



samlexpower®

**Switch Mode
DC Power
Supplies**

SEC-1212P
SEC-1223P
SEC-1235P
SEC-1235P-M

**Owner's
Manual**

Please read this
manual **BEFORE**
installing your
Power Supply.

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SECTION 1 | Important Safety Instructions

1.1 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.

ATTENTION!

RISQUE DE CHOC ÉLECTRIQUE ! N'OUVREZ PAS !

AVERTISSEMENT - POUR RÉDUIRE LE RISQUE D'INCENDIE OU DE CHOC ÉLECTRIQUE, NE PAS EXPOSER CET APPAREIL À LA PLUIE OU L'HUMIDITÉ, IL N'Y A PAS DE PIÈCE À L'INTÉRIEUR - REPORTEZ-VOUS À UN PERSONNEL QUALIFIÉ

1.2 SYMBOLS

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.



MISE EN GARDE!

L'utilisateur pourrait se blesser lorsque les consignes de sécurité ne sont pas suivies.



CAUTION!

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



ATTENTION!

Il y a un risque d'endommager l'équipement lorsque l'utilisateur ne suit pas les instructions.



INFO

Indicates useful supplemental information.

SECTION 1 | Important Safety Instructions

1.3 GENERAL

Please read before using your power supply:

- a) 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.
- b) 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.
- c) 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 country specific power cord plug. Also, the voltage and current specs of the extension cord should match the voltages and current capacities of the power supply.**
- d) 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 sides of the unit.
- e) Keep the unit away from moisture and water.
- f) **NEVER operate the units in parallel.**

1.4 GROUNDING



WARNING!

Your power supply should be grounded to reduce the risk of electric shock. The power supply is equipped with grounding provision in the IEC 320-C14 Power Cord Inlet.

Country specific power cord must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances. Improper connection can result in risk of electric shock.



MISE EN GARDE!

Votre alimentation doit être mis à la terre pour réduire le risque de choc électrique. L'alimentation est équipé d'une disposition de la mise à la terre IEC 320-C14 Cordon d'Inlet.

Le cordon doit être branché dans une prise de courant correctement installée et mise à la terre conformément à tous les codes et règlements locaux. Une connexion incorrecte peut entraîner un risque de choc électrique.

1.5 CONNECTION TO A BATTERY

DO NOT USE THE POWER SUPPLY FOR DIRECT CHARGING OF BATTERY OR DIRECT CONNECTION TO A BATTERY FOR BATTERY BACK-UP. (Please read Section 3.5).

SECTION 2 | Layout & Dimensions

2.1 SEC-1212P

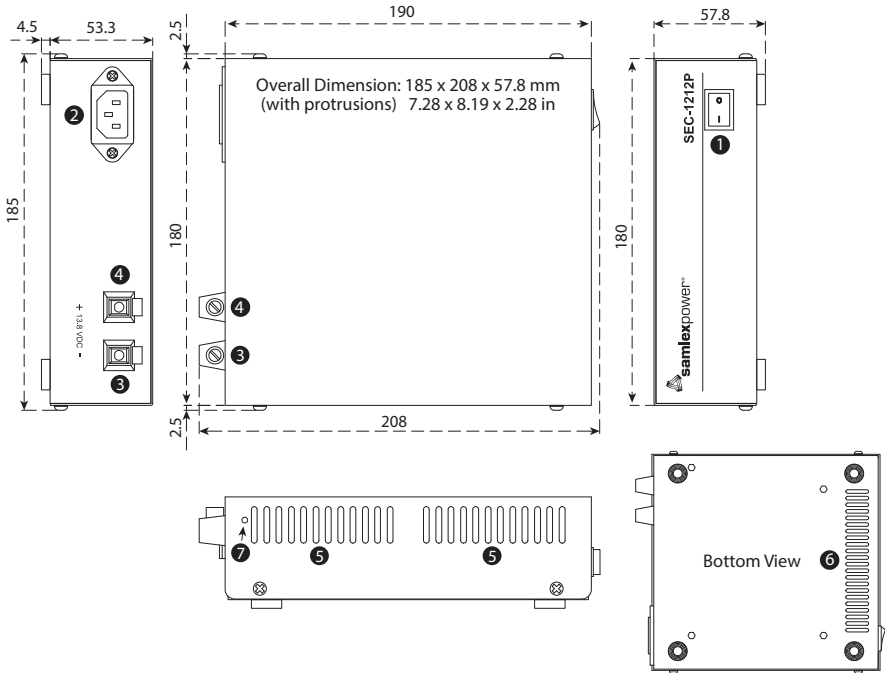


Figure 2.1 Layout & Dimensions - SEC-1212P

LEGEND for Fig 2.2

1. Lighted Power ON/OFF Rocker Switch (Lights Red when ON)
2. AC Power Cord Inlet: Type "IEC 60320-C14" for detachable power cord with "IEC 60320-C13" connector on one end and country specific plug on the other end.
3. Black Negative (-) DC Load Terminal
 - Tubular hole Dia 5mm/0.2" and set screw (5/64" Hex Socket Head, #10, 24 TPI, 5/16" long)*See Note 2
4. Red Positive (+) DC Load Terminal
 - Tubular hole Dia 5mm/0.2" and set screw (5/64" Hex Socket Head, #10, 24 TPI, 5/16" long)*See Note 2
5. Air cooling slots in the top cover for cooling by convection
6. Air cooling slots at the bottom housing for cooling by convection
7. Lanced tab that slides into corresponding slot in the bottom housing. (There is one more lanced tab on the other corresponding side of the top cover).

