



samlexpower®

**Switch Mode
DC Power
Supplies**

SEC-1212
SEC-1223

Owner's
Manual

Please read this
manual BEFORE
installing your
Power Supply.

OWNER'S MANUAL | Index

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SECTION 1 | Important Safety Instructions

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.

The following safety symbols will be used in this manual to highlight safety and information:



WARNING!

Indicates possibility of physical harm to the user in case of non-compliance.



CAUTION!

Indicates possibility of damage to the equipment in case of non-compliance.



INFO

Indicates useful supplemental information.

Please read before using your power supply:

1. It is recommended that you return your power supply to a qualified Samlex 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. An extension cord should not be used unless absolutely necessary. **If an extension cord must be used make sure that the pins on the plug are the same number, size and shape as those of the original power supply plug.**
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 is equipped with grounding conductor and grounding plug.

The cord must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances. Never alter the AC cord or plug provided. If the cord will not fit the outlet, have a proper outlet installed by 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 Back-up).

SECTION 3 | Product Overview

DESCRIPTION

SEC-1212 / SEC-1223 are switched mode power supplies which convert 120 VAC, 50/60 HZ to regulated 13.8 VDC based on pulse width modulation (PWM) control.

Features

- Based on switched mode technology and PWM control. Switching frequency:
 - SEC-1212 : 20 KHz
 - SEC-1223 : 25 KHz
- Compact and lightweight.
- High efficiency and less heat dissipation.
- Protected against short circuit, over current and over voltage (through PWM controller).
- SEC-1212 is convection cooled. SEC-1223 has forced air cooling and over temperature shut down.
- UL listed and approved.
- Complies with FCC part 15(B) for radiated & conducted noises for Class-B digital devices.

CONNECTION & OPERATION



WARNING!

Before plugging the unit to the AC outlet, please check that your local supply voltage is 120 VAC.

NOTE! The DC output connector (RED + / BLACK -) has a tubular hole of diameter 0.2" (5mm) with a set screw. For a firm connection, crimp/solder pin type copper terminal on the cable ends of your 12V DC device (2 Pin Type of terminals have been supplied with the unit).

Ensure that the power supply's ON/OFF switch is off and it is unplugged from the AC outlet. Switch off your 12 V DC device and connect it's Positive and Negative to the RED (Positive) and BLACK (Negative) terminals respectively. 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 ON and observe that the neon indicator in the switch illuminates. If the indicator fails to light , recheck the connection, AC outlet and the fuse inside the power supply.

Your 12V DC device may now be switched ON.

SECTION 3 | Product Overview

COOLING (SEC-1212)

SEC-1212 is cooled by convection. **PLACE THE SEC-1212 UNIT IN A WELL VENTILATED OPEN AND COOL AREA. DO NOT BLOCK THE VENTILATION OPENINGS ON THE SIDES.**

Cooling & Fan Control/Thermal Shut Down (SEC-1223)

SEC-1223 is cooled by convection and forced air. A temperature controlled fan has been provided to improve cooling at higher loads. The fan is controlled by a sensor mounted on the power transformer. **THE FAN WILL BE OFF AT LOWER LOADS.** It will come on only when the temperature of the power transformer is $\geq 60^{\circ}\text{C} \pm 5^{\circ}\text{C} / 140^{\circ}\text{F} \pm 9^{\circ}\text{F}$ due to higher loads or higher ambient temperature or poor cool air circulation around the unit. The fan will switch off automatically at $\leq 40^{\circ}\text{C} \pm 5^{\circ}\text{C} / 104^{\circ}\text{F} \pm 9^{\circ}\text{F}$. In case the fan fails or the air flow is blocked, a second temperature sensor mounted on the power transformer will activate over temperature shut down at $\geq 105^{\circ}\text{C} \pm 5^{\circ}\text{C} / 221^{\circ}\text{F} \pm 9^{\circ}\text{F}$. The output voltage will be automatically resumed once the unit cools down to $\leq 75^{\circ}\text{C} \pm 5^{\circ}\text{C} / 167^{\circ}\text{F} \pm 9^{\circ}\text{F}$. **PLACE THE SEC-1223 UNIT IN A WELL VENTILATED OPEN AND COOL AREA. DO NOT BLOCK THE OPENINGS AT THE FAN DISCHARGE ON THE BOTTOM AND THE SUCTION OPENINGS ON THE SIDES .**

BATTERY CHARGING & BATTERY BACK-UP



WARNING!

