INDUSTRY FIRSTS–CONTINUOUS INNOVATION

RV Power Wouldn't be Where it is Today Without WFCO!

WFCO has quietly changed the way RVs convert and distribute the electricity that powers the things that make camping enjoyable. For decades, WFCO innovations have helped increase power for RVs, improve efficiency, reduce size and weight, simplify installation, improve signal quality, and much more. Many WFCO firsts have since become industry standards. WFCO continues to innovate and remains dedicated to staying a big step ahead of the competition. Here's a list of some big and small WFCO firsts. And that's just the beginning!

1. 3-Stage Charging as Standard Equipment in All Converters

Not long ago, all converters provided only one charging stage. Even today most other brands of converters are still single-stage unless you choose the higher cost option packages. After analysis of the industry's charging needs, WFCO decided it was important for every RV to have a three-stage charging unit. So, every converter we offer today is three-stage: Normal, Quick, and Trickle Charge.

2. High-Temperature Plastic Power Centers and AC/DC Distribution Panels

Every one of these WFCO products now has a lightweight plastic casing. WFCO introduced this innovation when cumbersome metal casings were the norm, primarily to increase design flexibility for improved installation characteristics.

3. Zero Clearance Power Center Designs

For more than five years, every new WFCO power center has featured front venting and zero need for space behind the unit for air-flow cooling. The result is easier installation and greater floorplan design flexibility for RV manufacturers.

4. 65 and 75 Amp Power Centers

Before WFCO introduced these integrated units, RV manufacturers only had 2-piece unit choices for their high Amp power needs in RVs with 30 Amp AC service.

5. LED Blown Fuse Indicator

Not long ago, RV owners and service technicians had no easy way to see which fuse was blown. WFCO's simple LED innovation makes diagnosis quick and easy.

6. View Window in the Door

We figured it wasn't enough to add LED indicators, you also have to be able to see them when the door is closed. Today, unlike other brands, almost every WFCO product has a window for easy circuit problem detection.

7. Two or Three 30 Amp DC Fuse Positions

With the abundance of slide-outs in RVs, WFCO spotted the need for direct 30 Amp wiring to power slide-out motors. So, we added 30 Amp fuse positions in the DC fuse panels allowing manufacturers to connect slide out motors directly to the DC fuse panel.

8. 150 Amp Rated 12 Volt Fuse Board

Nobody else offers the high quality fuse board needed to support very large DC systems.

9. EZ Thumb Latch On Fuse Panel

Eliminates fiddly screws, making removal and replacement of the fuse panel easy and fast for installation or service.

10. Steel Reinforced Mounting Holes

Every WFCO Power Center and Distribution Panel has steel inserts on every mounting hole, preventing the cracking of mounting flanges when installing products on production lines or in service centers.

11. Built-in Strain Relief System

The National Electric Code requires strain relief for AC wiring entering the power converter. WFCO was first to provide standard, built-in strain relief, reducing the cost and time needed for installers to add secondary strain relief systems.

12. 100 Amp Deck Mount Converter

Quite simply, WFCO supplies the only 100 Amp deck mount available today.

13. 35 and 40 Amp Power Centers

When we introduced the 35 and 40 Amp Power Centers, they significantly reduced the footprint needed compared to other 35 to 55 Amp products on the market. They were also designed with DC wire pigtails to help with installation.

14. Eleven 12 Volt DC Branch Circuits

When other brands were offering only nine branch circuits, WFCO invested in eleven to better serve the increasing circuit needs of contemporary RVs.

15. Three-Position LED Operation Indicator Lights on 100 Amp Deck Mount

More information available to the RV owner: a green LED means everything's good, flickering amber is a close-to-overload situation, and red indicates unit is overloaded.

16. Power Factor Correction on 100 Amp Deck Mount

A unique advanced feature first introduced on the 100 Amp unit, this converter drops input power requirement by approx. 30%, saving electric power. Less wasted power saves money and is greener for the environment.

17. Power Factor Correction on 9960 and 9990 Power Centers

Newer WFCO Power Centers also feature this power saving innovation as standard equipment.

18. Push Button Bulk Mode

This is another WFCO first that makes the 100 Amp Deck Mount the most advanced converter in its class. RVers can choose Bulk Mode when desired with this unique feature.