NOTES: 1. The top cover will fit properly only when the 2 lanced tabs (7, Fig 2.1) are oriented towards the DC output terminals (3) and (4).

2(a). 5/64" Hex Key and 2 spare set screws have been provided.

2(b). 2 pieces of Pin Type Terminals (for wire size up to AWG#8) have also been provided for crimping to bare stranded wire ends of load wiring for firm contact under the set screws.

SECTION 2 | Layout & Dimensions

2.2 SEC-1223P AND SEC-1235P

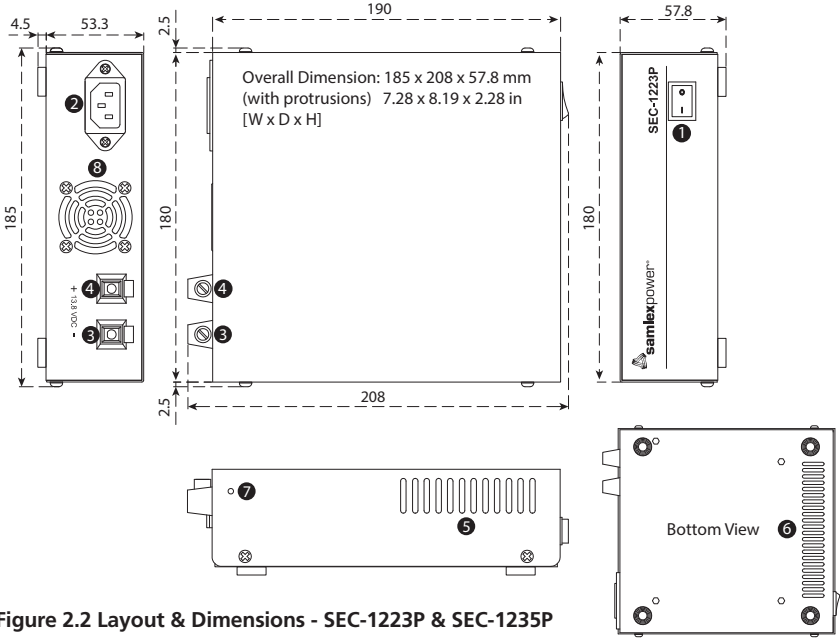


Figure 2.2 Layout & Dimensions - SEC-1223P & SEC-1235P

LEGEND for Fig 2.2

1. Lighted Power ON/OFF Rocker Switch (Lights Red when ON)
2. AC Power Cord Inlet: Type "IEC 60320-C14" for detachable power cord with "IEC 60320-C13" connector on one end and country specific plug on the other end.
3. Black Negative (-) DC Load Terminal
 - Tubular hole Dia 5mm/0.2" and set screw (5/64" Hex Socket Head, #10, 24 TPI, 5/16" long)*See Note 2
4. Red Positive (+) DC Load Terminal
 - Tubular hole Dia 5mm/0.2" and set screw (5/64" Hex Socket Head, #10, 24 TPI, 5/16" long)*See Note 2
5. Air inlet slots on the top cover for cooling fan suction
6. Air inlet slots in the bottom for cooling fan suction
7. Lanced tab that slides into corresponding slot in the bottom housing. (There is one more lanced tab on the other corresponding side of the top cover). This ensures that the top cover fits properly only in one orientation i.e. with ventilation slots (5) positioned away from the fan discharge openings (8).
8. Ventilation openings for fan discharge (outwards). Fan is located behind the ventilation openings.

NOTES: 1. The top cover will fit properly only when the 2 lanced tabs (7, Fig 2.2) are oriented towards the DC output terminals (3) and (4).
 2(a). 5/64" Hex Key and 2 spare set screws have been provided.
 2(b). 2 pieces of Pin Type Terminals (for wire size up to AWG#8) have also been provided for crimping to bare stranded wire ends of load wiring for firm contact under the set screws.

