VC-30 / VC-40
Programmable DC-DC Converter with Battery Charger function

USER'S MANUAL

1. INTRODUCTION

This MCU controlled Step Down 24V to 12V DC-DC Converter has a programmable 12.0 to 15.0V output in 0.2V increments.
It can also be set up as a Two Stage Battery Charger.
The 3 LED display shows output voltage and current in turn or selectively as desired.
When the unit is in a protection mode, 8 codes can be shown for different fault diagnosis.

Intended Application

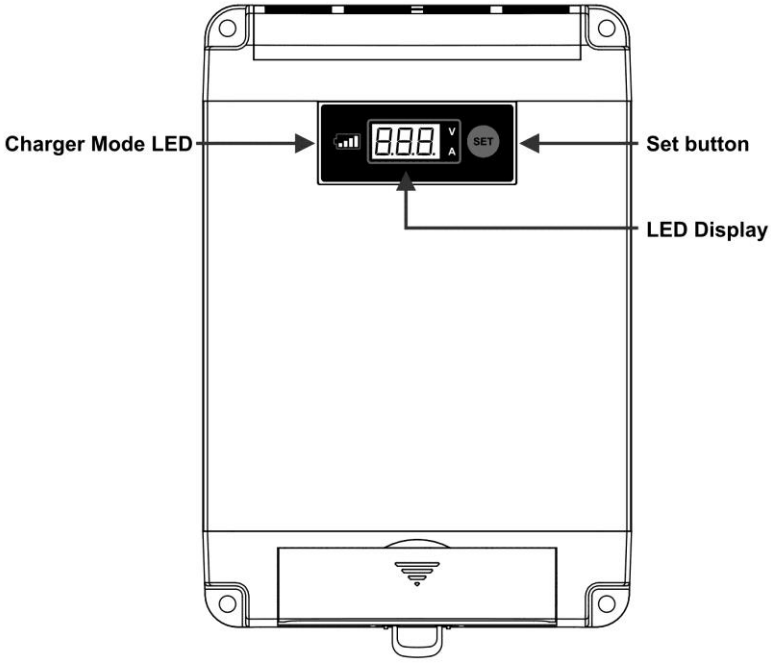
This digital programmable DC-DC Converter is ideal for voltage sensitive loads, equipment and battery charging.
The wide input range (19-36VDC) and the manual or ignition On/Off control makes it suitable for various DC applications.
It is ideal for charging a standalone 12V Battery Bank or a Battery Bank with a connected load.

2. FEATURES

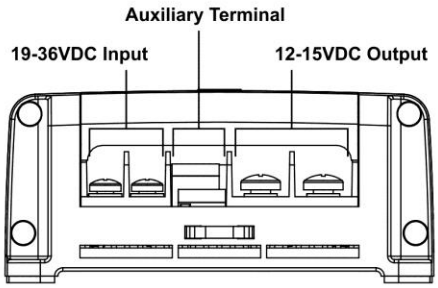
1. Programmable output voltage (12V-15V DC) makes it ideal for voltage sensitive devices.
2. 2 stage full powered Battery Charger mode with 14.3V Boost and 13.6 V float charge.
3. 3 digit LED display for Voltage, Current, Operation Mode and Protection Diagnosis.
4. Remote Voltage sensing for optimal and accurate powering of distant load or a battery.
5. Ignition terminal for automatic On/Off with ignition control or other external On/Off Switch.
   The function of Ignition terminal can be set to On or Off.
6. Remote alarm terminal (13.5V, 0.25A) for input under voltage alarm connection.
7. A separate always-on auxiliary output (13.8V, 0.5A) to power critical electronic devices such as security device or remote On/Off switch.
8. Eight protections with error code shown on the display. Seven protections are self-recoverable.
9. Thermostatic cooling fan.

3. CAUTION

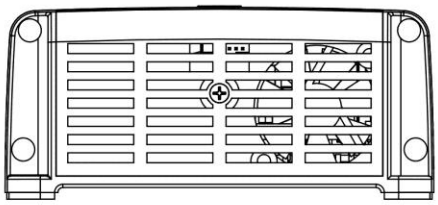
1. When an inductive load is used such as a motor, solenoid or other electro mechanical device a diode (400V, 3Amp) must be installed across the load as shown in (Connection Diagram 1) to protect the converter from the high voltage spike generated by the load when the supplied current is switched Off.
2. When the fuse is blown, fix the problem and replace the fuse with the same type and rating.
3. Avoid touching the heat sink during operation as it may burn your hand.