19. 180 Degree Door Latching Capability on 50 Amp Transfer Switch

A simple but practical exclusive feature. Mount the Transfer Switch with cables at the top, or turn it over and run the cables out the bottom- whichever is most convenient for installation. Then, snap in the door so that the label is the right way up for reading. No worry about the label being upside-down.

20. Gel Cell Battery Switch Option

Yet another innovation on the 100 Amp Deck Mount, this feature allows RVers to use Gel Cell batteries if desired. Simply flip over to the Gel Cell mode to supply the charging voltages appropriate for Gel Cell batteries.

21. Reverse Polarity LED Indicator

A new feature on the WF-8500 Series that advises the customer and/or service center of a faulty battery connection.

22. Input AC Voltage LED Status Indicators

This feature provides customers with even more information right at their fingertips by warning them if their AC input voltage is either too high or too low.

23. High Voltage Shutdown

WFCO takes extra measures to ensure the safety of both their customers and their products. This feature provides AC circuits, appliance, and device protection.

24. Three 30 Amp DC Circuits

The WF-8500 Series also features three 30 Amp DC circuits on the DC fuse panel containing a total of 13 circuits.

25. Three DC Circuit Connection Options

Three different DC circuit connection options are available on the WF-8500 Series: Screw Terminal, Quick Disconnect Terminal, or Wire Pigtail Connections.

SIX BIG REASONS OEMS CHOOSE TO INSTALL WFCO

1. Proven Reliability and High Quality

Used in over 80% of today's RVs, WFCO's exceptionally reliable converters are trusted by OEM engineers four times more than all other brands combined. Components and circuits are quality tested at critical stages of manufacturing, resulting in zero faults at final 4-hour burn-in test. It is a product of unmatched reliability, with warranty claims well under one percent.

2. More for Your Dollar Always

WFCO is a vertically integrated company, which enables us to provide quality control at every supply chain level while also achieving cost reductions due to lack of supplier markups and volume efficiencies. This enables WFCO to provide quality products and superior support at costs equal or lower than other brands.

3. Best Supplier Partner

WFCO is a family-owned American company, based in California with it's North American distribution warehouse based in Elkhart, close to most of our customers. We have invested in 55,000 sq. ft. of warehouse space and a 45-day inventory, which allows us to handle every order expeditiously, including emergency and same-day delivery so your production line never has to wait for a WFCO product. Our Power Pro team, with over 50 years combined experience, supports OEMs with in-plant installation support and expert resources. We are customer-focused, not stockholder-focused, and provide expert help in every way our customers need it.

4. The Installers' Friend

All products are designed with the installer in mind. Easy and proper installation is a major focus of our product design, which also reduces the possibility for error in the manufacturing process.

5. Advancing RV Power Supplies

WFCO develops innovations that become industry standards… We are the only supplier with the resources to offer solutions for every RV need, including lower volume niche products. Companies can have confidence in WFCO as the best total solution to their power needs; that it is a company that takes care of its customers, that it will keep up with future challenges, and will absolutely give them the most for their money.

6. The RV Industry's Electric Authority

WFCO has 40 years of power products experience. This is what we do. We helped develop the RV industry's codes and standards. That kind of background helps us improve product design for ease of use, better reliability, and better performance.

REASONS FOR DEALERS TO INSTALL WFCO

1. The Installers' Friend

Most important to the aftermarket is that WFCO converters are designed for easy installation, minimizing technician time while avoiding mistakes and improving your customer's satisfaction. We offer comprehensive cross-reference tools to help in product selection. Four SKUs cover most replacement needs and WFCO has the largest portfolio of specialty products that can replace virtually any obsolete converter you encounter. We are the only supplier with the resources to offer solutions for every RV's need, including lower volume niche products.

2. Proven Reliability and High Quality

Used in over 80% of all RVs built today, WFCO's exceptionally reliable converters are trusted by OEMs four times more than all other brands combined. Components and circuits are quality tested at critical stages of manufacturing, resulting in zero faults at final 4-hour burn-in test. It is a product of unmatched reliability, with warranty claims of well under one percent.

3. More for Your Dollar Always

WFCO is a vertically integrated company, which enables us to provide quality control at every supply chain level while also achieving cost reductions due to lack of supplier markups and volume efficiencies. This enables WFCO to provide quality products and superior support at costs that allow dealers healthy profits.

4. Best Aftermarket Partner

WFCO is a family-owned American company. Our Power Pro team supports aftermarket installation with technical support phone lines handled by techs with more than 50 years combined experience. We are customer-focused, not stockholder-focused, and we provide help every way our customers need it.

5. Advancing RV Power Supplies

WFCO develops innovations that become industry standards. RV service centers can have confidence in WFCO as the best total solution to their customer needs.

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Technical Information

Torque Values for WFCO Products

WF-8700, WF-8900, WF-8930/50, and WF-9900 Series

Terminal Description	Wire Gauge (AWG)	Torque (in.-lbs.)
Terminal Bars: Ground and Neutral	10 - 14	25
	8	30
	6	35
DC Fuse Panel Lugs: + VCC, NEG-, POS+	10 – 14	25
	8	32
	6	45
DC Fuse Panel: Single Circuit Terminals	16	12-20
	14	14-20
	12	16-20
	10	20-25

+VCC is not present on WF-8930/50

WF-8800, WF-9800, and WF-6800 Series

Terminal Description	Wire Gauge (AWG)	Torque (in.-lbs.)
DC Battery Lugs: NEG-, POS+	10 – 14	25
	8	32
	6	40
	2 - 4	45

WF-5100 Series

Terminal Description	Wire Gauge (AWG)	Torque (in.-lbs.)
DC Battery Lugs: NEG-, POS+	10 – 14	25
	8	32
	6	40
	2 - 4	45

WF-T-57, WF-T-30 (Ground Lug Only)

Terminal Description	Wire Gauge (AWG)	Torque (in.-lbs.)
Terminal Strip	6 - 14	25 - 35
Ground Lug	4 - 14	35 Max

WFCO Converters - Theory of Operation

Introduction

WFCO Converters of every style have become the favored brand for power conversion and electric distribution in the RV industry. They provide RV owners an efficient and cost-effective method to use an AC power source and provide power to DC components inside the RV, while charging accessory batteries at the same time. This document explains how these products are designed to operate.

Basic Operation

RVs are frequently sold with at least one 12 VDC accessory battery installed. This battery is normally a deep-cycle battery that has the ability to sustain a slower drain of power. RV owners find this useful when powering loads such as lights, radios and refrigerators without being connected to AC power or running the motorhome engine. As soon as the RV is connected to AC power, the converter begins charging the battery as needed, while, at the same time, providing 12 VDC power to loads such as lights, radios and refrigerators.

When the RV is connected to AC power, users frequently use the lights, refrigerators, fans and other electronics as they would in their home. RV users also expect the battery to be fully charged when they want to disconnect from power and move the RV, or when they are dry camping and turn off their generator.

WFCO Converters are designed to fulfill these needs and expectations by providing three stages of charging, commonly referred to as Absorption, Bulk and Float Modes.

Absorption Mode is the default or normal operation, providing an output of 13.6 volts DC. Because RVs today are designed with converters sized to provide ample DC output power for all DC loads in normal usage, an RV will rarely require anything other than Absorption Mode.

When a WFCO converter is connected to a battery in Absorption Mode, power is available for charging that battery whenever the converter output is greater than the voltage level of the battery. If the battery is at or near fully charged, the current draw from the converter to the battery may be very small. On the other hand, if the battery were to be fully discharged, the current draw from the converter to the battery may be quite high.

Testing has shown that a completely discharged battery (11.9 VDC) connected to a WFCO Converter in Absorption Mode with an output of 13.6 VDC and having a 20 amp lighting load connected to the converter will charge the battery to its fully charged level of 12.7 VDC in fewer than three hours. Adding more DC loads will lessen the amount of current available and will lengthen the time required to charge the battery. Batteries with damaged cells will also require additional time to charge, and may never reach a full charge voltage.

Because of the relationship between voltage and amperage, once the converter reaches its maximum rated operating current level, any increase in the DC load will start to decrease the voltage output level. When the output from the converter reaches a preset level, the converter will go into Bulk Mode.

Bulk Mode is designed to charge a significantly discharged battery in a little less time than Absorption Mode. The microprocessor in WFCO Converters continuously monitors the DC line voltage. When the microprocessor detects the preset voltage level, it will boost the converter voltage to 14.4 VDC. The increased voltage will help the battery charge faster, while still providing power to the DC appliances in the RV.

In Bulk Mode, it may not be possible to observe the 14.4 VDC output because of the voltage-current relationship. To measure the 14.4 VDC, reduce some DC loads while monitoring the voltage at the converter output. As the DC loads are removed, the voltage will begin to climb until 14.4 VDC (nominal) is shown on the meter.

As the battery continues to charge, the current drawn by the battery will gradually decrease. WFCO Converters are designed to drop out of Bulk Mode when the total amperage-draw from the converter reaches a preset point, indicating the battery is charged. If the amperage-draw stays above the preset point, the converter will stay in Bulk Mode for a maximum of four hours. These features have been implemented to protect and extend the life of the battery.

Float Mode is the third stage of converter operation. This mode is designed to provide a trickle charge to the battery. If the converter observes no significant variations in current draw for approximately 44 continuous hours, it will drop the output of the converter from 13.6V to 13.2V. This lower voltage will keep the battery charged while the RV is not in use. This also helps preserve the life of the battery, while keeping it charged and ready for use. A change in DC current will cause the converter to exit Float Mode and return to the default, or normal, Absorption Mode.

Safety Features

WFCO Converters are designed to keep the RV safe and, in some cases, prevent irreparable damage to the converter.

Automatic Cooling Fan: The microprocessor in the converter monitors the current drawn by the appliances and battery and increases the fan speed as the current draw increases. This cools the converter components as required by the load.

Over-Temperature Protection: If the internal temperature of the converter exceeds a critical point and the fan cannot cool the unit down, it will shut down. This protects the unit from excessive heat that may damage sensitive components. The unit will restart once the temperature inside the unit is again low enough.

Short-Circuit Protection: In the event of a short circuit in the RV, the WFCO Converter will drop the voltage output to zero volts. If the short-circuit condition is removed and no other fault conditions are detected, the converter will resume normal operation. However, short-circuit conditions are dangerous, and an RV will require inspection by a qualified service technician.

Reverse Battery and Overload Fuse Protection: WFCO Converters include replaceable fuses for protection from conditions that can permanently damage the converter. These fuses will blow and protect the converter if the battery is connected incorrectly, or if the converter experiences an overload condition. Before replacing the fuses, check to make sure that the polarity connection is correct, and turn off as many DC loads as possible. Disconnect from power, replace the fuses, and then reconnect to power.

Measuring DC Output

Voltmeters or digital multi-meters are great tools for measuring the voltage at different points in the system. Here are a few simple steps to follow in testing a converter:

- If there is a battery installed, disconnect one of the cables so the battery is out of the circuit.
- Turn off all the DC loads in the coach (lights, etc.) so there is no load on the converter.
- Turn the converter OFF by throwing the converter breaker in the load center or unplugging the shore cord, and leave it OFF for at least one minute.
- Turn the converter back ON and measure the DC voltage at the NEG and VCC lugs on the DC fuse board in the power center or at the NEG and POS terminals on a deck mount converter. The reading should be approximately 13.6 VDC.
- One by one, start turning DC loads back ON and monitor the voltage at the lugs on the fuse board or the terminals on the deck mount. The voltage should remain stable, but may drop slightly as loads are applied.
- After completing the testing, reconnect the battery cable removed in the first step.

Tips for Charging Batteries

Batteries charge more quickly when there are no other connected loads competing for DC current. If the batteries are taking too long to charge, consider turning off as many DC loads as possible. More power will be available for the battery to charge.

The following styles of batteries are approved for all WFCO Converters and Power Centers:

- Sealed lead-acid batteries for automotive engine starting
- Flooded lead-acid batteries for deep-cycle applications
- Sealed AGM batteries for deep-cycle applications

Do not charge GEL-cell batteries unless you are using a WFCO WF-6800 Series power converter, and have selected the GEL switch position in the back of the unit. No other WFCO Converters are designed to charge GEL-cell batteries.

Do not charge any types of batteries other than those listed above with WFCO Converters. If you are unsure if the WFCO Converter is compatible with a particular type of battery, please call your RV dealer or the battery manufacturer for assistance.

Discover other RV electrical andlighting on our website.