SECTION 2 | Layout & Dimensions

2.3 SEC-1235P-M

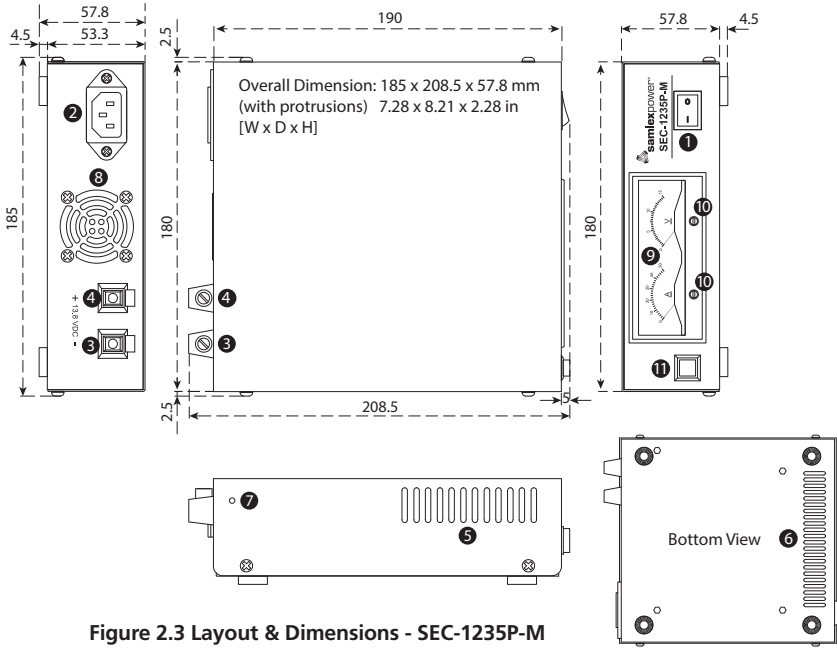


Figure 2.3 Layout & Dimensions - SEC-1235P-M

LEGEND for Fig 2.3

1. Lighted Power ON/OFF Rocker Switch (Lights Red when ON)
2. AC Power Cord Inlet: Type "IEC 60320-C14" for detachable power cord with "IEC 60320-C13" connector on one end and country specific plug on the other end.
3. Black Negative (-) DC Load Terminal
 - Tubular hole Dia 5mm/0.2" and set screw (5/64" Hex Socket Head, #10, 24 TPI, 5/16" long)*See Note 2
4. Red Positive (+) DC Load Terminal
 - Tubular hole Dia 5mm/0.2" and set screw (5/64" Hex Socket Head, #10, 24 TPI, 5/16" long)*See Note 2
5. Air inlet slots on the top cover for cooling fan suction
6. Air inlet slots in the bottom housing for cooling fan suction
7. Lanced tab that slides into corresponding slot in the bottom housing. (There is one more lanced tab on the other corresponding side of the top cover). This ensures that the top cover fits properly only in one orientation i.e. ventilation slots(5) positioned away from the fan discharge openings(8).
8. Ventilation openings for fan discharge (outwards). Fan is located behind the ventilation openings.
9. Lighted Volt and Ammeter:
 - Voltmeter: 0 to 15V ; 0.5V per division
 - Ammeter: 0 to 50A ; 2A per division
10. Screw adjustment for mechanical zeroing of Voltmeter and Ammeter needles.
11. On/Off Push Button for meter back light.

- NOTES:** 1. The top cover will fit properly only when the 2 lanced tabs (7, Fig 2.3) are oriented towards the DC output terminals (3) and (4).
- 2(a). 5/64" Hex Key and 2 spare set screws have been provided.
 - 2(b). 2 pieces of Pin Type Terminals (for wire size up to AWG#8) have also been provided for crimping to bare stranded wire ends of load wiring for firm contact under the set screws.

SECTION 3 | Description & Operation

3.1. DESCRIPTION

SEC-1212P / SEC-1223P / SEC-1235P / SEC-1223P-M are Switched Mode Power Supplies (SMPS) which convert 100-240 VAC, 50/60 Hz to regulated 13.8 VDC.

Features

- Complies with Minimum Energy Performance Standard (MEPS) for External Power Supplies and meets Directives issued by: CEC (USA)/ DoE (USA) / NRCAN (Canada)/ GEMS - MEPS (Australia and New Zealand) / ErP Directive (European Union) / International Efficiency Marking Protocol
- Efficiency Levels: (i) Level VI at input voltage of 115VAC (ii) Level VI at input voltage of 230 VAC
- Universal AC input range of nominal 100 VAC to 240 VAC, 50 to 60 Hz allows international application without changing jumpers / switch positions
- Power Factor (PF) corrected to > 0.9 at loads > 50% allows lower input current and line losses, lesser harmonic distortion and lower RF noise
- Uses highly integrated Switched Mode Controller combining PWM Control & Active Power Factor Correction for lower component count, higher efficiency and reliability

3.2. CONNECTION & OPERATION



WARNING!

Before plugging the unit to the AC outlet, please check that your local supply voltage is 100-240 VAC, 50/60 Hz.

NOTE! The DC output connectors (3 and 4, Figs 2.1 to 2.3) have 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 (for wire size up to AWG #8) have been supplied with the unit).



MISE EN GARDE!

Avant de brancher l'unité à la prise secteur, veuillez vérifier que votre tension d'alimentation est de 100-240 VCA, 50/60 Hz.

REMARQUE ! Les connecteurs de sortie (DC 3 et 4, figures 2.1 à 2.3) a un diamètre de trou tubulaire 0,2" (5mm) avec une vis. Pour un lien ferme, à sertir/ soudez les broches de cuivre de type borne sur les extrémités du câble de votre appareil DC 12V (2 broches type de terminaux ont été fournis avec l'appareil).

Ensure that the power supply's ON/OFF switch (1, Fig 2.1 to 2.3) is off and the power supply 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 (3 and 4, Figs 2.1 to 2.3). Ensure that the connections are secure and tight. Plug the power supply into the

SECTION 3 | Description & Operation

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.

SEC-1235P-M has Voltmeter and Ammeter (9, Fig 2.3). If necessary, use adjusting screws (10, Fig 2.3) to zeroise the needles (do this with the unit in OFF condition). If required, the back light of the meter can be switched ON using ON/OFF Push Button for the back light (11, Fig 2.3).

