

Operation Manual

FC300 Series – Rev 1.2

P/N FC300-000

FC300 Series Power Converters



ADAPTIVE Power Systems

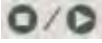
Worldwide Supplier of Power Equipment

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1 Contact Information

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2 Front Matter

2.1 Limited Warranty

Adaptive Power Systems, Inc. (APS) warrants each unit to be free from defects in material and workmanship. For the period of one (1) years from the date of shipment to the purchaser, APS will either repair or replace, at its sole discretion, any unit returned to the APS factory in Irvine, California or one of its designated service facilities. It does not cover damage arising from misuse of the unit or attempted field modifications or repairs. This warranty specifically excludes damage to other equipment connected to this unit.

Upon notice from the purchaser within (30) days of shipment of units found to be defective in material or workmanship, APS will pay all shipping charges for the repair or replacement. If notice is received more than thirty (30) days from shipment, all shipping charges shall be paid by the purchaser. Units returned on debit memos will not be accepted and will be returned without repair.

This warranty is exclusive of all other warranties, expressed or implied.

2.2 Service and Spare Parts Limited Warranty

APS warrants repair work to be free from defects in material and workmanship for the period of ninety (90) days from the invoice date. This Service and Spare Parts Limited Warranty applies to replacement parts or to subassemblies only. All shipping and packaging charges are the sole responsibility of the buyer. APS will not accept debit memos for returned power converter or for subassemblies. Debit memos will cause return of power converters or assemblies without repair.

This warranty is exclusive of all other warranties, expressed or implied.

2.3 Safety Information

This chapter contains important information you should read BEFORE attempting to install and power-up APS Equipment. The information in this chapter is provided for use by experienced operators. Experienced operators understand the necessity of becoming familiar with, and then observing, life-critical safety and installation issues. Topics in this chapter include:

- Safety Notices
- Warnings
- Cautions
- Preparation for Installation
- Installation Instructions



Make sure to familiarize yourself with the **SAFETY SYMBOLS** shown on the next page. These symbols are used throughout this manual and relate to important safety information and issues affecting the end user or operator.

SAFETY SYMBOLS



Direct current (DC)



Alternating current (AC)



Both direct and alternating current



Three-phase alternating current



Protective Earth (ground) terminal



On (Supply)



Off (Supply)



Fuse



Caution: Refer to this manual before this using Product.



Caution: Hazardous voltages may be present. Risk of electric shock

2.4 Safety Notices

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Adaptive Power Systems assumes no liability for the customer's failure to comply with these requirements.

GENERAL

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

ENVIRONMENTAL CONDITIONS

This instrument is intended for indoor use in an installation category I, pollution degree 2 environments. It is designed to operate at a maximum relative humidity of 80% and at altitudes of up to 2000 meters / 6560 feet. Refer to the specification tables for the ac mains voltage requirements and ambient operating temperature range.

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage and the correct fuse is installed.

GROUND THE INSTRUMENT

This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the AC power converter mains through a properly rated power cord, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired Fuses or short circuit the fuse holder. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

DO NOT SERVICE OR ADJUST ALONE.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT EXCEED INPUT RATINGS.

This instrument may be equipped with a line filter to reduce electromagnetic interference and must be connected to a properly grounded receptacle to minimize electric shock hazard. Operation at line voltages or frequencies in excess of those stated on the data plate may cause leakage currents in excess of 5.0 mA peak.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an Adaptive Power Systems Sales and Service Office for service and repair to ensure that safety features are maintained.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

3 Product Overview

This chapter provides an overview of the APS FC300 Series AC power converters. It introduces the reader to general operating characteristics of these power converters. Operational information and menu navigation details are provided in Section 6, “Front Panel Operation”.

3.1 General Description

The APS FC300 Series consists of two models at different output power levels. Each model has similar electrical performance and operational characteristics except for maximum AC input currents, AC and DC output currents and AC input voltage requirements. Refer to Section 4, “Technical Specifications” for specific AC input specifications by model.