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

These units should **NOT BE DIRECTLY CONNECTED TO A BATTERY** for charging or for battery back-up. Battery charging and battery back-up may be undertaken only when the battery is connected through suitable external isolating diodes and charge limiting resistor.

The isolating diode will ensure that the battery does not back power the power supply. When a battery is deeply discharged, it will initially draw a very large charging current and thus, will force the power supply into current limit mode for prolonged periods. This is harmful for the power supply. The charge limiting resistor will limit the charging current, thereby, ensuring that the maximum charging current is well below the current limit value of the power supply.



INFO

It is recommended that optional battery back-up module BBM-1225 may be used to convert SEC-1212/SEC-1223 for battery back-up application.

SECTION 4 | Troubleshooting Guide

OPERATION AS A SIMPLE POWER SUPPLY - ONLY LOAD IS CONNECTED. NO EXTERNAL BATTERY AND NO BATTERY BACKUP.

Symptom	Possible Cause	Remedy
<p>ON / OFF Switch is ON</p> <ul style="list-style-type: none"> Switch is NOT lighted No DC output 	<p>No AC power from the AC outlet</p> <p>Internal AC side fuse is blown</p>	<p>Check AC power is available at the AC outlet. Breaker feeding the AC outlet may have tripped.</p> <p>Open the top cover and check the AC side fuse. Replace if blown.</p> <p>If the fuse blows again, the input section is damaged. Please call Tech Support.</p>
<p>ON / OFF Switch is ON</p> <ul style="list-style-type: none"> Switch is lighted No DC output 	<p>Unit has shut down due to over temperature – Temperature of output transformer windings is: $\geq 105^{\circ}\text{C} \pm 5^{\circ}\text{C} / 221^{\circ}\text{F} \pm 9^{\circ}\text{F}$ (For SEC-1223 only)</p>	<p>Check that the fan is running. If not, the fan / fan control circuit may have been damaged. Call Tech Support.</p> <p>Check that the fan suction vents on the sides of the unit and the discharge vents on the bottom of the unit are not blocked.</p> <p>The unit will reset automatically when the transformer windings cool down to $\leq 75^{\circ}\text{C} \pm 5^{\circ}\text{C} / 167^{\circ}\text{F} \pm 9^{\circ}\text{F}$</p>
<p>ON / OFF Switch is ON</p> <ul style="list-style-type: none"> Switch is lighted DC Output voltage drops 	<p>If the voltage loses regulation and drops to $< 13.5\text{V}$, the unit is overloaded and is in current limit. The load is trying to draw \geq the current limit value</p> <p>If the voltage drop is considerable with voltage $< 2\text{V}$, the load side is seeing a short circuit and short circuit current limited to the current limit value is being driven into the short circuit</p>	<p>Reduce the current drawn by the load to less than the continuous rating.</p> <p>Switch OFF the load. Remove the short circuit on the load side.</p>
<p>GFCI outlet / GFCI breaker supplying AC power to the unit trips when the unit is switched ON</p>	<p>Additional RF noise currents from the unit that are filtered to Earth Ground increase the net Leakage Current on the GFCI outlet / GFCI breaker to $> 5\text{mA}$</p>	<p>Switch OFF other SMPS devices operating from the same GFCI outlet / GFCI breaker to reduce the net leakage current to $< 5\text{mA}$</p> <p>Move the unit to another GFCI outlet / GFCI breaker that has lesser number of SMPS load(s) or no SMPS load</p> <p>Power the unit from normal, non GFCI outlet or from an outlet not protected by GFCI breaker</p>

SECTION 5 | Limiting Electromagnetic Interference



CAUTION!

Conducted and radiated noises in this unit are limited as per the applicable National / International Standards. In North America, the applicable standard is FCC Part 15(B) for Class "B" Digital Devices for Residential Installations. The corresponding European standard is EN55022, Class "B" & EN610000-3-2, 3.

This unit 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 measures recommended in the following paragraphs.

UN-INTENTIONAL RF NOISE GENERATED BY SWITCHED MODE POWER SUPPLIES (SMPS)

Switched Mode Power Supplies (SMPS) employ high frequency switching (25 KHz in this unit) and thus, are a source of radio interference, a recipient of radio interference and a conduit of radio interference. (Older Linear Type, low frequency 50 / 60 Hz transformer based power supplies do not employ high frequency switching voltages and will be quieter as compared to SMPS).