Your 12V DC device may now be switched ON.

3.3 COOLING AND OVER TEMPERATURE PROTECTION

3.3.1 Cooling and Over Temperature Protection: SEC-1212P

INSTALL IN WELL VENTILATED, OPEN, COOL AND DRY AREA. DO NOT BLOCK VENTILATION OPENINGS ON THE SIDES AND IN THE BOTTOM

SEC-1212P is cooled by convection. For this, it has ventilation slots on the 2 sides of the top cover (5, Fig 2.1) and in the bottom housing (6, Fig 2.1).

Over temperature protection is provided by Temperature Sensor mounted on the Primary Heat Sink. The output power of the unit will be shut down if the Primary Heat Sink temperature rises to $105^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or above due to one or more of the following reasons:

- Ambient temperature ratings given in the specifications at Section 6 have been exceeded
- Ventilation slots on the sides of the top cover (5, Fig 2.1) and in the bottom housing (6, Fig 2.1) are blocked

The output power will be reset automatically when the Primary Heat Sink cools down to $75^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or lower.

3.3.2 Cooling and Over Temperature Protection: SEC-1223P/1235P/1235P-M

INSTALL IN WELL VENTILATED, OPEN, COOL AND DRY AREA. DO NOT BLOCK SUCTION AND DISCHARGE VENTILATION OPENINGS ON THE SIDES AND IN THE BOTTOM

SEC-1223P/1235P/ SEC-1235P-M are cooled by convection and by forced air cooling by temperature controlled fan. The fan sucks cool air from the inlet slots located towards the front sides of the top cover (5, Fig 2.2 and 2.3) and the front side of the bottom housing (6, Figs 2.2 and 2.3). The air is discharged from the rear ventilation openings in the bottom housing behind the fan (8, Figs 2.2 and 2.3).

The fan operation is controlled by Temperature Sensor mounted on the Secondary Heat Sink inside the unit. The fan will turn ON only if the Secondary Heat Sink temperature rises to $55^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or higher due to (i) higher loads (ii) higher ambient temperature, or (iii) poor cool air change around the unit. Thus, the fan may remain OFF when supplying lower loads in cooler ambient temperature. The fan will switch OFF automatically when the Secondary Heat Sink temperature cools down to $45^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

SECTION 3 | Description & Operation

In case (i) the fan fails or, (ii) the suction / discharge ventilation openings are blocked or, (iii) the ambient temperature ratings given in the specifications at Section 6 have been exceeded, temperature inside the unit will continue to rise. A second Temperature Sensor mounted on the Primary Heat Sink will shut down the output power if the Primary Heat Sink temperature rises to $105^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or above. The output power will be reset automatically when the Primary Heat Sink cools down to $75^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or lower.

3.3.3 Orientation of Top Cover Fitment – SEC-1223P/1235P/1235P-M

In SEC-1223P/1235P/1235P-M, the fan sucks cool air from the inlet slots located towards the front sides of the top cover (5, Fig 2.2 and 2.3) and the front side of the bottom housing (6, Figs 2.2 and 2.3). The air is discharged from the rear ventilation openings in the bottom housing behind the fan (8, Figs 2.2 and 2.3). For proper air flow path from the front to the rear, it is necessary that the top cover is fitted with the side ventilation slots (5, Fig 2.2 and 2.3) oriented towards the front. To ensure this, 2 lanced tabs (7, Fig 2.2 and 2.3) are provided in the top cover that will slide into the corresponding slots in the rear side of the bottom housing. The top cover will not fit properly if the ventilation slots are facing towards the rear side because the lances tabs will interfere with the top edge of the front side of the bottom housing (there are no corresponding slots on the front side of the bottom housing)

3.3.4 Orientation of Top Cover Fitment – SEC-1212P

In SEC-1212P, there is no fan. Cooling is carried out by convection through the ventilation slots on the 2 sides of the top cover (5, Fig 2.1) and in the bottom housing (6, Fig 2.1). For improved cooling of the Primary Heat Sink through conduction, the air gap between the top surface of the Primary Heat Sink and the bottom surface of the top cover is filled by using a thermally conductive gap filler strip of soft, ceramic filled silicone elastomeric material. When the top cover is removed and fitted back, its orientation has to be such that the thermally conductive gap filler strip gets positioned properly on top of the Primary Heat Sink. To ensure this, 2 lanced tabs (7, Fig 2.1) are provided in the top cover that will slide into the corresponding slots in the rear side of the bottom housing. The top cover will not fit properly if the 2 lanced tabs (7, Fig 2.1) are facing towards the front side of the bottom housing because the lances tabs will interfere with the top edge of the front side of the bottom housing (there are no corresponding slots on the front side of the bottom housing).

