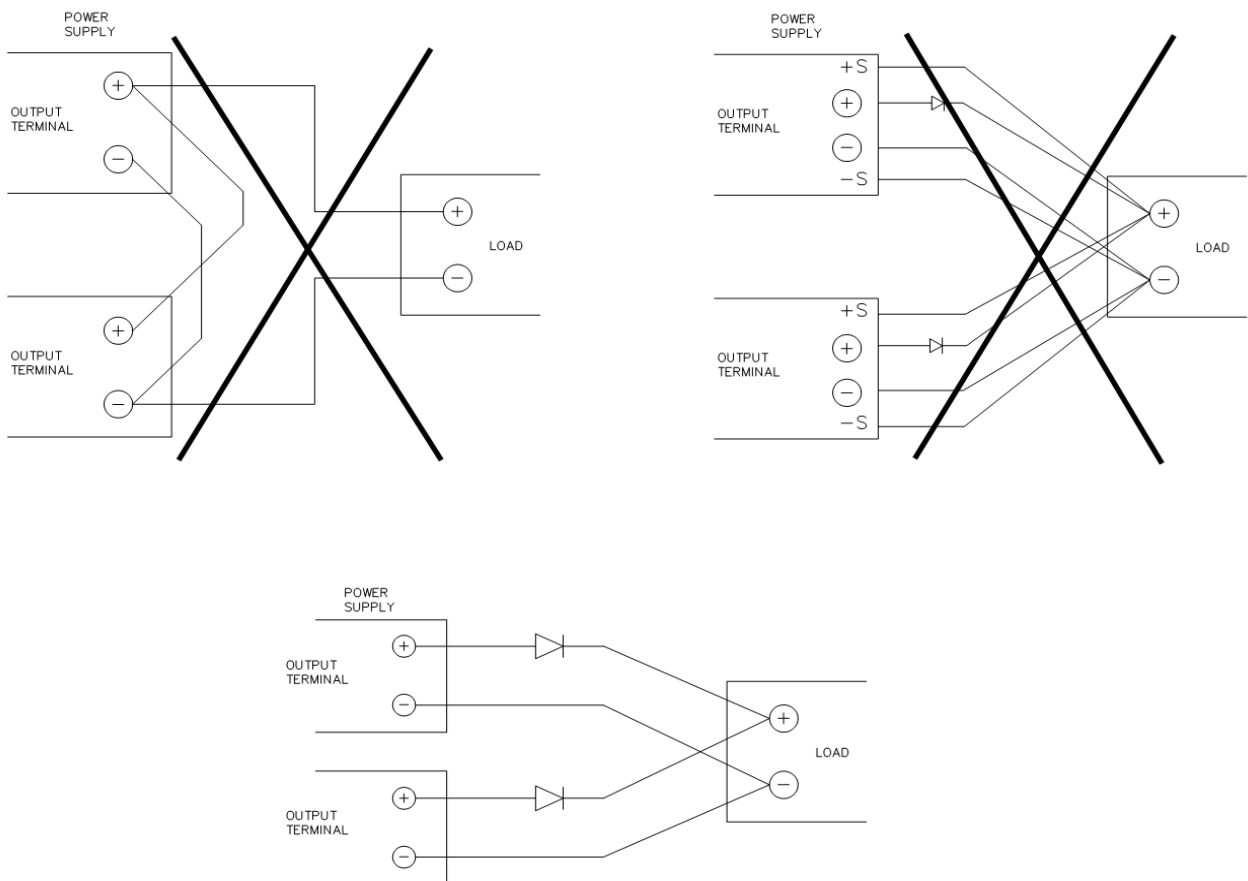
Fig. 11-3 Parallel for Redundant Operation

Limitations of power supplies in parallel operation:
- If the power supplies are not connected for redundant operation (no oring diodes), the green LED indicator on all power supplies can be lit whenever the output common bus voltage is present and the output voltage read by the I²C bus is the voltage of the output common bus; not of the individual power supply.
- The output current reading by the I²C bus is the average value of all currents from the power supplies connected in parallel.

12. Series Operation

The output of several units can be connected in series for increased output voltage. It is recommended that diodes be connected in parallel with each unit output to prevent reverse voltage during start-up sequence or in case one of the units shuts down. Each diode should be rated to at least the power supply rated output voltage and output current. Refer to Fig. 12-1 and 12-2 for series operation with local and remote sensing.
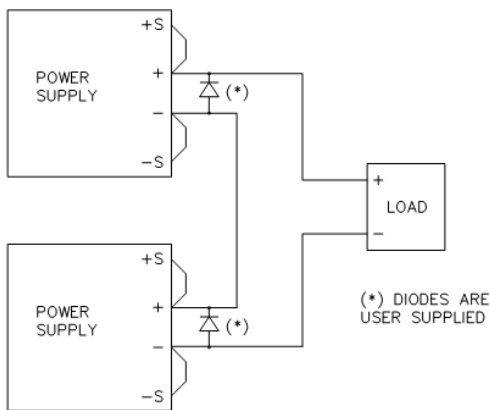
Fig. 12-1: SERIES CONNECTION, LOCAL SENSING
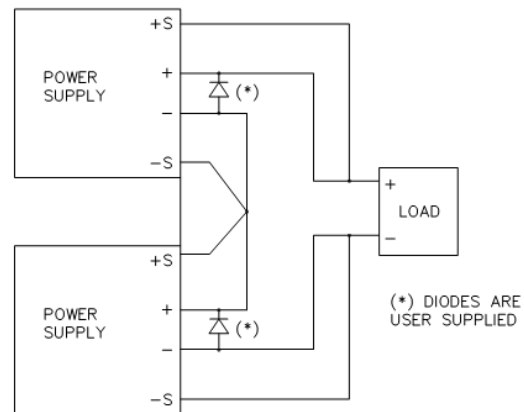
Fig. 12-2: SERIES CONNECTION, REMOTE SENSING

Limitations of power supplies in series operation:

- If the total voltage of outputs connected in series exceeds the 60Vdc SELV limit then all outputs must be considered Non-SELV.
- Non-SELV outputs are hazardous and must not be made user accessible. They must be guarded to avoid a service engineer making inadvertent contact with the output studs or dropping a metal tool onto them.
- Without galvanic isolation, the I²C can't be used with series operation because the GND pin of the I²C signal is internally connected to –V of the unit. Consult factory for operation in this mode.
- Without galvanic isolation, the signals (AUX, TRIM, ENA & IOG) are also not recommended to use with series operation because the COM pin is internally connected to –V of the unit. Consult factory for operation in this mode.

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13. Power ON Signal (ENA terminal)

This signal is located at the secondary side (output side) and is internally connected to a 5V source via 4.99kΩ pullup resistor. (Maximum sink current is 10mA and maximum applied voltage is 5V.)

Return line for ENA terminal is the COM terminal. When output voltage goes over a specified voltage level at start up, Power ON signal is LOW.

Output voltage threshold level is as follows.

CPFE1000F-12   **: 8V (TYP)**
CPFE1000F-28   **: 19V (TYP)**
CPFE1000F-48   **: 33V (TYP)**

Output voltage threshold level for Power ON signal to go HIGH is as follows.

CPFE1000F-12   **: 6V (TYP)**
CPFE1000F-28   **: 15V (TYP)**
CPFE1000F-48   **: 28V (TYP)**

14. I.O.G Signal (IOG terminal)

Normal or abnormal operation of the power module can be monitored by using the IOG terminal. This signal monitor output is located at secondary side (output side) and is internally connected to a 5V source via 4.99kΩ pullup resistor.

This signal is LOW when inverter is normally operating and HIGH when inverter stops or when inverter is operating abnormally. (maximum sink current is 10mA, maximum applied voltage is 5V). The Ground for the IOG terminal is the COM terminal.

Also note that IOG becomes unstable under the following conditions:

・Operation of Over Current Protection (OCP)
・Light load conditions during parallel operation
・Dynamic load operation

15. Auxiliary Power Supply

For external circuits (AUX terminal)

The auxiliary output voltage is within the range of 10～14VDC and has a maximum output current of 20mA. The Ground for the auxiliary output is the COM terminal. Avoid shorting the AUX terminal with any other terminal as this will damage the unit.

16. Operating Temperature Range

The CPFE1000Fxx can be mounted in any direction except inverted (baseplate uppermost); however, careful consider should be given to avoid heat accumulation around the module. Verify baseplate temperature at worst case operating condition at the measurement point as shown on page 19. The baseplate temperature must be maintained at or below the following maximum baseplate temperatures:

CPFE1000F-12 : 85 deg C ; CPFE1000F-28 and CPFE1000F-48: 70 deg C (85VAC≦Vin＜170VAC); 85 deg C (170VAC≦Vin≦265VAC)

Due to the temperature limit of other components in the power supply that are not directly installed on the base plate, the ambient temperature must also be maintained at or below the maximum limits. The table below shows the de-rated output power at different ambient temperatures.

Model	Input Voltage	50°C	60°C	70°C	85°C
CPFE1000F-12	85VAC to 170VAC / 170VAC to 265VAC	720 / 720W	720 / 720W	576 / 670W	360 / 595W
CPFE1000F-28		1008 / 1008W	864 / 1008W	720 / 958W	N.A. / 883W
CPFE1000F-48		1008 / 1008W	864 / 1008W	720 / 958W	N.A. / 883W

N.A. (not applicable); unit cannot be operated under a low line condition at 85°C

Table 15-1 Derating (Ambient Temperature)

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17. Withstand Voltage

This module is designed to withstand applied voltage 2.5kVAC between input and baseplate, 3kVAC between input and output for a duration of 1 minute. When performing this test, set the current limit of test equipment to 20mA.

This module is designed to withstand applied voltage 500VDC between output and baseplate for 1 minute. When performing this test, be sure to apply DC voltage only. Avoid applying AC voltage during this test because this will damage the module.

Refrain from injecting a high test voltage suddenly. Be sure to gradually increase the applied voltage during testing and gradually reduce the voltage after the test.

Caution- when using a timer switch on the test equipment, a impulse voltage which is higher than the applied set voltage, can be generated when the timer switch is cut off. This causes damage to the power module. Connect each terminal according to the circuit diagrams shown below.
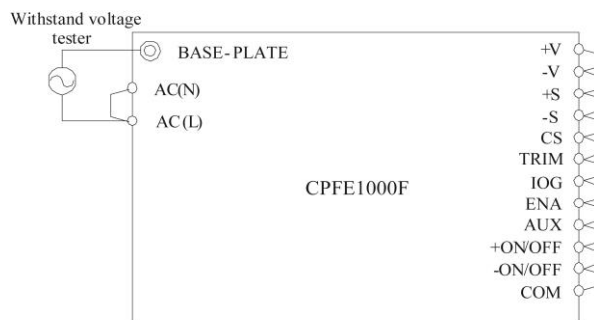
2.3kVDC 1 minute (20mA)

Fig. 16-1 Input to Baseplate Withstand Voltage
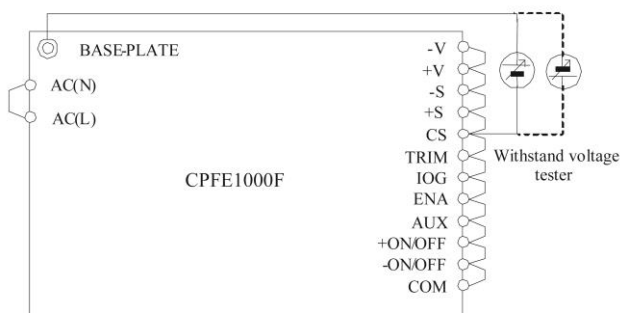
Test Method

500VDC 1 minute

Fig.16-2 Output to Baseplate Withstand Voltage

Test Method

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18. Insulation Resistance

Use DC Insulation Resistance test equipment (MAX.500V) between output and baseplate.
Insulation Resistance must be 100Mohm or more at 500VDC. Take caution that some types of test equipment generate high pulse voltage when switching applied voltage. After test, discharge this module using resistor, etc.

100Mohm or more at 500VDC

Fig. 17-1 Insulation Resistance Test Method

19. Connection Details

Input Connection

Mains input connection by 3way AMP 'Mate-n-lock' connector
Mating 3-way housing: AMP 350766-1.
Mating crimp terminals: AMP 926893-1 (14~20AWG), 926895-1 (18~24AWG)
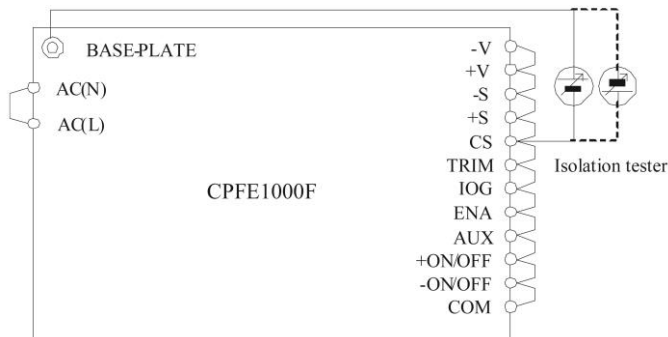
Pin 3 : Live
Pin 2 : Earth
Pin 1 : Neutral

Internal Fuse Type: F15AH 250V A (CPFE1000F-12)
Internal Fuse Type: F20AH 250V A (CPFE1000F-28, CPFE1000F-48)

Output Power Connection

DC output +ve & -ve connection by two M6x20 studs, max torque 10Nm.
Use appropriate ring terminals and wire for the load and short circuit current.

Output Signals

Signal connections available on 10 pos.& 3 pos. 2.5mm header connectors (ref J2,J3,J5).
Mating 10-way housing : Molex 22-01-1102.
Mating 3-way housing: Molex 22-01-2035.
Mating crimp terminals : Molex 08-70-0064 (22~30AWG)

J2,J3 Pin	Function
1	+ Sense
2	- Sense
3	COM
4	- remote on/off
5	+ remote on/off
6	Aux
7	Current share
8	Trim
9	ENA
10	IOG

J5 Pin	Function
1	GND
2	SCL
3	SDA

Table 18-1Pin Assignments

20. Safety Approvals

UL/CSA 60950-1, IEC/EN60950-1
Intended for installation in a non-operator access environment
Intended for installation in an external electrical/mechanical/fire enclosure

21. EMC & Immunity

Conducted Emissions - EN55022/EN55032 Class B, MIL STD 461/462D CE102
Radiated Emissions - EN55022/EN55032 Class B
Immunity - EN61000-4-2, -3, -4, -5, -6, -8, -11, -12, -14

22. Fault Finding

If the unit shuts down, cycle the AC power to the supply. The over voltage or over temperature protection circuit may have been activated thus shutting down the output. In the event of an over temperature condition, ensure the unit has cooled down before re-applying the AC input.

If the unit still fails to power up, return to TDK-Lambda Americas for evaluation and repair.

23. Connector Locations

J2, J3 (Output Signals)

J8 (Auto Recovery Jumper)
"OFF" position sets the unit to latch off in an over-temperature condition. Note: If J8 is set to "OFF" position, add a jumper from pin 3 to pin 4 of J2 or J3 to enable the output voltage.

J6, J7 (Address Jumpers)
See I^{2}C section for more details

J5 (I^{2}C Connector)
3 pos. 2.54mm header
Pin 1 GND
Pin 2 SCL
Pin 3 SDA

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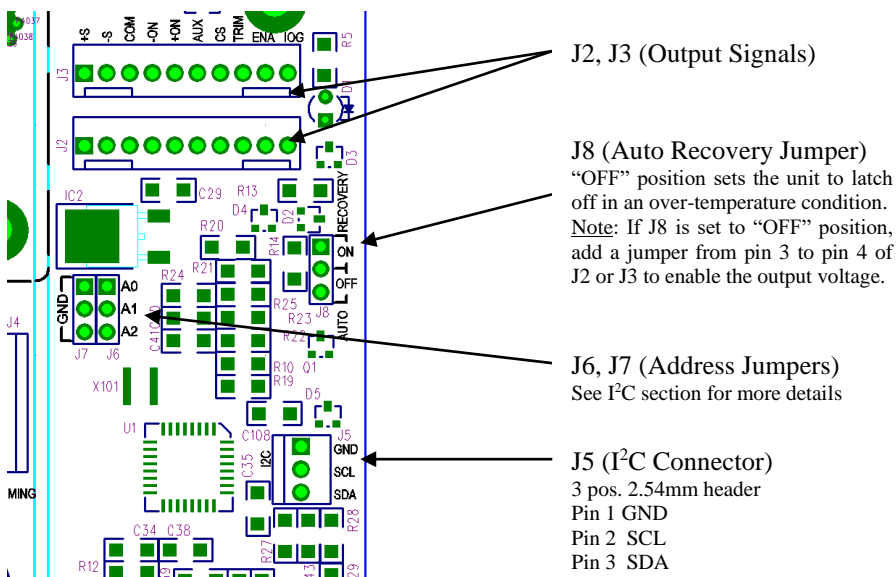
24. I^{2}C Bus Interface

1.- Introduction

The I^{2}C interface option includes facilities to monitor operating parameters of the Power Supply (PS). The parameters are then transferred to the host PC if demanded, over a standard I^{2}C bus.

The following data can be monitored for the individual units connected to the I^{2}C 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……)

2.- Addressing (A0, A1, A2)

Three address lines allow up to 8 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 to "0" or leaving the address line open to set it to "1".

A0, A1, A2 are in the PS (J6,J7) for Customer configuration of the I^{2}C address. Addresses are on Hex format 0x00

A2	A1	A0	Address
0	0	0	A0
0	0	1	A2
0	1	0	A4
0	1	1	A6
1	0	0	A8
1	0	1	AA
1	1	0	AC
1	1	1	AE

Jumper = "0"

Open = "1"

3.- Serial Clock

This line is clocked by the processor which controls the I^{2}C bus. It is internally connected to +5V via a pull-up resistor. The I2C interface is designed to run with a serial clock speed of 100KHz

4.- Serial Data

This line is a bidirectional data line. It is internally connected to +5V via a pull-up resistor.

5.- Operation and Functions

5.1 Digital status

Digital status functions are provided by a status byte register. This is a 8-bit word when read by the I^{2}C controller.

Address	Bytes	Data
07	1	Status Byte

On the status byte each bit corresponds to a specific digital function as shown on the table below:

Bit	Function	Description	
0	I2C On_Off status	0 = Unit On , 1 = Unit Off	"1" if unit is shut down by I2C OFF command (0A)
1	Enable	0 = Good , 1 = Bad	Good if Vout is higher than 8 volts, Bad if Vout <6 volts for 12V output Good if Vout is higher than 19 volts, Bad if Vout <15 volts for 28V output Good if Vout is higher than 33 volts, Bad if Vout <28 volts for 48V output
2	IOG	0 = Good , 1 = Bad	Good if main Inverter is working OK, Bad is main inverter stops working or it's working abnormally
3	OTW	0 = Good , 1 = Bad	Good if baseplate temperature is < 90C, Bad if baseplate temperature is >90C, unit is ON
4	OTP	0 = Good , 1 = Bad	Good if baseplate temperature is < 100C, Bad if baseplate temperature is >100C, unit in OTP status
5	VoutOK	0 = Good , 1 = Bad	Good if Vout is present, Bad if not Vout is present
6	IoutOK	0 = Good , 1 = Bad	Good if Iout is in acceptable value below 110% Inom, Bad if unit is in OCP
7	Not Used	Always 0	

Note: During fault conditions, output voltage may be in hiccup mode. Because of that, the status byte can be different depending on the time when data is read.

Example:

1.- Read the status byte register (HEX number)
2.- Convert the HEX number to BIN number
3.- BIN number is read from right to left

If Over-current is applied to a 12V output unit

1.- Read the status byte register (HEX number) : 66

2.- Convert the HEX number to BIN number: 1100110

bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
1	1	0	0	1	1	0

3.- BIN number is read from right to left:

Bit	Function	Value	Description
0	I2C On_Off status	0	Unit is not OFF thru I2C
1	Enable	1	Vout < 6 volts
2	IOG	1	Main Inverter stops working
3	OTW	0	Baseplate temperature <90C
4	OTP	0	Baseplate temperature <100C, not OTP
5	VoutOK	1	Vout is not present
6	IoutOK	1	Iout is OK (acceptable)
7	Not Used	0	

5.2 EEPROM Functions

A 512 bytes EEPROM is included on the I2C option. The EEPROM is programmed at the factory with the data shown on the following table:

Address	Bytes	Data
01	20	Serial Number
02	3	Firmware revision
03	4	Product revision
08	11	Unit Part Number
09	8	Manufacturing Date
10	3	Manufacturing Location

All characters on the data are presented on ASCII format (HEX code)

Example:

For getting the Unit Part Number of a 12V output unit: CPFE1000F12

1.- Get 11 bytes of HEX data from address 08

2.- Convert the HEX code to characters using the ASCII code.

0x43,0x50,0x46,0x45,0x31,0x30,0x30,0x30,0x46,0x31,0x32

C	P	F	E	1	0	0	0	F	1	2

5.3 Analog Functions

Analog functions are provided by a 8-channel 10-bit resolution Analog-Digital Converter (ADC).When this device is read by the I2C bus controller it provides a 2 bytes word information.

Address	Bytes	Data
04	2	Output Voltage Readback
05	2	Output Current Readback
06	2	Baseplate Temperature Readback

The ADC has to be scaled to obtain a correct value for the voltage, current and temperature readings. The following scaling factor (SF) should be employed:

CPFE1000F12	Range	SF	Accuracy
Voltage	0 – 15V	0.034	+/-2%
Current	0-60A	0.0815	+/-10%
Temperature	0-100ºC	Note 1	+/-3%

CPFE1000F28	Range	SF	Accuracy
Voltage	0 – 34V	0.0777	+/-2%
Current	0-36A	0.0488	+/-10%
Temperature	0-100ºC	Note 1	+/-3%

CPFE1000F48	Range	SF	Accuracy
Voltage	0 - 58V	0.1355	+/-2%
Current	0-21A	0.0282	+/-10%
Temperature	0-100ºC	Note 1	+/-3%

Note: 1 Use the following formula for calculating temperature.

$$\left(\frac{\text{DEC Number} - 610}{1.8}\right) + 25$$

Where DEC Number is the decimal conversion of the HEX number read on address 6 (temp reading)

Example:

Output Voltage:

Address: 04
Bytes: 2
For 12 volts output, Vout measured on output bus bars: 12.003 vdc
Get the HEX number : 165
Convert the HEX to DEC number: 357
Multiply the DEC number by Scaling Factor (SF): 0.034
Vout = 357 * 0.034 = 12.1 Volts
Same method is used for current and temperature readings.

5.4 Remote ON/OFF thru I^{2}C.

Unit can be remotely turned OFF by the OFF command on address 0A. Once address 0A is called out, the unit will stay OFF until the ON command is called out thru address 1A or the Input Line is removed for about 30 seconds.
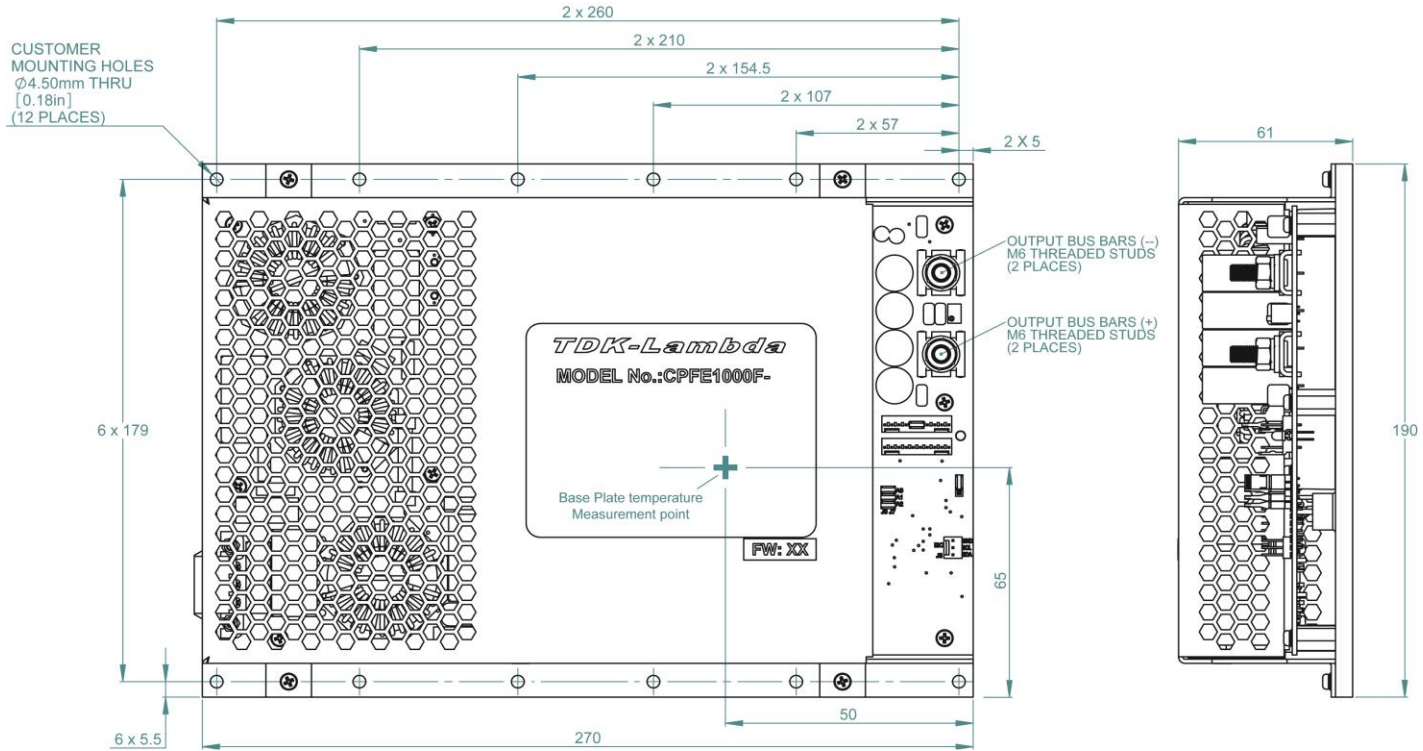
Note: For the Remote ON/OFF control to function, the unit must be enabled via the ON/OFF control (See Section 10) or the local ON/OFF jumper from J2 pin 5 to pin 6.

Address	Function
1A	Turn output On
0A	Turn output Off

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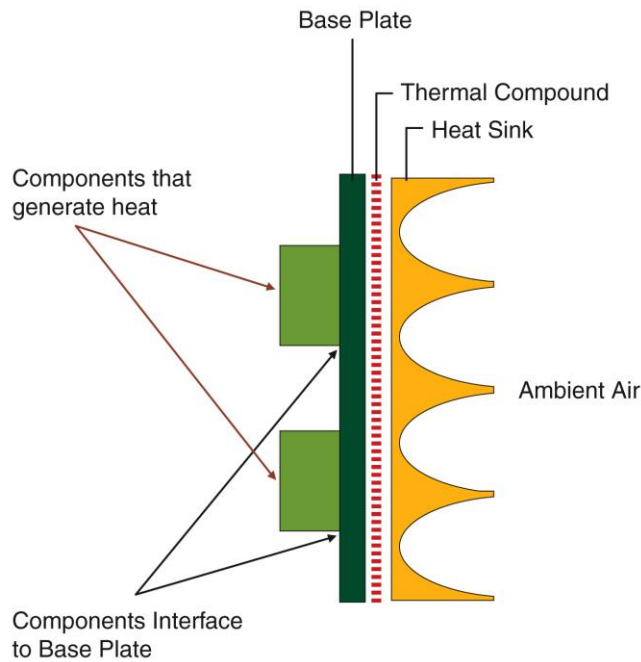**6.- Typical application diagram**
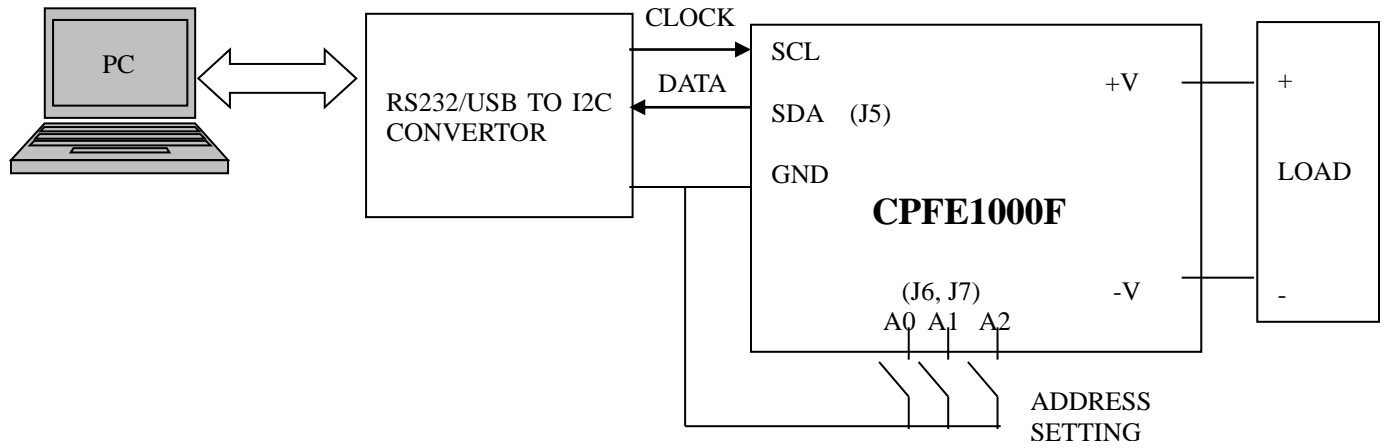
25. Mechanical Drawing

26. Baseplate Temperature Measurement Point

See above drawing for temperature measurement point.

27. Heat Sink Selection

PD = Power Dissipation $\quad \dfrac{P_{out}}{eff} - P_{out} = \dfrac{500}{.85} - 500 = 88$ Watts

Θ = Thermal Resistance, degrees C per Watt, ^{o}C/W
Tb = Temperature of Base Plate
Ta = Temperature Ambient Air
Θsa = Thermal resistance between Heat Sink and Ambient Air
Θba = Thermal resistance between Base Plate and Heat Sink

Example: Ambient 25°C $\qquad \Theta = \dfrac{Tb\text{-}Ta}{PD} = \dfrac{75^{o}C}{88} = .85^{o}$C/W
Base Plate 100°C