Top View

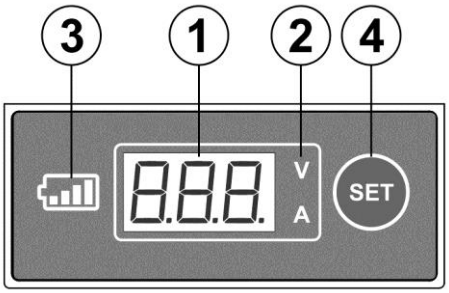


Front View



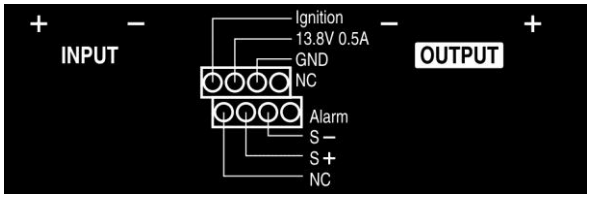
Rear View

4. Panel View



1. 3 digit LED. Displays voltage, current, operation and fault diagnosis.
2. LED indicates Voltage (V) or Current (A).
3. Indicates that the converter is in the charger mode.
4. Set button.

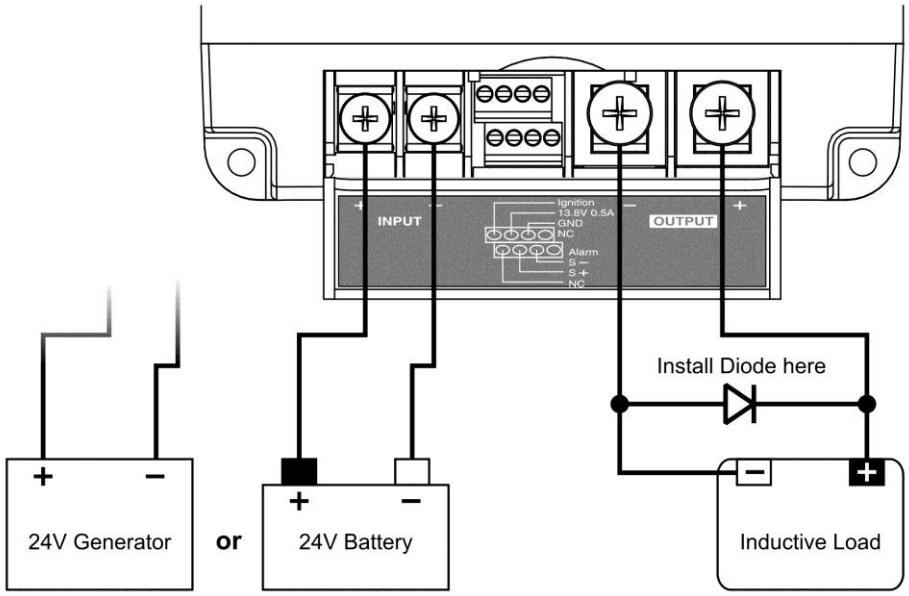
5. Input, output and auxiliary terminal view