3.4 OVERLOAD / SHORT CIRCUIT PROTECTION

3.4.1 Unit is used as a Power Supply without Battery Backup (12V Battery is not Connected to the Battery Terminals)

Refer to Fig 3.1 under Section 3

The SMPS Section is provided with Hiccup Mode of Overload and Short Circuit protections. Output load current from the SMPS is fed through a series connected, 0.1875 Ohm Load Sense Resistor inside the SMPS. Output load current produces voltage drop across the Load Sense Resistor. This voltage drop is proportional to the value of the load current. Protections are triggered based on the voltage drop sensed across the Load Sense Resistor as follows:

SECTION 3 | Description & Operation

- a) **Hiccup Mode Overload Protection:** When the voltage drop across the Load Sense Resistor in the SMPS Section is more than 5.18 to 5.44V (output current > 27.6 to 29A) and is sustained for 40-50ms, Hiccup Mode Overload Protection is triggered. The output of the SMPS is shut down. After 3 to 4 sec, the SMPS Section is switched ON again. If the overload still exists for 40-50ms, the SMPS will shut down again. Hence, for a continuous overload of > 27.6 to 29A, the SMPS Section switches ON and OFF (hiccup) every 3 to 4 sec. The average output voltage of the SMPS during this protection will be nearly 0V.
- b) **Hiccup Mode Short-Circuit Protection:** When the voltage drop across the Load Sense Resistor inside the SMPS Section is more than 7.5V (output current > 40A) and is sustained for 4 to 6.5 ms, Hiccup Mode Short Circuit Protection is triggered. The output of the SMPS is shut down. After 2 to 3 sec, the SMPS is switched ON again. If the short circuit still exists for 4 to 6.5 ms, the SMPS will shut down again. Hence, for a continuous short circuit, the SMPS switches ON and OFF (hiccup) every 2 to 3 sec. The average output voltage of the SMPS during this protection will be nearly 0V.

3.5 BATTERY CHARGING & BATTERY BACK-UP



WARNING!

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



MISE EN GARDE!

Ces unités sont des unités d'alimentation et non pas les chargeurs de batterie. Ne pas connecter ces appareils directement à une batterie.

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 the following optional battery back-up modules may be used for battery back-up application:

- For SEC-1212P and SEC-1223P: Battery Back Up Module Model No. BBM-1225
- For SEC-1235P / 1235P-M: Battery Back Up Module No. BBM-12100

SECTION 4 | Troubleshooting Guide

4.1 TROUBLESHOOTING GUIDE IS GIVEN AT TABLE 4.1 BELOW

NOTE: This guide is based on operation as a power supply (only DC load is connected - no external battery or battery backup).

TABLE 4.1 TROUBLESHOOTING GUIDE		
Symptom	Possible Cause	Remedy
ON / OFF Switch is ON <ul style="list-style-type: none"> Switch is NOT lighted No DC output 	No AC power from the AC outlet	Check AC power is available at the AC outlet. Breaker feeding the AC outlet may have tripped.
	Internal AC side fuse is blown	(i) Open the top cover and check the AC side fuse. Replace if blown. (ii) If the fuse blows again, the input section is damaged. Please call Tech Support.
	Unit has shut down due to over temperature – Temperature of Primary Heat Sink is $\geq 105^{\circ}\text{C} \pm 5^{\circ}\text{C}$	<p>For SEC-1223P / 1235P / 1235P-M:</p> (i) Check that the fan is running. If not, the fan / fan control circuit may have been damaged. Call Tech Support. (ii) Check that fan air suction rents on the sides (5, Figs 2.2 and 2.3) and bottom (6, Fig 2.2 and 2.3) and fan air discharge vents (8, Figs 2.2 and 2.3) are not blocked. (iii) The unit will reset automatically when the Primary Heat Sink cools down to $75^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or below. <p>For SEC-1223P / 1235P / 1235P-M:</p> (i) Check the ventilation slots on the top cover (5, Fig 2.1) and in the bottom housing (6, Fig 2.1) are not blocked. (ii) Check ambient temperature is within specifications in Section 6. (iii) The unit will reset automatically when the Primary Heat Sink cools down to $75^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or below.
ON / OFF Switch is ON <ul style="list-style-type: none"> Switch is lighted DC Output voltage is in Hiccup Mode: On → Off for 2 to 3 sec → On → Off for 2 to 3 sec → Off (This sequence is repeated continuously). Refer to Section 3.4 for details.	<ul style="list-style-type: none"> The output side is overloaded as the value of the load current is higher than the value of the output current limit (Refer to output current limit specifications at Section 6). There's a short circuit on the load side. 	<ul style="list-style-type: none"> Reduce the current drawn by the load to less than the DC output current limit value (Refer to output current limit specifications in Section 6). Switch OFF the load. Remove the short circuit on the load side.
GFCI outlet / GFCI breaker supplying AC power to the unit trips when the unit is switched ON	RF noise currents from the unit that are filtered to Earth Ground have increased the net Leakage Current on the GFCI outlet / GFCI breaker to $> 5\text{mA}$	(i) Switch OFF other SMPS devices operating from the same GFCI outlet / GFCI breaker to reduce the net leakage current to $< 5\text{mA}$ (ii) Move the unit to another GFCI outlet / GFCI breaker that has lesser number of SMPS load(s) or no SMPS load (ii) Power the unit from normal, non GFCI outlet or from an outlet not protected by GFCI breaker

SECTION 5 | Limiting Electro-Magnetic Interference (EMI)

5.1 CAUTION!

Conducted and radiated noises in this unit are limited as per the applicable National / International Standards. Refer to the applicable standards given in the specifications in Section 6.

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.



ATTENTION!

Bruits et rayonnement dans cette unité sont limitées que par la législation nationale / normes internationales. Consulter les normes mentionnées dans les spécifications de la Section 6.

Cet appareil génère, utilise et peut émettre une énergie de fréquence radio et, s'il n'est pas installé et utilisé conformément aux instructions, peut causer des interférences nuisibles aux communications radio. Cependant, cela ne garantit pas qu'aucune interférence ne se produira dans une installation particulière. Si cet équipement provoque des interférences nuisibles à la réception radio ou télévision, ce qui peut être déterminé en éteignant l'équipement, l'utilisateur est encouragé à essayer de corriger les interférences en prenant une ou plusieurs des mesures recommandées dans les paragraphes suivants.

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

Switched Mode Power Supplies (SMPS) employ high frequency switching (25-170 KHz in these units) 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 noise is both conducted and radiated through the input power cord and the DC output wiring to the radio.

SECTION 5 | Limiting Electro-Magnetic Interference (EMI)

5.3 FILTRATION OF CONDUCTED NOISE

The conducted RF noise from these SMPS units 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. Thus, the filtered noise currents are intentionally leaked to the Earth Ground. This is termed as the "Earth Leakage Current".

5.4 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. 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.

5.5 ADDITIONAL GUIDELINES FOR REDUCING RF NOISE

- Use additional appropriate AC Radio Frequency Interference (RFI) Power Line Filter immediately before the AC input of the power supply (should be rated for the AC input voltage and input current of the power supply). Filtered, Ferrite Coated Cord Set for AC input is another choice (rated for AC input voltage and input current of the power supply). 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.
- Use additional appropriate DC radio frequency interference (RFI) power line filter immediately after the DC output of the power supply.
- Twist the Positive and Negative wires from the output of the power supply to the radio.

SECTION 5 | Limiting Electro-Magnetic Interference (EMI)

- 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]

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

During malfunction or an accident, the metal chassis of an electrical 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 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 > 4-6mA passing through the human body 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 > 4-6 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 at Section 5.2, 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 > 4-6mA 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 < 4mA 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

6.1 SEC-1212P

	Input: 115 VAC	Input: 230V
INPUT		
Input Voltage Range	100-240 VAC	
Input Frequency Range	50-60Hz (47-63Hz)	
AC Input Current	1.48A at 120 VAC	0.72A at 240 VAC
	1.54A at 115 VAC	0.75A at 230 VAC
	1.80A at 100 VAC	0.90A at 200 VAC
Inrush current on switching ON	30A (Cold start)	60A (Cold start)
Power Factor at full load	> 0.9	
No Load Power Draw	< 0.21W	<0.5W
Average Efficiency	> 89%	>91%
Energy Efficiency Level	Level VI at 115 VAC input	
	Level VI at 230 VAC input	
PWM Switching Frequency	75 to 150 KHz	
PFC Switching Frequency	25 to 68 KHz	
OUTPUT		
Output Voltage	13.8V ± 0.1V	
Output Current	Rated	11A
	Current Limit	13.2 to 14.2A
Output Power	151.8W	
Output Ripple and Noise	100 mV peak to peak at full load	
Output Voltage Adjustment Range	12.5 to 15.0 VDC	
Output Voltage Tolerance at no load	± 0.1V	
PROTECTIONS		
Overload and Short Circuit	Hiccup Mode at 120% (13.2A). Auto reset when fault is removed.	
Output Over Voltage Protection	By PWM Controller (16.5 ± 0.5 VDC)	
Cooling	By convection. No fan	
Over Temperature Protection	The unit will shut down when the temperature of the Primary Heat Sink rises to 105°C ± 5°C. Auto reset when the temperature drops to 75°C ± 5°C	
Internal AC Side Fuse	250V, 2.5A; Time Delay Type; 5mm x 20mm	
ENVIRONMENTAL		
Operating Temperature	-20°C to +50°C: 100% rated power	
Over Temperature Protection	50°C – 60°C: Linearly de-rate from 100% power at 50°C to 80% power at 60°C	
COMPLIANCE - SAFETY		
UL Safety Listed	USA	UL 62368-1, 2014-12-1
	Canada	CSA C22.2 No. 62368-1-14, 2014-12

NOTE: Specifications are subject to change without notice.

SECTION 6 | Specifications

	Input: 115 VAC	Input: 230V
COMPLIANCE - SAFETY (Continued)		
European CE Safety Marked	<ul style="list-style-type: none"> • Low Voltage Directive (LVD) 2014/35/EU • EN62368-1 : 2014+A11 : 2017 	
Australia and New Zealand Safety Requirements	AS/NZS 60950-1: 2015	
COMPLIANCE: EMC		
North America	EMI: FCC Part 15(B), Class B	
Europe (for CE Mark)	EMC Directive: 2014/30/EU EMI: EN55032:2012; <ul style="list-style-type: none"> • EN61000-3-2: 2014 • EN61000-3-3: 2013 EMS: EN55024: 2010 <ul style="list-style-type: none"> • EN61000-4-2: 2009; • EN61000-4-3:2006+A1:2008+A2:2010 • EN61000-4-4:2012 • EN61000-4-5:2014 • EN61000-4-6:2014 • EN61000-4-8:2010 • EN61000-4-11:2004 	
Australia / New Zealand	EMI: AS/NZS CISPR 32, Class B	
COMPLIANCE: RoHS2		
For European CE Mark	2011/65/EU (RoHS2)	
COMPLIANCE: ENERGY EFFICIENCY OF EXTERNAL POWER SUPPLIES		
USA Department of Energy (DOE)	10CFR, Parts 429 and 430	
California Appliance Efficiency Regulations	California Code of Regulations, Title 20, Division 2, Chapter 4, Article 4, Sections 1601 to 1608	
Natural Resources Canada (NRcan)	CSA C381.1- 08	
Australia and New Zealand	AS/NZS 4665.1	
European Union	Directive 2005/32/EC and European Commission Regulation (EC) No. 278/2009	
International Efficiency Marking Protocol	Efficiency Level: VI at input voltage of 115 VAC Efficiency Level: VI at input voltage of 230 VAC	
DIMENSIONS		
W x D x H	185 x 208 x 57.8mm / 7.28 x 8.19 x 2.28 in	
Weight	1.4 Kg / 3 lb	
COUNTRY OF MANUFACTURE		
Made in	Taiwan	

NOTE: Specifications are subject to change without notice.

SECTION 6 | Specifications

6.2 SEC-1223P

	Input: 115 VAC	Input: 230V
INPUT		
Input Voltage Range	100-240VAC	
Input Frequency Range	50-60Hz (47-63Hz)	
AC Input Current	3.01A at 120 VAC	1.49A at 240 VAC
	3.15A at 115 VAC	1.55A at 230 VAC
	3.7A at 100VAC	1.85A at 200 VAC
Inrush current on switching ON	30A (Cold start)	60A (Cold start)
Power Factor at full load	0.99	0.97
No Load Power Draw	< 0.5W	< 0.5W
Average Efficiency	> 89%	> 91%
Energy Efficiency Level	Level VI at 115 VAC input	
	Level VI at 230 VAC input	
PWM Switching Frequency	75 to 150 KHz	
PFC Switching Frequency	25 to 68 KHz.	
OUTPUT		
Output Voltage	13.8V ± 0.1V	
Output Current	Rated	23A
	Current Limit	27.6 to 29.0A
Output Power	317.4W	
Output Ripple and Noise	100 mV peak to peak at full load	
Output Voltage Adjustment Range	12.5 to 15.0 VDC	
Output Voltage Tolerance at no load	±0.1V	
PROTECTIONS		
Overload and Short Circuit	Hiccup Mode at 120% (27.6A). Auto reset when fault is removed.	
Output Over Voltage Protection	By PWM Controller (16.5 ± 0.5 VDC)	
Cooling	Fan ON when the temperature of Secondary Heat Sink reaches 55°C ± 5°C. Fan switches OFF when the temperature drops to 45°C ± 5°C	
Over Temperature Protection	The unit will shut down when the temperature of the Primary Heat Sink rises to 105°C ± 5°C. Auto reset when the temperature drops to 75°C ± 5°C	
Internal AC Side Fuse	250V, 4.0A; Time Delay Type; 5mm x 20mm	
ENVIRONMENTAL		
Operating Temperature	-20°C to +50°C: 100% rated power	
Over Temperature Protection	50°C – 60°C: Linearly de-rate from 100% power at 50°C to 80% power at 60°C	
COMPLIANCE - SAFETY		
UL Safety Listed	USA	UL 62368-1, 2014-12-1
	Canada	CSA C22.2 No. 62368-1-14, 2014-12

NOTE: Specifications are subject to change without notice.

SECTION 6 | Specifications

	Input: 115 VAC	Input: 230V
COMPLIANCE - SAFETY (Continued)		
European CE Safety Marked	<ul style="list-style-type: none"> • Low Voltage Directive (LVD) 2014/35/EU • EN62368-1 : 2014+A11 : 2017 	
Australia and New Zealand Safety Requirements	AS/NZS 60950-1: 2015	
COMPLIANCE: EMC		
North America	EMI: FCC Part 15(B), Class B	
Europe (for CE Mark)	EMC Directive: 2014/30/EU EMI: EN55032:2012; <ul style="list-style-type: none"> • EN61000-3-2: 2014 • EN61000-3-3: 2013 EMS: EN55024: 2010 <ul style="list-style-type: none"> • EN61000-4-2: 2009; • EN61000-4-3:2006+A1:2008+A2:2010 • EN61000-4-4:2012 • EN61000-4-5:2014 • EN61000-4-6:2014 • EN61000-4-8:2010 • EN61000-4-11:2004 	
Australia / New Zealand	EMI: AS/NZS CISPR 32, Class B	
COMPLIANCE: RoHS2		
For European CE Mark	2011/65/EU (RoHS2)	
COMPLIANCE: ENERGY EFFICIENCY OF EXTERNAL POWER SUPPLIES		
USA Department of Energy (DOE)	10CFR, Parts 429 and 430	
California Appliance Efficiency Regulations	California Code of Regulations, Title 20, Division 2, Chapter 4, Article 4, Sections 1601 to 1608	
International Efficiency Marking Protocol	Efficiency Level: VI at input voltage of 115 VAC Efficiency Level: VI at input voltage of 230 VAC	
DIMENSIONS		
W x D x H	185 x 208 x 57.8mm / 7.28 x 8.19 x 2.28 in	
Weight	1.53 Kg / 3.4 lb	
COUNTRY OF MANUFACTURE		
Made in	Taiwan	

NOTE: Specifications are subject to change without notice.

SECTION 6 | Specifications

6.3 SEC-1235P AND 1235P-M

	Input: 115 VAC	Input: 230V
INPUT		
Input Voltage Range	100-240 VAC	
Input Frequency Range	50-60Hz (47-63Hz.)	
AC Input Current	3.87A at 120 VAC	1.91A at 240 VAC
	4.05A at 115 VAC	1.99A at 230
	4.80A at 100 VAC	2.4A at 200 VAC
Inrush current on switching ON	30A (Cold start)	60A (Cold start)
Power Factor at full load	0.99	0.97
No Load Power Draw	< 0.5W	< 0.5W
Average Efficiency	> 89%	> 92%
Energy Efficiency Level	Level VI at 115 VAC input	
	Level VI at 230 VAC input	
PWM Switching Frequency	75 to 150 KHz	
PFC Switching Frequency	25 to 68 KHz	
OUTPUT		
Output Voltage	13.8V \pm 0.1V	
Output Current	Rated	30A
	Current Limit	36 to 37.5A
Output Power	414W	
Output Ripple and Noise	100 mV peak to peak at full load	
Output Voltage Adjustment Range	12.5 to 15.0 VDC	
Output Voltage Tolerance at no load	\pm 0.1V	
Output Metering (Only for SEC-1235P-M)	SEC-1235P-M is provided with the following meters: <ul style="list-style-type: none"> • Voltmeter : 0 to 15V; 0.5V per division • Ammeter: 0 to 50A; 2A per division • Back lighting with On/Off Switch 	
PROTECTIONS		
Overload and Short Circuit	Hiccup Mode at 120% (36A). Auto reset when fault is removed.	
Output Over Voltage Protection	By PWM Controller (16.5 \pm 0.5 VDC)	
Cooling	Fan ON when the temperature of Secondary Heat Sink reaches 55°C \pm 5°C. Fan switches OFF when the temperature drops to 45°C \pm 5°C	
Over Temperature Protection	The unit will shut down when the temperature of the Primary Heat Sink rises to 105°C \pm 5°C. Auto reset when the temperature drops to 75°C \pm 5°C	
Internal AC Side Fuse	250V, 6.3A; Time Delay Type; 5mm x 20mm	
ENVIRONMENTAL		
Operating Temperature	-20°C to +50°C: 100% rated power	
	50°C – 60°C: Linearly de-rate from 100% power at 50°C to 80% power at 60°C	

NOTE: Specifications are subject to change without notice.

SECTION 6 | Specifications

		Input: 115 VAC	Input: 230V
COMPLIANCE - SAFETY			
UL Safety Listed	USA	UL 62368-1, 2014-12-1	
	Canada	CSA C22.2 No. 62368-1-14, 2014-12	
European CE Safety Marked		<ul style="list-style-type: none"> • Low Voltage Directive (LVD) 2014/35/EU • EN62368-1 : 2014+A11 : 2017 	
Australia and New Zealand Safety Requirements		AS/NZS 60950-1: 2015	
COMPLIANCE: EMC			
North America		EMI: FCC Part 15(B), Class B	
Europe (for CE Mark)		EMC Directive: 2014/30/EU EMI: EN55032:2012; <ul style="list-style-type: none"> • EN61000-3-2: 2014 • EN61000-3-3: 2013 EMS: EN55024: 2010 <ul style="list-style-type: none"> • EN61000-4-2: 2009; • EN61000-4-3:2006+A1:2008+A2:2010 • EN61000-4-4:2012 • EN61000-4-5:2014 • EN61000-4-6:2014 • EN61000-4-8:2010 • EN61000-4-11:2004 	
Australia / New Zealand		EMI: AS/NZS CISPR 32, Class B	
COMPLIANCE: RoHS2			
For European CE Mark		2011/65/EU (RoHS2)	
COMPLIANCE: ENERGY EFFICIENCY OF EXTERNAL POWER SUPPLIES			
USA Department of Energy (DOE)		10CFR, Parts 429 and 430	
California Appliance Efficiency Regulations		California Code of Regulations, Title 20, Division 2, Chapter 4, Article 4, Sections 1601 to 1608	
International Efficiency Marking Protocol		Efficiency Level: VI at input voltage of 115 VAC Efficiency Level: VI at input voltage of 230 VAC	
DIMENSIONS			
W x D x H		SEC-1235P: 185 x 208 x 57.8mm / 7.28 x 8.19 x 2.28 in SEC-1235P-M: 185 x 208.5 x 57.8mm / 7.28 x 8.21 x 2.28 in	
Weight		1.66 Kg / 3.7 lb	
COUNTRY OF MANUFACTURE			
Made in		Taiwan	

SECTION 7 | Warranty

3 YEAR LIMITED WARRANTY

SEC-1212P / SEC-1223P / SEC-1235P / SEC-1235P-M 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")
www.samlexamerica.com

Notes

Contact Information

Toll Free Numbers

Ph: 1 800 561 5885

Fax: 1 888 814 5210

Local Numbers

Ph: 604 525 3836

Fax: 604 525 5221

Website

www.samlexamerica.com

USA Shipping Warehouses

Kent, WA

Plymouth, MI

Canadian Shipping Warehouse

Delta, BC

Email purchase orders to

orders@samlexamerica.com



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