3.2 Features Table

Feature	
Available Power Models	500VA or 1000VA
AC Mode	0 – 155Vac / 0 – 300Vac
DC Mode	0 – 210Vdc / 0 – 420Vdc
AC Waveforms	Sine
Frequency	40 ~ 450 Hz

Table 3-1: FC300 Series Features

3.3 Available Models

3.3.1 Model FC305

This is the smallest model offered at 500VA output. Output voltage is 155Vac on the low voltage range and 310Vac on the high voltage range. The FC305 connects the AC power grid using a standard IEC 60320 standard type C13 (15 A) modular line cord. One line cord is included in the ship kit. If the plug is not correct for your locale, country specific line cords should be readily available or the plug on the included line cord can be replaced with the correct plug.

3.3.2 Model FC310

This FC310 offers 1000VA output in AC mode. It is the same size as the FC305. Output voltage is 155Vac on the low voltage range and 310Vac on the high voltage range. The FC310 connects the AC power grid through a three-position terminal strip at the rear panel. No line cord is included.

3.4 Product Features

The following key characteristics apply to all FC300 Series models;

- AC output mode
- Frequency range in AC mode is 40 Hz to 500 Hz
- Dual voltage ranges in both modes
- AC voltage ranges are 0-155Vac and 0-310Vac RMS
- Current limit with Fold-Back (CC)
- Full complement of output parameter metering:
 - Frequency
 - Volt AC
 - Current AC
 - True Power
 - Power Factor
- Over voltage, over current, over power and over temperature protection
- Fan Cooled

4 Technical Specifications

Technical specifications shown here apply at an ambient temperature of 25° C ± 5°.

4.1 Specifications Table

SPECIFICATIONS			
AC INPUT SPECIFICATIONS			
Phases		1 \emptyset / 2 Wire + Ground	
Voltage		110 / 220V ± 10%	
Frequency		47-63Hz	
Model		FC305	FC310
Max. AC Input Current (RMS)		10A / 5A	20A / 10A
Input Power Factor / Efficiency		> 0.67 / > 78%	> 0.67 / > 80%
OUTPUT SPECIFICATIONS			
Model		FC305	FC310
Power Rating	Total Power	500 VA	1000 VA
Max Current ¹	Ranges H / L	4.6 A / 2.3 A	9.2 A / 4.6 A
Phases		1 \emptyset / 2 Wire + Ground	
Voltage	Ranges H / L	0 - 310 V / 0 - 155 V	
	Resolution	0.1 V	
	Accuracy	±(1.0% of setting + 0.1% F.S.)	
Frequency	Range	45 - 450 Hz	
	Resolution	0.1 Hz at 40 - 99.9 Hz, 1 Hz at 100 - 450 Hz	
	Accuracy	±0.03% of setting	
Total Harmonic Distortion (VTHD)		< 0.3% @ 110 / 220Vac & 50 / 60Hz (Resistive load)	
Crest Factor		≥ 3 to 1	
Regulation Load / Line		± (0.5% of output + 0.5 V) for Resistive load / ± 0.1 V	
Protection		OCP, OVP, OPP, OTP, Short Circuit and Alarm	
MEASUREMENTS			
Frequency	Range	0.0 - 450.0 Hz	
	Res. / Accuracy	0.1 Hz / ± 0.1 Hz	
Voltage RMS	Range	0.0 - 400.0 V	
	Res. / Accuracy	0.1 V / ±(1.0% of reading + 0.1% F.S.)	

SPECIFICATIONS			
Model		FC305	FC310
Current RMS	Range H / L	0.005A - 0.600A / 0.50A - 6.50A	0.005A - 1.200A / 1.00A - 13.00A
	Res. / Accuracy	0.001A / \pm (1.0% of reading + 0.005A)	
Real Power	Range H / L	0.005A - 0.600A / 0.50A - 6.50A	0.005A - 1.200A / 1.00A - 13.00A
	Res. / Accuracy ²	High Range: 0.1W / \pm (2.0% of reading + 5W) Low Range: 0.1W / \pm (2.0% of reading + 1.5W)	
ENVIRONMENTAL			
Operating Temperature		32° - 104° F / 0° - 40° C	
Relative Humidity		20% - 80%, non-condensing	
DISPLAYS AND MEMORY			
Displays		Green LEDs for Frequency, Voltage, Current, Power or Power Factor (simultaneously)	
Memory (standard)		3 Programmable Memory Locations for Voltage, Frequency and Current	
MECHANICAL SPECIFICATIONS			
Model		FC305	FC310
Dimensions	(H x D x W)	3.5" x 11.8" x 17" / 89 x 300 x 430 mm	3.5" x 15.75" x 17" / 89 x 400 x 430 mm
Weights	(Kg / lbs.)	12.5/ 27.6	18.2 / 40.1

Footnotes:

- 1: Maximum current available at output voltage 110Vac on low voltage range or 220Vac on high voltage range.
- 2: At PF > 0.2 and output voltage > 5Vac

4.2 Output Voltage / Current Rating Charts

4.2.1 V-I Rating Charts FC305

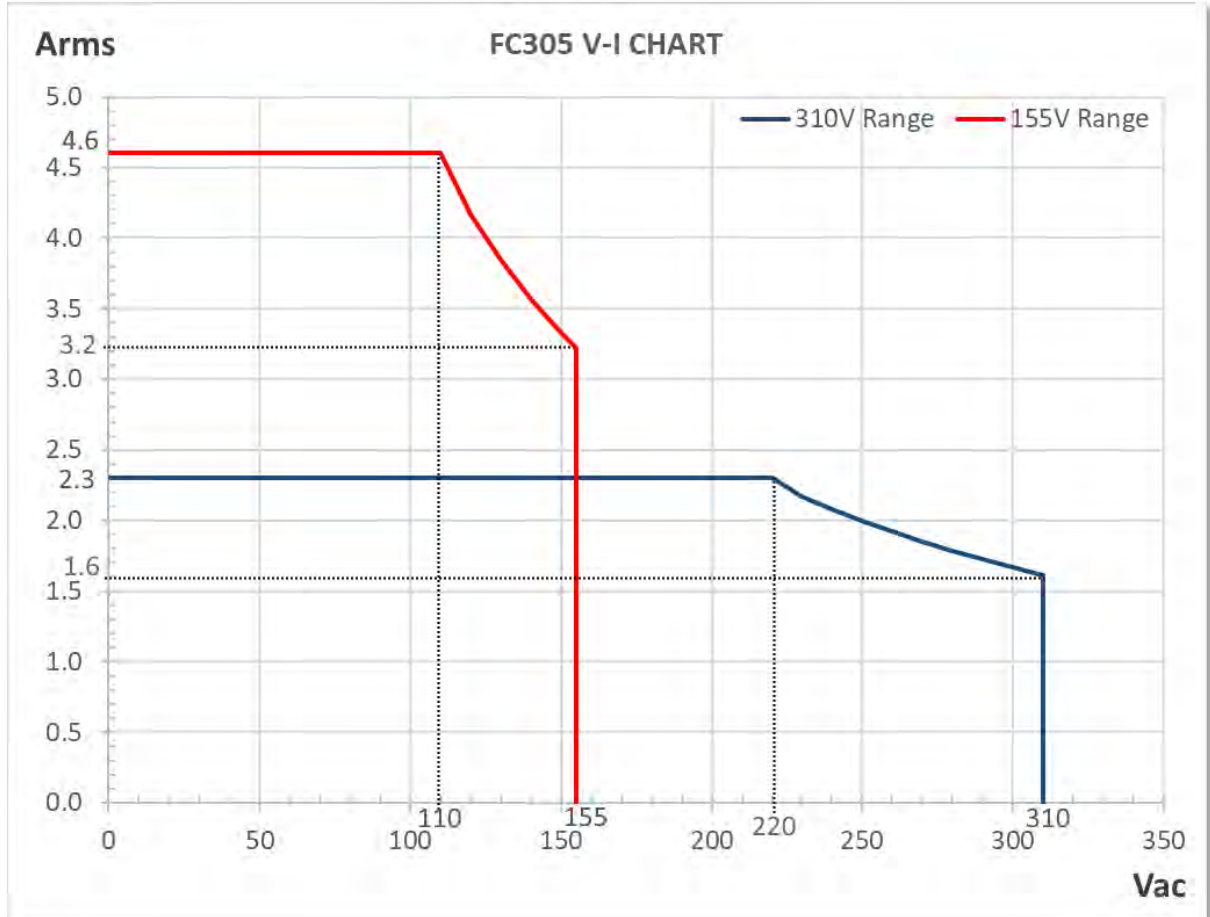


Figure 4-1: V-I Rating Charts FC305

4.2.2 V-I Rating Charts FC310

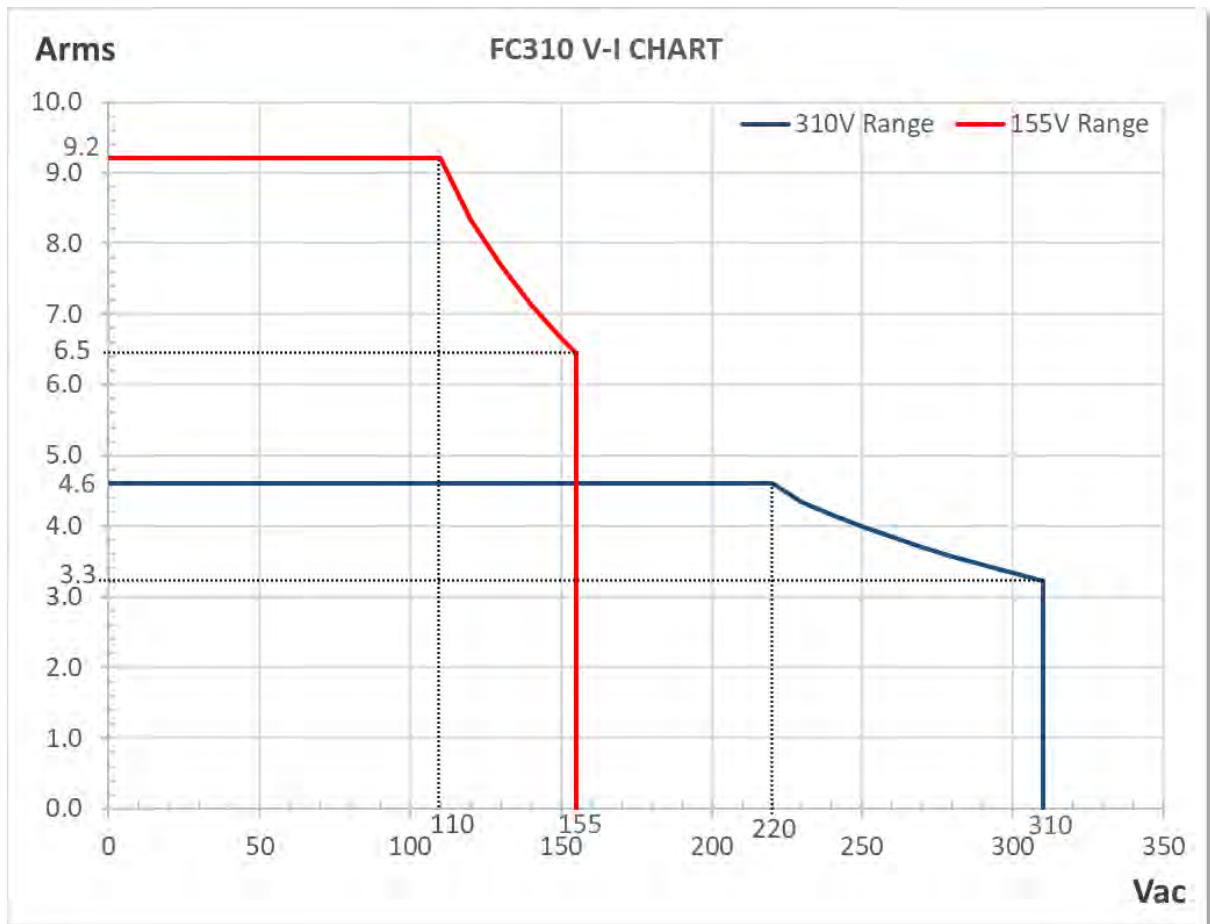


Figure 4-2: V-I Rating Charts FC310

4.3 Rear Panel Descriptions

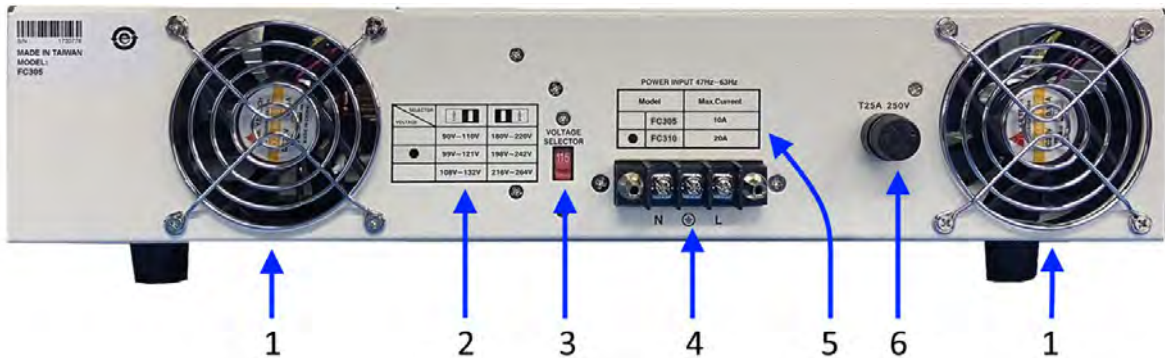


Figure 4-3: FC300 Series Rear Panel

CALL OUT	ITEM	DESCRIPTION
1	THERMAL FANS	To cool the instrument. When the temperature exceeds 60 ° C, the fans will enter the second speed.
2	INPUT VOLTAGE RATINGS	Instrument input voltage indications
3	INPUT POWER SELECTOR	Line voltage selection is set by the position of the switch. In the left position, it is set for 110-volt operation, in the right position it is set for 220-volt operation.
4	INPUT POWER TERMINAL BLOCK	Provides input power to the instrument. This center ground terminal should be connected to a good earth ground before operation
5	AC INPUT CURRENT	Max AC Input Current Rating info
6	FUSE RECEPTACLE	To change the fuse, unplug the power (mains) cord and turn the fuse cap counter clockwise to remove the fuse.

Table 4-1: Rear Panel Layouts

5 Unpacking and Installation

5.1 Inspection

The FC300 Series of power converters are carefully inspected before shipment. If instrument damage has occurred during transport, please inform Adaptive Power Systems' nearest sales and service office or representative.

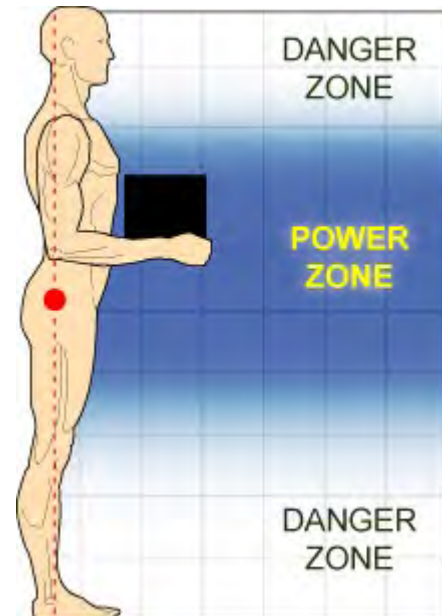
5.2 Proper Lifting and Handling Guidelines

Lifting properly is important. While there are some general lifting guidelines, a different approach may be needed for each load to be lifted. Generally, it is best to lift with your legs, not your back. Lifting techniques depend on the size and shape of the load, and the frequency of lifting that is required.

The FC300 Series units are considered moderately heavy; proper lifting and handling techniques must be used at all times.

Removing units from their packaging should be done with ergonomics in mind. Items to be planned include determining routes between staging areas and work spaces and soliciting assistance from other members of your team.

The power zone for lifting is close to the body, between mid-thigh and mid-chest height. Comparable to the strike zone in baseball, this zone is where arms and back can lift the most with the least amount of effort.



Refer to the “LIFTING DO’S & DON’TS” chart below before removing any units from its packaging or re-locating it to a different work area.



Figure 5-1: Lifting Do's and Don'ts Chart

5.2.1 Unpacking

The FC300 Series power converters are shipped in a cardboard box with protective foam inserts. To remove a unit from its box, one or two persons may be used depending on unit weight.

Removal Steps:

1. Position the carton on a stable flat surface with sufficient clearance.
2. Make sure the carton is right-side up. Top is clearly marked on the side of the carton.
3. Know where the unit is to be placed before proceeding. Make sure the path between the carton and the staging area is short and clear of any obstacles.
4. Use a box cutter to cut the tape that holds the top flaps together. Also cut the side tape on the top flaps.
5. Open all four flaps completely and fold them down along the side of the carton so they don't interfere with access to the inside of the carton.

6. Remove the small card box insert that contains some ship kit items from the top foam cutout and put in a safe place.
7. Remove the top foam insert piece and retain for future use if desired.
8. To remove the unit from the box:
 - a. Stand as close to the back of the box (where the rear panel of the unit is) and bend with your knees.
 - b. Get a firm hand hold underneath the units by placing your hands on each side of the unit near the middle. This will help even the weight when lifting.
 - c. While keeping your back straight, lift the unit out of the box by straightening your legs.
 - d. Place the unit on the intended staging surface, usually a bench or table.

5.3 Ship Kits

All units are shipped with a ship kit that may contain several items. Ship kits can vary by model so check the contents of the ship kit you received against the relevant table below. If any items appear to be missing, contact Adaptive Power Systems customer service. (support@adaptivepower.com).

The following accessories are included with each FC300 Series power converter.

Item	Description	FC305	FC310
1	AC Input Cable	1	-
2	AC Input Terminal Safety Cover	-	1
3	User Manual Download PDF	https://tr.adaptivepower.com/	
4	Calibration Certificate	1	1

Table 5-1: FC300 Series Included Accessories Ship Kit

5.4 AC Input Requirements

The FC300 models operate on single phase AC input and use a standard IEC line cord. All other FC300 models have a terminal block for AC input. Please read the sticker on the rear panel of the instrument to be sure the proper input voltage is provided before powering your instrument ON.

Refer to Section 5.6, "Check Line Voltage" to see how to check the line voltage selection and fuse type.



5.5 Instrument On/Off Power Switch

The power switch that is included in the instrument is not considered a disconnecting device. It only disconnects **one** current carrying conductor to power off the device. The user should configure the equipment with an external switch or circuit breaker for disconnecting it from each operating energy supply source. In compliance with EN61010-1 for permanently connected equipment, this switch should meet the following guidelines:

- Must be included in the building installation.
- Must be in close proximity to the equipment and within easy reach of the operator.
- Must be marked as the disconnecting device for the equipment.
- Must not interrupt the protective earth conductor.
- Must be in compliance with EN 60947 series, the rated voltage shall be at least equal to the rated input voltage of the equipment and the rated current shall be equal to the rated input current of the equipment.



WARNING

Be sure to select the appropriate wire gauge for use with the FC300 series AC power converter. The line cord must be capable of handling the input current drawn by the AC power converter.

5.6 Grounding Requirements



WARNING

Before connecting power to this instrument, the protective ground (earth) terminals of this instrument must be connected to the protective conductor of the line (mains) power cord. The main plug shall only be inserted in a socket outlet (receptacle) provided with a protective ground (earth) contact

The chassis must be grounded. A proper Earth Ground connection must be used at all times. Correct grounding of your electrical system infrastructure according to applicable national standards must be observed.



WARNING

This protective ground (earth) must not be defeated by the use of an extension cord without a protective conductor (grounding).

The mains plug is used as the disconnecting device and shall remain readily operable. The socket-outlet shall be installed near the equipment and shall be easily accessible.



WARNING

The main plug shall only be inserted in a socket outlet with a protective ground (earth) contact. This protective ground must not be defeated by the use of an extension cord without a protective conductor.



CAUTION

The FC310 Model rear panel output terminal cover should be used to prevent electric shock. The input/output terminals must be covered when using this product.

5.7 Cooling

The power converter is air cooled using forced air drawn in from the front and exhausted at the rear. Do not block any ventilation openings to prevent overheating of the equipment. Keep the ventilation slits uncovered during operation. Failure to do so could cause the instrument to overheat and may damage internal components.

5.8 Fan Noise

The following noise levels apply under maximum power output with normal unobstructed flow.

Max. Audible Noise: 63 dB

5.9 AC Input Cabling



5.9.1 AC Input

Connect the power cord to the AC input terminal block on the rear panel. Plug the male power cord into a grounded power outlet.

1. Adjust an appropriate length for the input power cord while inserting the cord through the protection enclosure. By using a Phillips type screwdriver to connect and secure appropriate power lines onto the terminal. When complete, cover up with the plastic safety cover into the terminal.

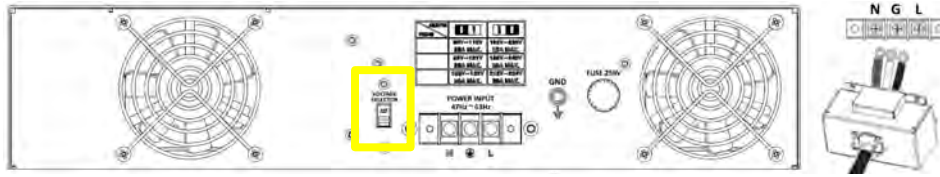


Table 5-2: AC Input Voltage Selector Switch Location

2. Push to seal the protection enclosure and secure it with a screwdriver and on the cable.

The following charts lists the wire configuration that must be used for connection to the AC input of the respective power converter models:

Model	AC Input (AWG / mm ²)		
	L	N	G
FC305	12- / 3.31 mm ²	12- / 3.31 mm ²	13 / 2.62 mm ²
FC310	8 / 8.37 mm ²	8 / 8.37 mm ²	10 / 5.26 mm ²

The table below shows the recommended wire gauge required to connect a load to the output of the power converter by model.

Model	Output Wire Gauge (AWG / mm ²)		
	L	G	N
FC305	22 / 0.33 mm ²	16 / 1.31 mm ²	22 / 0.33 mm ²
FC310	16 / 1.31 mm ²	16 / 1.31 mm ²	16 / 1.31 mm ²

5.10 Cleaning

To clean this product, use a soft or slightly damp cloth.



CAUTION

BEFORE you clean the unit, switch the mains power off and disconnect the input line cord.

- **Please do NOT use any organic solvent capable of changing the nature of the plastic such as benzene or acetone.**
- **Please ensure that no liquid is allowed to penetrate this product.**

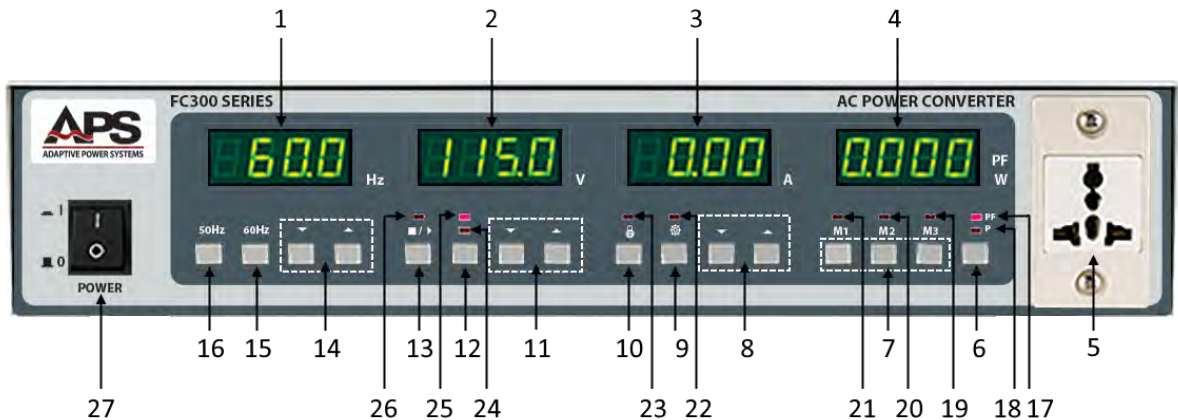
5.11 In Case of Malfunction

In the unlikely event of an instrument malfunction or if the instrument does not turn ON despite the presence of the correct AC line voltage, please attach a warning tag to the instrument to identify the owner and indicate that service or repair is required. Contact Adaptive Power Systems or its authorized representative to arrange for service.

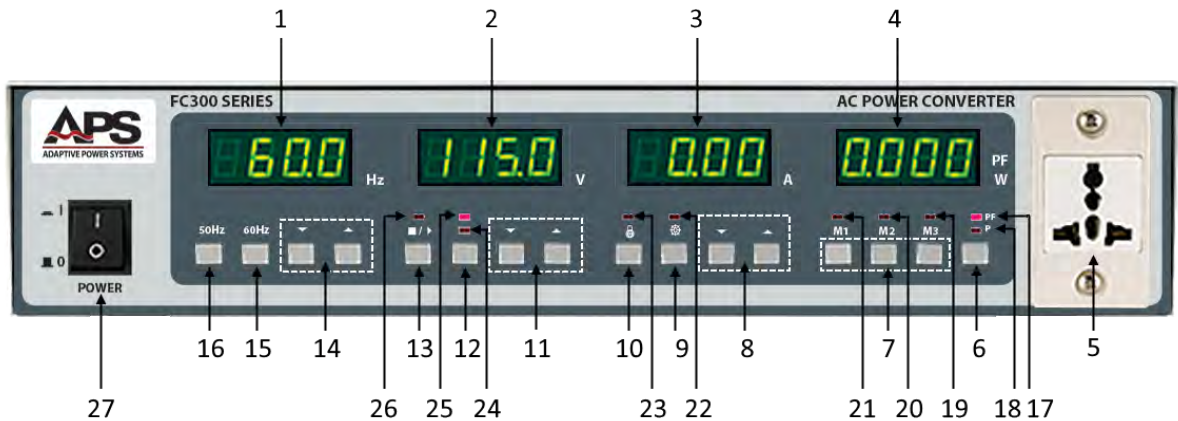
6 Front Panel Operation

This Chapter provides an overview of front panel operation for the FC300 Series power converters.

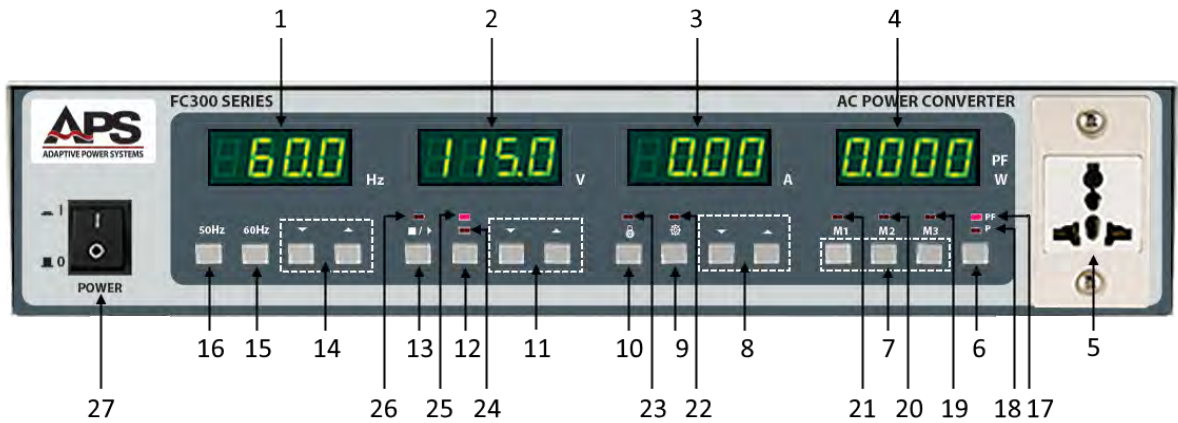
6.1 Front Panel Controls and Displays





NO.	Display / Control	Description
1	FREQUENCY	Displays the output frequency. When the output is OFF, shows the frequency setting. Otherwise, displays the frequency of the output.
2	VOLTAGE	When the output is OFF, displays the output voltage setting. Otherwise, it displays the voltage of the output.
3	CURRENT	When the output is OFF, displays the output current setting. Otherwise, displays the current of the output.
4	MULTI FUNCTION	Displays the value of output wattage or power factor
5	UNIVERSAL AC OUTPUT SOCKET	Trip Current (20A)
6	P / PF SELECT BUTTON	Selects display of output wattage or power factor value.
7	M1, M2 AND M3 BUTTON	Store setting memories. [Press and hold for a second or above].
8	CURRENT ▲ / ▼ KEYS	These keys increase or reduce the output current setting from the display value. They can also be used as a selection key for System settings.
9	⚙️ KEY	Enter or exit from the setting of system parameter. You can utilize the ▲ / ▼ keys under VOLTAGE meter to select the parameter that you need to set, and the ▲ / ▼ keys under CURRENT meter to set parameters.
10	🔒 KEY	Disables all the keys on the front panel. Switches between Lock and Unlock modes.



NO.	Display / