samlexpower®

DC-DC Step Up Converters

STEP 7
STEP 10
STEP 20

Owner's Manual

Please read this manual BEFORE installing your Converter

OWNER'S MANUAL | Index

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SECTION 1 | Safety

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS
This manual contains important Safety and Operating Instructions. Please read before using this unit .

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.

SECTION 2 | Description & Features

DESCRIPTION

STEP 7, STEP 10 and STEP 20 are 12VDC (Nominal) to 24 VDC (Nominal) Step Up Converters based on high performance, fixed frequency switching regulator. These are designed to deliver rated output current of 7A, 10A and 20A respectively at actual output voltage of 25VDC +/- 0.1V at no load. There is no isolation between the input and output circuits – input and output have common Negative.

STEP 20 consists of two STEP 10 units assembled together to operate in parallel.

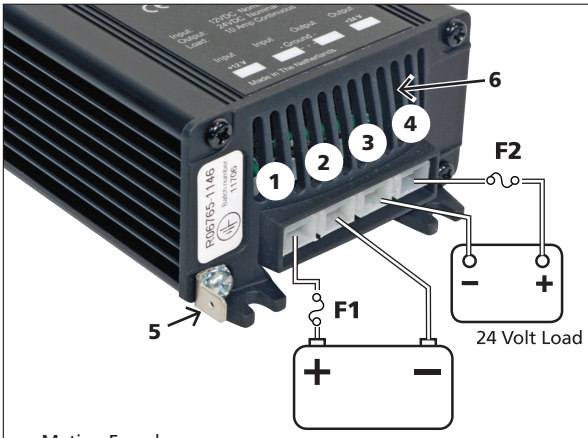
FEATURES:

- High efficiency switching regulator
- Very low energy consumption - less than 5 mA
- Small size and light weight
- Non isolated input and output design for higher efficiency
- Protected against overload, short circuit, reverse polarity and high voltage and transient suppression on input side

LAYOUT AND INPUT OUTPUT CONNECTIONS

Please refer to Fig 1 for STEP 7 and STEP 10 and Fig. 2 for STEP 20

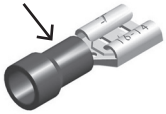
FRONT VIEW



F1: Input Fuse (Not Supplied)
32V, Fasting Acting
- STEP 7: 25A
- STEP 10: 35A

F2: Output Fuse (Not Supplied)
32V, Fasting Acting
- STEP 7: 7A
- STEP 10: 10A

Mating Female Quick Disconnect for Wiring

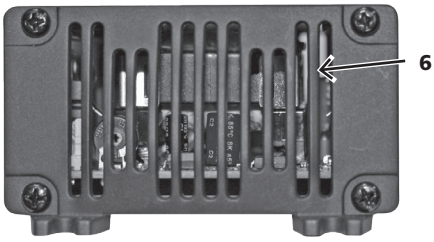


* Note:

a. Terminals on the unit: Male, "Quick Connect" Spade Terminal - 6.3 mm / 0.25"

b. Use mating, female "Quick Connect" terminal shown on the left for connecting wires (Not Supplied).

BACK VIEW



LEGEND:

*1. Input Terminal: +12V

*2. Input Terminal: -12V Common (-) Ground

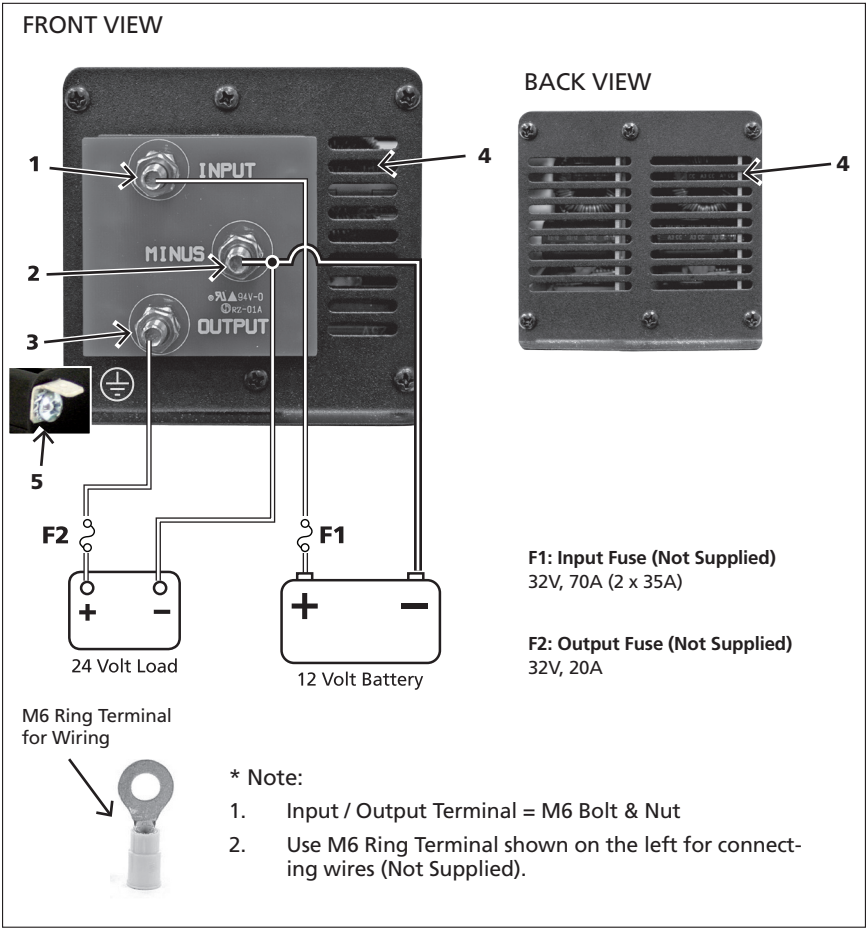
*3. Output Terminal: -24V Common (-) Ground

*4. Output Terminal: +24V

5. System/Earth Ground

6. Ventilation Slots

Fig. 1: Layout & Input / Output Connectins - STEP 7, STEP 10



LEGEND:

*1. Input Terminal: +12V

*2. Input / Output Terminal: Common (-) for 12V Input / 24V Output

*3. Output Terminal: +24V

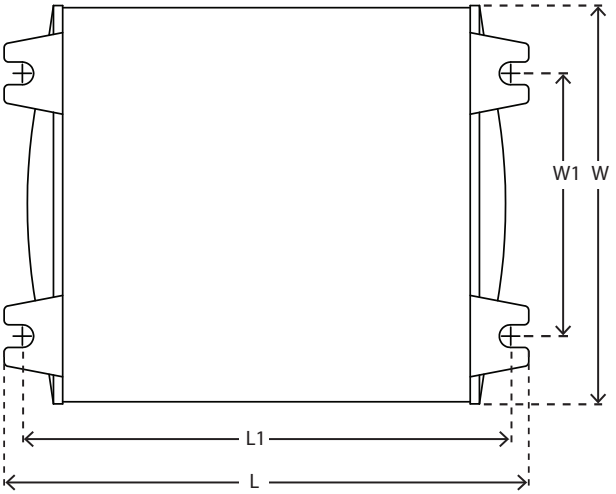
4. Ventilation Slots

5. System Earth Ground

Fig. 2: Layout & Input / Output Connections - STEP 20

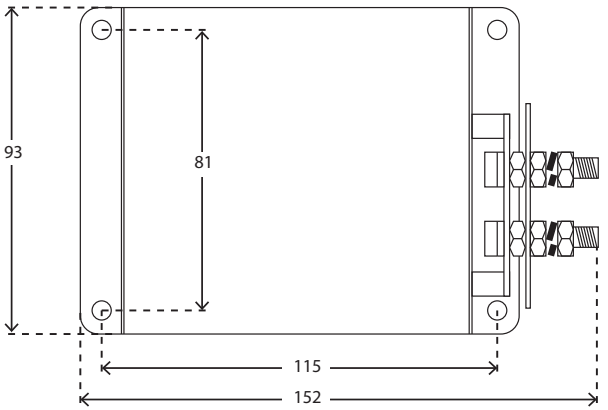
OVERALL AND MOUNTING DIMENSIONS

Please refer to Fig 3 for STEP 7 and STEP 10 and Fig. 4 for STEP 20



MODEL	OVERALL			MOUNTING	
	L	W	H	L1	W1
STEP 7	98	88	49	92	58
STEP 10	126	88	49	120	58
Mounting Hole Diameter = 5 mm					

Fig. 3: Overall & Mounting Dimensions STEP 7 and STEP 10.



Overall (Including Protrusions):
152 x 93 x 91 mm

Mounting (Between Mounting Holes):
115 x 81 mm

Diameter of Mounting Hole:
4.5 mm

Fig. 4: Overall & Mounting Dimensions STEP 20.

SECTION 4 | Installation

GENERAL INSTALLATION REQUIREMENTS

- Install the unit in a cool, dry, protected and well-ventilated space
- The unit may be installed on top of a horizontal surface or on the bottom of a horizontal surface. The unit can also be installed horizontally on a vertical surface (For safety, the Input / Output Terminals should not be pointing up or down to prevent objects falling into the unit through the ventilation openings in the front and back of the unit and short circuiting electrically live internal portions)
- The unit is cooled by convection through flow of cool air around the chassis surfaces and through the ventilation openings in the front and back of the unit. Ensure that these openings are not blocked.

INPUT AND OUTPUT CONNECTIONS

CAUTION!

PLEASE ENSURE THAT THE POLARITY OF THE INPUT / OUTPUT CONNECTION IS NOT REVERSED. A REVERSE POLARITY CONNECTION ON THE INPUT SIDE WILL BLOW INTERNAL \ EXTERNAL FUSE. THIS INTERNAL FUSE IS SOLDERED. DAMAGE DUE TO REVERSAL OF POLARITY IS NOT COVERED BY WARRANTY.

STEP 7 and STEP 10

6.3 mm / 0.25", "Quick Disconnect", Male Spade Terminal is used for input and output connections (1 to 4, Fig 1). Same type of terminal is used for grounding (5, Fig 1).

STEP 20

M-6 Bolt and Nut are used for input / output connections. 6.3 mm / 0.25", "Quick Disconnect", Male Spade Terminal is used for Grounding (4, Fig 2).

WIRE SIZING

WIRE SIZING FOR INPUT AND OUTPUT CONNECTIONS

Conductors used in wiring have resistance that opposes the current flow and produces voltage drop and heating. The resistance is directly proportional to the length of the conductor and is inversely proportional to the thickness (area of cross-section). Thus, a longer and thinner conductor will have higher resistance and will, therefore, produce higher voltage drop and more heating. The size of a conductor is designated by AWG (American Wire Gauge) #. For AWG numbers up to AWG # 1, the smaller the AWG number, the thicker the size of conductor. The size of conductor for a particular application will depend upon (i) the maximum current it is required to carry (called Ampacity) at specified temperature of the conductor / insulation and (ii) the voltage drop across the distance over which this current is carried. The size of conductors should be determined based on (i) the Ampacity and (ii) the maximum voltage drop of 2%, whichever is thicker. The wires should be multi-stranded insulated copper rated for at least 105°C.

WIRE SIZING FOR 12 VDC INPUT AND 24 VDC OUTPUT CONNECTIONS

Recommended sizes of wiring for 2% voltage drop are as follows:

STEP 7: (Input current of 20A +/- 10% at Battery Voltage of 10V and output current of 7A at 24V Nominal).

WIRE SIZE FOR 2% VOLTAGE DROP	12V INPUT SIDE			24V OUTPUT SIDE		
	3 FT	6 FT	10 FT	3 FT	6 FT	10 FT
AWG #	#12	#10	#6	#18	#16	#14

STEP 10: (Input current of 30A +/- 10% at Battery Voltage of 10V and output current of 10A at 24V Nominal).

WIRE SIZE FOR 2% VOLTAGE DROP	12V INPUT SIDE			24V OUTPUT SIDE		
	3 FT	6FT	10 FT	3 FT	6 FT	10 FT
AWG #	#10	#8	#6	#18	#16	#12

STEP 20: (Input current of 50A +/- 10% at Battery Voltage of 10V and output current of 20A at 24V Nominal).

WIRE SIZE FOR 2% VOLTAGE DROP	12V INPUT SIDE			24V OUTPUT SIDE		
	3 FT	6FT	10 FT	3 FT	6 FT	10 FT
AWG #	#8	#4	#2	#10	#8	#4

TERMINATION OF CONNECTING WIRES

STEP 7 and STEP 10: Use 6.3mm / 0.25" "Quick Connect", Female mating terminal on the connecting wiring (See Fig. 1, Page 4)
This type of terminal is available for maximum wire size of AWG #10. When using wires thicker than AWG #10, you may terminate the wire as follows:

- Use 6.3mm / 0.25" "Quick Connect" Female mating connector (AWG #10 size)
- Use around 2" piece of AWG #10 wire and crimp the connector to one end
- Solder / splice the other end of AWG #10 wire to the thicker wire

Use of short length of 2" of smaller AWG #10 wire will not increase voltage drop appreciably.

STEP 20: For connecting wires for, use M6 Ring Terminal (See Fig 2, Page 5) for the wire size being used.

EXTERNAL FUSES ON THE INPUT AND OUTPUT SIDES:

Please refer to Input / Output Connection shown in Figs 1 and 2.

The input and output connections should be made through 32V fast blow fuses (For example, automotive fuses Type ATO / ATC by Bussmann / LittelFuse). The fuses should be connected in series with the Positive input and output wires. The fuse on the 12V input side should be as close to the battery Positive terminal as possible. This will prevent the possibility of overheating / melting of the input side wires in case of short circuit on the input side cabling (a battery can provide thousands of Amperes of current during short circuit condition).

WARNING!

THE WARRANTY WILL BE VOIDED IF THE ABOVE EXTERNAL FUSES ARE NOT USED.

GROUNDING

6.3 mm / 0.25", "Quick Disconnect", Male Spade Terminal is provided for grounding (5, Fig 1 for STEP 7 and STEP 10 and 5, Fig 2 for STEP 20). Use AWG #10 wire terminated with 6.3mm / 0.25" - "Quick Connect" Female mating terminal.

SECTION 5 | Specifications

PARAMETER	STEP 7	STEP 10	STEP 20
INPUT			
Input Voltage Range	9-18 VDC	9-18 VDC	9-18 VDC
Input Current at No Load	< 5mA	< 5mA	< 5mA
OUTPUT			
Output Voltage at No Load	25V ± 0.1V	25V ± 0.1V	25V ± 0.1V
Output Voltage Regulation	+0% / -5%	+0% / -5%	+0% / -5%
Output Current	7A	10A	20A
Output Noise and Ripple	< 50mV RMS	< 50mV RMS	< 50mV RMS
Peak Efficiency	92%	92%	92%
ISOLATION			
Isolation: Input to Output	No. Common Negative		
Isolation: Input/ Output to chassis	Isolated		
TEMPERATURE RISE / COOLING			
Temperature Rise after 30 Min of Operation at Full Load	30°C @ 20°C ambient		
Type of cooling	By convection (No Fan)		
PROTECTIONS			
12V Input Side Fuse (Internal)	30A	40A	80A (2x40A)
12V Input Side Fuse (External)	25A (Not supplied)	35A (Not supplied)	70A (2 x 35A) (Not supplied)
24V Output Side Fuse(Internal)	No Fuse		
24V Output Side Fuse (External)	7A (Not supplied)	10A (Not supplied)	20A (Not supplied)
Reverse Polarity on Input Side	External / Internal Input Side Fuse will blow		
High Voltage and Transient Suppression on Input Side	Will blow input side fuse at continuous input voltage > 40V. Also protects against load dump.		
Over Current	Short Circuit Proof. External 7A Fuse will blow	Short Circuit Proof. External 10A Fuse will blow	Short Circuit Proof. External 20A fuse will blow.
INPUT /OUTPUT CONNECTIONS			
Type of Connectors	Male, "Quick Connect" Spade Terminal - 6.3mm / 0.25"		M6 Bolt and Nut
COMPLIANCE			
RoHS	RoHS compliant		
European Conformity	CE marked Emission: EN50081-1 Immunity: EN50082-1		
European Automotive EMC Directive	95/54/EC		

SECTION 5 | Specifications

PARAMETER	STEP 7	STEP 10	STEP 20
ENVIRONMENTAL			
Operating Temperature Range	–20°C / –4°F to 30°C / 86°F		
Humidity	95%. Non Condensing		
MECHANICAL			
Chassis	Anodized Aluminum with plastic end covers		
Dimensions (With Protrusions) (W x D x H)	88 x 98 x 49 mm 3.5 x 3.9 x 1.9 in	88 x 126 x 49 mm 3.5 x 5.0 x 1.9 in	93 x 152 x 91 mm 3.7 x 6.0 x 3.6 in
Weight	0.3 kg / 0.7 lb.	0.4 kg / 0.9 lb.	1.8Kg / 4 lb.
Note: Specifications are subject to change without notice.			

SECTION 6 | Warranty

2 YEAR LIMITED WARRANTY

STEP 7, STEP 10 and STEP 20 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 2 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

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