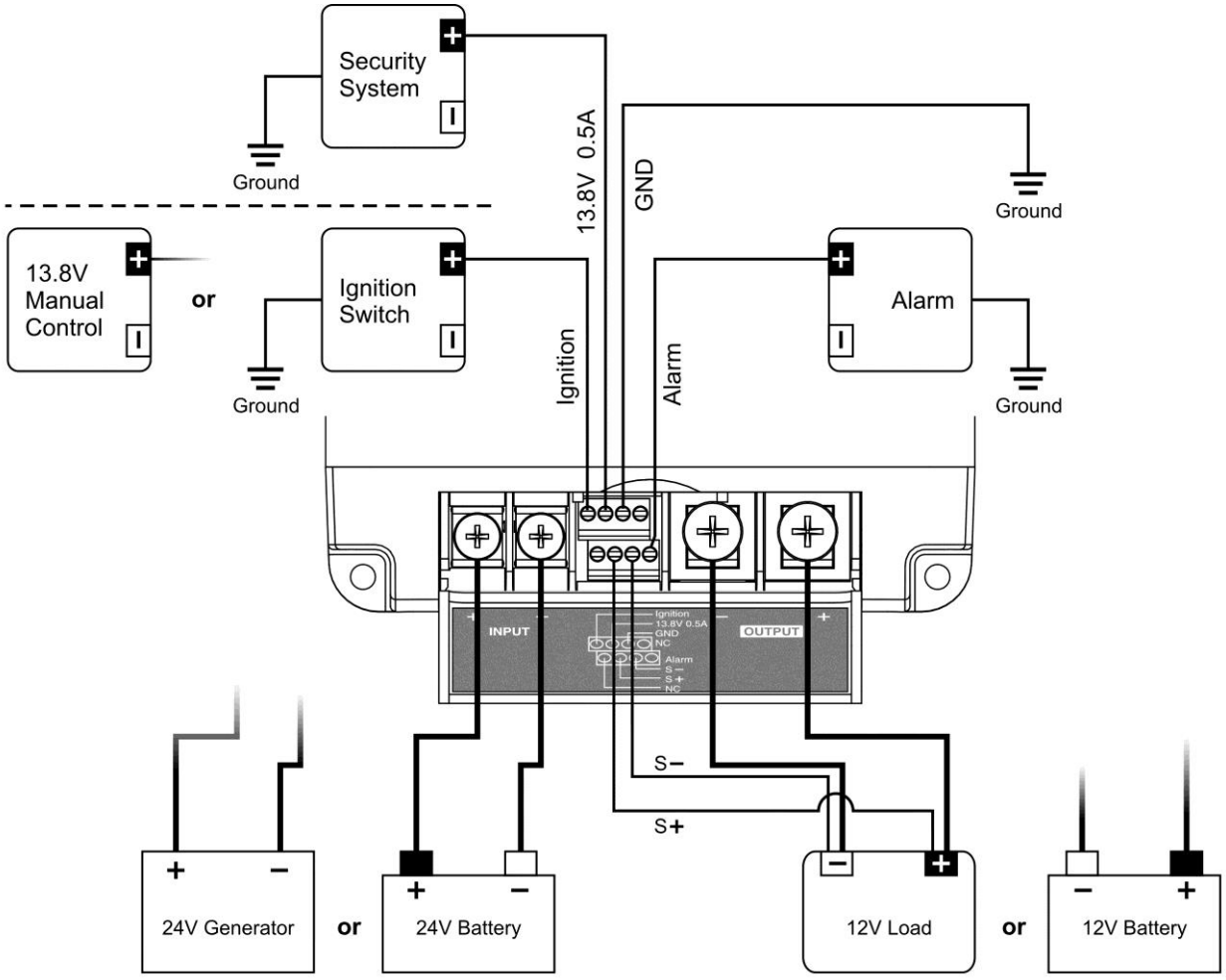
Ignition	Ignition port (connect to positive 8 to 32V)
13.8V 0.5A	Always On Auxiliary Output
GND	Ground terminal
NC	No connection
Alarm	Positive 13.8V and 0.5A for LED warning for low input voltage
S-	Voltage Remote Sensing Negative
S+	Voltage Remote Sensing Positive

6. Wiring Diagram

6.1 Connection Diagram 1

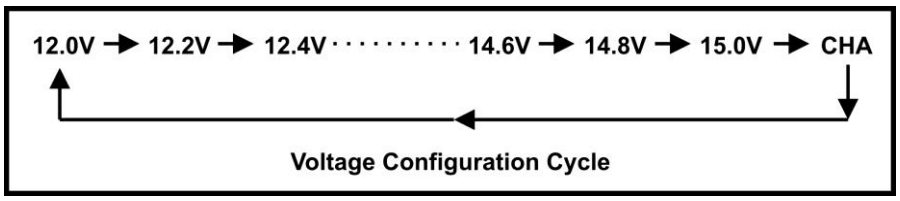


6.2 Connection Diagram 2 (Negative Ground)



7. INITIAL SET UP AND CONNECTION

1. Leave the output terminals disconnected.
2. Connect the 24V battery to input terminals. Check for correct polarity.
3. Locate the “SET” button for programming.
4. Press and hold the “SET” button until SEL shows up and the display flashes. Unit is ready for programming.
5. Subsequent short presses will increase the output voltage by 0.2V increments.



Voltage Configuration Cycle

6. Stop at the desired Output Voltage or at CHA if you wish to select to battery charger mode.
7. After a few seconds, the display stops flashing to indicate that the selected setting has been confirmed and the unit will operate in the new set output voltage or as a battery charger.
8. Now you can connect the output terminal to a 12V device or a 12V battery according to your set mode, double checking for correct polarity.

8. General Operation

LED Display
During operation, the LED display shows voltage and amps.
A quick press of the SET button will either freeze the display (at desired V, A) or return to the default scrolling mode.
The display will switch off after 10 minutes to conserve energy. It can be restarted again by a quick press of the SET button.

When the output current is less than 1 Amp or output is open circuited the LED display will show LOA indicating Low Output Amp.
This applies to both converter and charger mode.
In the charger mode when the output float voltage is 13.6V and the current to the battery is less than one Amp, LOA can be interpreted that the Battery is Full. In the converter mode LOA means that there is less than 1 Amp or no load drawing from the output or that the output is open circuit.

Remote Voltage Sensing
The voltage converter can be finely tuned to supply your device the required voltage. Even when your device is at a distance, you can use the remote voltage sensing terminal (S-, S+) to ensure accurate point of load voltage that further improves the stability of the load point voltage.

DC – DC Converters; VC-30 & VC-40 **Batch;** Serial# beginning G111600xxx

> It is NOT recommended to connect the remote sensing circuit **(S+ & S-)** to a 12V Battery.
Doing so will cause an internal Over-load ***if*** the Battery is at any time dis-connected from the VC-30/40 ‘s ***Output*** terminal. This will cause the Internal Fuses to blow & may cause further damage to the unit itself.

> Also note, If connecting the **S+** & **S- Circuit** to a remote Load/Device the actual ***Output Voltage*** at the VC-30/40 O/Put terminals will be greater then what is Set/Displayed on the LED Screen depending on how much Voltage Drop is presenting to the Load.

>Therefore, Excessive Voltage Drop may also cause the O/put to reach OVP & shutdown temporarily, Then go into a cycling situation whenever excessive Voltage Drop is present.
= Voltage Drop can only be compensated for, **N**OT overcome. The solution is to use appropriate sized cable, etc. to minimize the Total Voltage Drop to a level which can be compensated for.

Ignition Port & Ignition Control Mode
When the Ignition Control is activated the unit will only operate when the ignition has been tuned on. Alternatively, apply a positive 8 to 32V to the ignition terminal as an On/Off switch.
Once the Ignition Control has been activated, the unit will remain in Ignition Control Mode until it is disabled either by reset rES, or FtY factory reset. See section 11 and 12 for more detailed information.

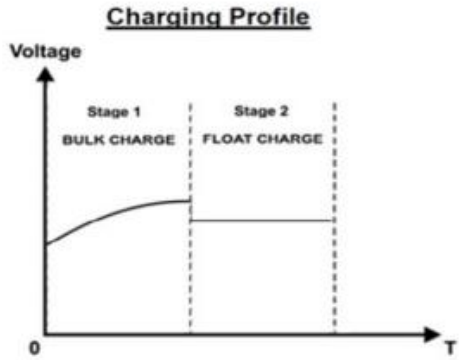
Alarm Terminal
The Alarm terminal is for input low voltage alert (F05) which provides 13.5V, 0.25A to remote LED to give out an alert before the converter enters into low voltage protection mode and shuts down. The alarm signal will be On once the input is below 21V and will be Off when the input rises back above 21V.

9. Battery Charger Mode - Two Stage Charger

When the unit is set at the Charger Mode, the LED displays CHA, the charger icon will also be on to confirm the unit is in Charger Mode operation.

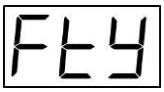
The Boost Charge constant voltage is set at 14.3V and the Float Charge voltage is at 13.6V.

The Charger Icon flashes in Boost Charge and becomes constant in Float Charge.
Quick press the SET button to display charging voltage and current.
Please note that when the battery is full and the float charge current is less than 1A, the current display shows LOA



10. DISPLAY INDICATION

LOA	Low Current Display when the output current is less than 1 Amp
CHA	CHARGER Mode

	SELECTION (programmable) Mode, ready for programming of output voltage & charger mode
	IGNITION CONTROL DISABLED, there is always output when input is powered up
	FACTORY DEFAULT SETTINGS ENABLED (see section 12 for default settings)
	Flashing = Boost Charge, Solid = Float Charge

11. IGNITION SWITCH CONTROL

This converter can be controlled by the ignition switch. Ignition switch control is disabled by default.

To enable ignition switch control, just apply a positive 8 to 32V signal to ignition terminal.
After ignition control has been enabled it will stay enabled until it is disabled as follows:

To disable ignition control

- Press and hold “SET” button until  is shown.
- Release button then wait for few seconds. The ignition control will be disabled.

12. FACTORY DEFAULT SETTINGS

1. Unit is in DC-DC Converter Mode with Output Voltage set at 13.8V
2. Ignition Control is disabled. That means the Output is always ON.

You can reset converter to factory default setting by following steps.

- Press and hold SET button until  is shown.
- Release button then wait a few seconds. The converter will reset back to the factory default setting.

13. DISPLAY ON/OFF

The display will be switched off automatically after 10 minutes. Press the SET button to restart the display for another 10 minutes.

14. ALWAYS ON AUXILIARY OUTPUT

The DC-DC converter will provide constant 13.8V, 0.5A to power critical devices such as security alarm etc.
Upon connection of input to 24V battery supply, the 13.8V terminal will be powered.

15. REMOTE VOLTAGE SENSING PORTS

The remote voltage sensing works for both converter mode and charger mode. It compensates for voltage drop at a distant load or auxiliary battery.
It further enhances the accuracy of output voltage to the distant load or battery and provides more stability with varying output current.
Just connect AWG 22 cable between the Positive S+ to Positive of load / battery and Negative S- to Negative of load / battery.

16. ALARM

The alarm signal port provides a 13.5V 0.25A for external LED to give pre-warning signal when input voltage drops below 21V before 19V at which output shuts down.

17. LOW CURRENT DISPLAY

The display will show  when the output current is less than 1Amp. The unit can be in converter or

charger mode or when the output is open circuit. When in charger mode, it can be interpreted as battery full.

18. Troubleshooting

If no display comes up after connection to the input, check for correct input polarity.
Disconnect all cables to the unit and check the input fuse.

The LED will display an error code when the converter is in any protection mode.
The following table denotes the 8 Error Codes.

Error Code	Description
F01	**Over Temperature Protection (Self-restart)** When unit's internal temperature becomes higher than the threshold value, unit shuts down output. Unit will resume normal operation automatically once the temperature becomes normal.
F02	**Output Over Voltage Protection (Self-restart)** In DC-DC Converter Mode, the output will shut down when the output voltage is 15% higher than the preset voltage level. Unit will self-restart when the output voltage falls 1V below the preset level. In DC-DC Charger Mode and in Boost Charge Stage, the unit will shut down when the output voltage is above 16V. It will self-restart when the voltage falls below 15.5V. It will also shut down when the Charge or at Float Charge Stage voltage is higher than 15.1V. It will self-restart when the voltage falls below 14.6V.
F03	**Over Load Protection (Self-restart)** When the Output current is 3 Amp higher than 40A for model VC-40, 30A for model VC-30, the unit will shut down the output. The unit will self-restart once the output current falls back to the unit's rated value.
F04	**Fan Fault (Self-restart)** When the fan does not operate normally, the unit will shut down the output. Unit will resume normal operation once the fan fault condition has been removed.
F05	**Input Low Voltage Protection (Self-restart)**

	Input V < 21V	Alarm signal On
	Input V > 21V	Alarm signal Off
	15V < Input V < 19V for 3 min.	Output shuts down, self-restart > 25V
	Input V < 15V	Output instant shut down self-restart >25V
F06	**Output Short Circuit Protection (Self-restart)** Unit shuts down the output when the output is short circuited. It will self-restart when the fault condition is removed.	
F07	**Output battery terminal reverse polarity protection** Fuse will be blown when the output is reverse polarity connected to the battery. Replace the fuse with correct type and rating.	
F08	**Input over voltage protection (Self-restart)** Output shuts down when the input voltage is higher than 35V. It will self-restart when the input drops below 32V.	

19. SPECIFICATIONS

Models	VC-30	VC-40
Input Voltage Range	19 – 36VDC	
Output Voltage Range	12 – 15VDC (0.2V increments)	
Continuous Output Current	30A	40A
No load current	< 50mA	
Efficiency	≥ 90%	
Protections	Over Voltage, Overload, Input Reverse Polarity, Over Temperature, Output Reverse Polarity, Output Short Circuit, Input Under Voltage	
Aux. Output (Always On)	13.8V / 0.5A	
Two Stage Battery Charger	Boost Charge 14.3V, Float Charge 13.6V	
Output Remote ON/OFF	Yes	
Remote Voltage Sense	Yes	
External Alarm Output	13.5VDC / 0.25A	
Indicators	3 digits LED display for V, A & Error code, Battery Charger Indicator	
Cooling System	Thermostatic Control Fan	
Operating Temperature	-10°C to +50°C	
Approvals	EN 55014, EN60335.2.29	
Accessory	Supplied 4 cable lug connectors, One 400V 3A diode	
Dimensions (WxHxD)	130x55x160 mm 5.2x2.2x6.3 inch	130x55x190 mm 5.2x2.2x7.5 inch
Weight	1kg 2.2lbs	1.2kg 2.64lbs