

# SWITCH MODE DC POWER SUPPLY



## REGULATED DC POWER SUPPLY

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**MODEL: SEC-1235CE**

### INSTALLATION & OPERATING MANUAL

Please read this manual before operating your power supply.

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## CAUTION !



**RISK OF ELECTRIC SHOCK  
DO NOT OPEN**



**WARNING—TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE. THERE ARE NO USER SERVICEABLE PARTS INSIDE—REFER TO QUALIFIED SERVICE PERSONNEL.**

### **IMPORTANT SAFETY INSTRUCTIONS**

Please read before using your power supply.

- 1) It is recommended that you return your power supply to a qualified dealer for any service or repair. Incorrect assembly may result in electric shock or fire.
- 2) To reduce the risk of electric shock, unplug the power supply from the outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
- 3) If an extension cord is used, make sure that it has grounded male plug Type EU1-16P (CEE-7/7, "Schuko") and grounded female receptacle(s) Type EU1-16R (CEE-7/4, "Schuko"). The size of the current carrying conductors should be such that they are able to carry at least 5 A for the length of the extension.
- 4) Place the unit in an area that will allow air to flow freely around the unit. DO NOT block or obstruct vent openings on the side/bottom of the unit.
- 5) Keep the unit away from moisture and water.
- 6) **NEVER OPERATE THE UNITS IN PARALLEL**

**WARNING!** Your power supply should be grounded to reduce the risk of electric shock. The power supply comes with a detachable power cord that has a grounded male plug Type EU1-16P (CEE-7/7, "Schuko"). The flat contact strips on the circumference of the plug get connected to the chassis of the unit. When the power cord is plugged into the corresponding receptacle Type EU1-16R (CEE-7/4, "Schuko"), the chassis of the unit is automatically connected to the earth ground through the equipment grounding conductor that is connected to the spring contacts of the power outlet receptacle Type EU1-16R (CEE-7/4, "Schuko").

The power cord must be plugged into a Type EU1-16R (CEE-7/4, "Schuko") outlet that is properly installed and grounded in accordance with all local codes and ordinances. Never alter the power cord that has been provided. If the plug of the cord will not fit the outlet, have a proper outlet installed by a qualified electrician. Improper connection can result in risk of electric shock.

**DO NOT USE THE POWER SUPPLY FOR DIRECT CHARGING OF BATTERY OR DIRECT CONNECTION TO A BATTERY FOR BATTERY BACK-UP. (Please read the section on "Battery Charging and Battery Back-up" on page 5).**



## DESCRIPTION

SEC-1235CE is a Switched Mode Power Supply (SMPS) which converts 230 V, 50 Hz AC power to regulated 13.8 V DC power based on Pulse Width Modulation (PWM) control.

## FEATURES

- Based on switched mode technology and PWM control
- Compact and light weight
- High efficiency and less heat dissipation
- Protected against short circuit, over load and over temperature
- Cooling by temperature controlled fan
- Safety compliance to European Low Voltage Directive 2006/95/EC
- EMI/EMC compliance to European EMC Directive 2004/108/EC

## CONNECTION AND OPERATION

**NOTE:** The DC output connectors (RED + and Black -) have a tubular hole of diameter 0.2" (5mm) with a set screw. If bare wire with stranded conductors is used to connect the load to the above output connectors of the power supply, the strands will spread out as the set screw is tightened and hence, the set screw will not pinch all the strands. As a result, the effective cross section of the current conducting area of the wire will be reduced resulting in voltage drop at the load end, reduced efficiency and also overheating. For a firm connection, crimp / solder a suitable pin type of copper terminal on the wire end to be connected to the power supply. **For convenience, a pair of terminals has been provided for crimping / soldering to the wire end.**

### OPERATION

- Ensure that the on / off switch on the power supply is switched off and it is unplugged from the AC outlet
- Switch off the 12 V load to be connected to the power supply. Connect the positive input wire of the load to the RED (Positive) terminal of the power supply and the negative input wire of the load to the BLACK (Negative) terminal of the power supply. Ensure that the connections are secure and tight
- Plug the power supply into the AC outlet. Press the On / Off switch of the power supply to the On position and check that the switch is illuminated indicating availability of the AC input power. If the On / Off switch is not illuminated, recheck the AC input connection, AC outlet and the fuse inside the power supply.
- Now switch on the DC load
- Ensure that the continuous load is limited to 30 A

## COOLING FAN CONTROL / THERMAL PROTECTION

**WARNING!** Operate the unit in a well ventilated, open and cool area. Do not block the openings at the fan discharge on the bottom of the unit and the suction openings on the sides.

The units are cooled by convection and by forced air cooling. **A temperature controlled fan** has been provided to improve cooling at higher loads and at higher ambient temperatures. The switching on of the fan is controlled by a sensor mounted on the power transformer. The fan will be switched on when the temperature of the sensor reaches 60° C +/- 5° C. The fan will be automatically switched off when the sensor cools down to 50° C +/- 5° C. **Thus, at lower loads or during lower ambient temperatures, the fan may remain switched off.**

An additional protection is provided to shut down the power supply in case the fan fails or if the air flow is blocked or if the ambient temperature is very high. A second temperature sensor is also mounted on the power transformer and will activate at 105° C +/- 5° C and shut down the output of the power supply. After the power supply cools down to 95° C +/- 5° C, the temperature sensor will de-activate and the power supply will resume operation automatically

## TROUBLESHOOTING - GENERAL

The output voltage can be adjusted with the help of the internal potentiometer marked "VR2". Adjustment range is (11V to 16 V).

**WARNING!** At output voltages higher than 13.8 V, the maximum output current should be reduced linearly from 30 A at 13.8 V to 25 A at 16 V.

## PROTECTIONS

### OVERLOAD / SHORT CIRCUIT

The units are protected against overload by constant current limiting at 35 A. If the load tries to draw more than 35A, the output voltage will drop and will no longer be regulated. The output voltage will drop to near 0 V in case of a dead short. The unit will recover automatically once the overload condition is removed.

### OVER TEMPERATURE

Protection is provided to shut down the power supply in case the fan fails or if the air flow is blocked or if the ambient temperature is very high. A temperature sensor is mounted on the power transformer and will activate at 105° C +/- 5° C and shut down the output of the power supply. After the power supply cools down to 95° C +/- 5° C, the temperature sensor will de-activate and the power supply will resume operation automatically.

## BATTERY CHARGING AND BATTERY BACKUP

**WARNING!** **These units are power supplies and not battery chargers. Do not connect these units directly to a battery**

The voltage of a 12 V battery in a deep discharged condition will be around 10 to 11.4 V. When a deeply discharged 12 V battery is charged at say 13.8 V, it will initially draw a very large current. As the battery capacity is restored, the battery voltage increases to around 13.8 V when fully charged and the current drawn by the battery reduces a few hundred mA.

If a deeply discharged battery is directly charged by SEC-1235CE, the battery will initially draw a very large current and thus, will force the power supply into current limit mode for prolonged period of time. This is harmful for the power supply as operating under prolonged periods under current limit conditions is an abnormal operating condition.

SEC-1235CE may be used for battery charging and battery backup application only when the battery is charged through a suitable external isolating diode and charge limiting resistor in series with the power supply. The isolating diode will ensure that the battery does not feed power back into the power supply and the series connected charge limiting resistor will limit the maximum charging current to a value less than the current limit.

It is recommended that the optional Battery Backup Module BBM-12100 may be used in conjunction with the power supply for battery charging / backup application.

**Call Technical Support at 1-800-561-5885 for further assistance**

## ADJUSTING OUTPUT VOLTAGE

**PROBLEM : Power ON/OFF switch does not illuminate when turned on.**

PROBABLE CAUSE

No power in the AC outlet

SUGGESTED REMEDY

Check there is power in the outlet.

AC side fuse inside the power supply is blown

Replace the fuse inside the unit.  
See fuse ratings at page 11

**PROBLEM : AC side fuse blows as soon as power is turned on.**

PROBABLE CAUSE

Unit is defective

SUGGESTED REMEDY

Call technical support.

**PROBLEM : The output voltage is 0 V or very low**

PROBABLE CAUSE

Input voltage is very low

SUGGESTED REMEDY

Check that the input voltage is 230VAC

The unit is in current limit condition due to overload caused by large reactive loading or by the output being short circuited

Check the output terminals are not shorted. Remove the load. If the output voltage gets restored, the load is shorted or is offering large reactive impedance.

Unit is shut down due to over temperature.

Check that the fan has not failed or the vent openings are not blocked

**PROBLEM : Output voltage drops as soon as the load is switched on**

PROBABLE CAUSE

The unit is going into current limit protection mode

SUGGESTED REMEDY

Reduce the load current to less than the current limit value. Motors, pumps, compressors, relays, incandescent and halogen lamps and large capacitors in the input section of the DC devices draw very high inrush or starting currents of up to 10 times their normal operating currents. Ensure that these inrush/starting currents



## SWITCHING POWER SUPPLIES AND RF NOISE

This equipment has been tested and found to comply with the limits as laid down under European Standards EN55022 (Class-B) & EN61000-3 - 2 & 3. These limits are designed to provide reasonable protection against a harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, this does not guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

## SWITCHING POWER SUPPLIES AND RF NOISE

1. Switched mode power supplies ( SMPS ) employ high frequency switching and thus, are a source of radio interference, a recipient of radio interference and a conduit of radio interference. ( Older linear type transformer based power supplies do not employ high frequency switching voltages and will be quieter as compared to switching type of supplies).
2. The primary emission sources originate in the switching devices due to their fast switching current transitions: harmonics of the switching frequency and broadband noise created by under-damped oscillations in the switching circuit. The secondary source is from the bridge rectifier, both rectifier noise and diode recovery. The AC input rectifier / capacitor in the front end of the switching power supplies ( excepting those with power factor correction ) are notorious for generating power supply harmonics due to the non linear input current waveform. The noise is both conducted and radiated through the input power cord and the DC output wiring to the radio.
3. Switching power supplies are also recipients of radio interference. The normal operation of the power supply can be disturbed due to RF noise getting coupled into the power supply. Thus, the power supply may generate excessive RF noise and lose output voltage regulation due to excessive transmitter energy being coupled through the AC / DC lines to the power supply's regulator feedback path. This may be due to antenna being too close or due to the antenna or feed system not radiating properly. First check the antenna system SWR. Then, if necessary, relocate either the antenna or the power supply farther apart.
4. The receiver may "hear" the power supply. A slowly moving, slightly buzzing carrier heard in the receiver may be caused by the antenna being too close. As with the transmitter related noise pick up, a loose coaxial connector or a broken or a missing ground may aggravate this problem. Normally these noises will be below the background or "band" noise. Increase the separation between the power supply and the receiving antenna. Use an outdoor antenna. This will reduce the amount of signal picked up from the power supply and also increase the amount of the desired signal.

5. The conducted and radiated noises are limited as per the applicable national / international standards. In North America, the applicable standard is as per FCC Part 15(B) for Class “B” digital devices. The European standard is as per EN55022, Class “B” & EN61000-3-2, 3. **Thus, the RF interference is limited but not entirely eliminated.**

6. The conducted RF noise from these power supplies is limited to the maximum allowable levels by internal filtration. The filtered RF noise currents (normally < 5mA ) are bypassed to the chassis of the power supply. The chassis is, in turn, connected to the earth ground pin of the AC input power cord (for Class 1 units). Thus, the filtered noise currents are intentionally leaked to the earth ground. This is termed as the “Earth Leakage Current”. For safety against electric shock, this earth leakage current is also required to be limited. It will be seen that these two requirements are conflicting.

**NOTE: In some cases, to prevent electric shock hazard due to abnormal leakage current (like in marinas, spas, hot tubs, wet spaces etc.), the AC outlet circuits / receptacles in these areas are served through a GFCI (Ground Fault Circuit Interrupter ).** This GFCI is normally set to trip when it senses an earth leakage current > 5 mA. A single GFCI may be serving multiple AC outlet circuits / receptacles and therefore, will be sensing the sum of all the leakage currents of the devices connected to these. As the switching power supplies have intentional leakage current as explained above, it may trip a GFCI feeding multiple AC outlet circuits / receptacles. In such cases, disconnect devices connected to the other AC outlet circuits / receptacles served by this GFCI.

7. Following additional guidelines may be followed to reduce the effects of RF noise:

- a. Use additional appropriate AC radio frequency interference (RFI) power line filter rated for minimum 5 A immediately before the AC input of the power supply. For example, consider suitability of model # 6VN1 from "N" series by Corcom, Inc. ([www.cor.com](http://www.cor.com)) or similar. Filtered, ferrite coated cord set ([www.emceupen.com](http://www.emceupen.com)) is another choice. These cord sets, with integral line interference filters, reduce common and differential mode interferences over a wide frequency range. Because they are shielded, they are also effective against radiated interferences. In addition to the built-in filter networks, the cable conductors are coated with an RF absorbing ferrite compound. This provides additional attenuation at high frequencies that is lacking in most regular LC filters. The RF absorption of the ferrite-coated cable avoids resonances at high frequencies, reducing the conducted and radiated RF noises even further
- b. Use additional appropriate DC radio frequency interference (RFI) power line filter rated for minimum 40 A immediately after the DC output of the power supply. For example, consider suitability of model # "FD10B050" from "FD" series by Curtis Industries ([www.curtisind.com](http://www.curtisind.com)) or similar.
- c. Twist the positive and negative wires from the output of the power supply to the radio.
- d. The DC side positive and negative outputs of these power supplies are isolated from the chassis. As explained at paragraph 6 above, the noise currents are filtered to the chassis ground and the chassis ground is connected to the earth ground through the earth ground pin of the AC power outlet receptacle. Avoid connecting (referencing) the DC negative output terminal of the power supply to the earth ground.
- e. Connect a 1/4" wave length of wire on the negative terminal of the power supply. Connect one end of the wire to the negative terminal and leave the other end free. The wave length corresponds to the wave length of the interfering frequency. (May not be practical for long wave lengths).

[ Formula: Wave length (Meters) = 300 / frequency in MHz ]

## SPECIFICATIONS

Model No.	SEC-1235CE
Nominal Input Voltage	230 VAC, 50Hz (Range: 207 to 253 VAC)
Input current	3.5 A at 230 VAC
Output Voltage	13.8 VDC
Output voltage adjustment	11.5 V to 15.5 V with the help of internal potentiometer
Output current	30 A continuous
Current limit	35 A, constant current limiting, auto recovery
No load current draw	130 mA at 230 VAC, 50 Hz
Ripple	50 mV peak to peak
Noise	150 mV peak to peak
Peak Efficiency	85%
Cooling	Temperature controlled fan
Protections against	Overload, short circuit Over temperature
Operating temperature	0° to 40° C
Safety compliance	Conforms to European Low Voltage Directive 2006/95/EC
• Standards	• IEC 60950-1; EN 60950-1
EMI/EMC compliance	Conforms to European EMC Directive 2004/108/EC
• Standards	• EN 55022 (class B); EN 61000-3-2; EN 61000-3-3 • EN 55024 : EN 61000-4-2 to 6; EN 61000-4-8; EN 61000-4-11
AC input connections	Male AC inlet connector Type "IEC 320-C14" Detachable AC power cord with: • Female connector Type "IEC 320-C13" on one end to mate with AC power inlet connector on the power supply • Male, 2 pole, 3 Wire grounding plug Type EU1-16P (CEE 7/7) (Schuko) on the other end for connection to the AC outlet.
DC output connections	RED (+) and BLACK (-) terminals with tubular hole and set screw. Hole diameter 0.2", (5 mm). Includes a pair of copper terminal lugs for crimping to output wires to the load
Input side fuse	250V, 4A
(5 mm X 20 mm, glass ferrule, delayed action)	Manufacturer: Littell Fuse, Model 218004
Weight	3.4 lbs
Dimensions (L X W X H)	8" X 7.3" X 2.5"

**Note:** The above specifications are subject to change without notice



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