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 SMPS (excepting those with Power Factor correction) generate 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.

FILTRATION OF CONDUCTED NOISE

The conducted RF noise from this SMPS unit is limited to the maximum allowable levels by internal filtration. The filtered RF noise currents (< few hundred micro Amps) 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".

EXCESSIVE RF OUTPUT INTERFERENCE BY SMPS DUE TO INCOMING RF INTERFERENCE WHEN POWERING RADIO TX / RX

SMPS 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.

SECTION 5 | Limiting Electromagnetic Interference

Then, if necessary, relocate either the antenna or the power supply farther apart. 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, this noise 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.

ADDITIONAL GUIDELINES FOR REDUCING RF NOISE

- Use additional appropriate AC Radio Frequency Interference (RFI) Power Line Filter rated for minimum 10A immediately before the AC input of the power supply. For example, consider suitability of Model # 10VN1 from TE Connectivity www.te.com or similar. Filtered, Ferrite Coated Cord Set 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. For example, consider suitability of EMC Cord “IMU-14” from EMC Eupen www.emceupen.com or similar.
- Use additional appropriate DC radio frequency interference (RFI) power line filter rated for minimum 30 A immediately after the DC output of the power supply. For example, consider suitability of 30A filter Model # “FD10EE030” from Curtis Industries www.curtisind.com or similar.
- Twist the Positive and Negative wires from the output of the power supply to the radio.
- The DC side Positive and Negative outputs of these power supplies are isolated from the chassis. As explained earlier, the noise currents are filtered to the chassis of the unit and the chassis 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.
- Connect a ¼” wavelength 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 wavelength corresponds to the wavelength of the interfering frequency. (May not be practical for long wave lengths).

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

COMBINED FILTERED NOISE CURRENTS FROM MULTIPLE SMPS ON A BRANCH CIRCUIT MAY TRIP GROUND FAULT CIRUIT INTERRUPTER (GFCI)

During malfunction or an accident, the metal chassis of a device may get energized to unsafe voltage due to internal high voltage section coming in contact with the chassis. If a person standing on Earth touches this energized chassis, a leakage current

SECTION 5 | Limiting Electromagnetic Interference

proportional to the person's skin resistance will flow through the person's body to Earth Ground. The leakage current through the body is higher when the skin contact resistance is lower i.e. if the skin is wet or wounded. This leakage current does not return to the power source but is dissipated in Earth Ground. A leakage current of $> 5\text{mA}$ could produce lethal electrical shock. Ground Fault Circuit Interrupter (GFCI) is used for safety against electrical shock due to leakage. GFCI measures the difference between the current sent to the load and returned from the load and will trip and disconnect the power circuit if the difference is $> 5\text{mA}$. GFCIs are normally installed in AC Branch Circuits feeding power outlets in wet areas like marine craft, RVs, spas, hot-tubs, kitchens, washrooms, etc.

As explained earlier, RF noise filtration circuits in SMPS generate intentional Earth Leakage Current. SMPS are used extensively as DC power sources in modern day electrical / electronic devices e.g. Audio / Video / Computing devices, power supplies, battery chargers etc. A single GFCI outlet / GFCI breaker may be serving multiple SMPS loads and therefore, will be sensing the sum of all the Earth Leakage Currents and, if the sum is $> 5\text{mA}$ after connecting this unit, the GFCI will trip. In such a case, disconnect other SMPS based device(s) being served by this GFCI one by one till the net leakage current is reduced to $< 5\text{mA}$ and the GFCI does not trip. **Other solution is to power this unit from a GFCI outlet / GFCI breaker that does not have any SMPS load or power from an outlet that is not protected by GFCI.**

SECTION 6 | Specifications

	SEC-1212	SEC-1223
AC INPUT		
Nominal AC Input Voltage	120 VAC, 60 Hz	
Input Current	2.5 A	5.5A
Input Current at No Load	120 mA \pm 10% @120VAC	
Inrush current at Startup	20A +/- 5A for < 5 ms	30A +/- 5A for < 5 ms
DC OUTPUT		
Output Voltage	13.8VDC \pm 0.1V	
Output Current	<ul style="list-style-type: none"> Continuous: 10A Current Limit: 14A, Auto recovery 	<ul style="list-style-type: none"> Continuous: 23A; Current Limit: 25A, Auto recovery
Output Noise and Ripple	< 150 mV Peak to Peak	
Peak Efficiency	85% +/-5%	
DESIGN		
Type	Switch Mode Power Supply (SMPS) with Fixed Frequency Pulse Width Modulation (PWM)	
Output Side Switching Frequency	20 KHz	25 KHz
PROTECTIONS		
Short Circuit, Overload	Constant Current Limiting at 14A; Auto Reset	Constant Current Limiting at 25A; Auto Reset
Over Voltage	Regulated by PWM Controller	
Over Temperature	Cooled by convection. No protection is necessary	Output shuts down when Power Transformer winding temperature \geq 105°C \pm 5°C / 221°F \pm 9°F; Auto reset on cooling down to \leq 75°C \pm 5°C / 167°F \pm 9°F
COOLING		
Type of cooling	Convection – No fan	Temperature controlled fan. ON when Power Transformer winding temperature is \geq 60°C \pm 5°C / 140°F \pm 9°F; OFF when cools down to \leq 40°C \pm 5°C / 104°F \pm 9°F
FUSE		
Internal AC Side Fuse, 120VAC Input	<ul style="list-style-type: none"> 5 mm x 20 mm Glass Fuse 250V, 3A, Time Delay Type Littelfuse - "239003" 	<ul style="list-style-type: none"> 5 mm x 20 mm Glass Fuse 250V, 6.3A, Time Delay Type Littelfuse - "21806.3"

NOTE: Specifications are subject to change without notice.

SECTION 6 | Specifications

	SEC-1212	SEC-1223
COMPLIANCE		
Safety	UL safety listed as "Information Technology Equipment Power Supply" for USA (UL Standard ANSI/UL-60950-1) and for Canada (CSA Standard CAN/CSA-C22.2 No. 60950-1)	
Electro Magnetic Interference EMI – Radiated & Conducted	FCC Part 15(B), Class B	
INPUT / OUTPUT CONNECTIONS		
AC Input Connection	<ul style="list-style-type: none"> • "IEC 320-C14" Inlet Connector on the unit • Detachable Power Cord with: <ul style="list-style-type: none"> • "IEC 320-C13" Connector on one end • NEMA5-15P Plug on the other end 	
DC Output Connectors	Terminal with Tubular Hole - Diameter 5mm / 0.2" and set screw (#10, 24 TPI, 5/16" long)	
ENVIRONMENTAL		
Operating Temperature Range	0°C / 32°F to 30°C / 86°F	0°C / 32°F to 40°C / 104°F
DIMENSIONS AND WEIGHT		
Dimensions (W x D x H)	185 x 208 x 59.5 mm	185 x 208 x 61 mm
	7.28 x 8.19 x 2.34 in	7.28 x 8.19 x 2.40 in
Weight	1.36 kg	1.6 kg
	3.0 lb	3.5 lb

NOTE: Specifications are subject to change without notice.

SECTION 7 | Warranty

3 YEAR LIMITED WARRANTY

SEC-1212/SEC-1223 manufactured by Samlex America, Inc. (the “Warrantor”) is warranted to be free from defects in workmanship and materials under normal use and service. The warranty period is 3 years for the United States and Canada, and is in effect from the date of purchase by the user (the “Purchaser”).

Warranty outside of the United States and Canada is limited to 6 months. For a warranty claim, the Purchaser should contact the place of purchase to obtain a Return Authorization Number.

The defective part or unit should be returned at the Purchaser’s expense to the authorized location. A written statement describing the nature of the defect, the date of purchase, the place of purchase, and the Purchaser’s name, address and telephone number should also be included.

If upon the Warrantor’s examination, the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor’s option without charge, and returned to the Purchaser at the Warrantor’s expense. (Contiguous US and Canada only).

No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so. Warranty service shall be performed only by the Warrantor. Any attempt to remedy the defect by anyone other than the Warrantor shall render this warranty void. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion.

No other express warranty is hereby given and there are no warranties which extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.

There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any persons, or damage to person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof. The Warrantor assumes no liability for incidental or consequential damages of any kind.

Samlex America Inc. (the “Warrantor”)
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NOTES

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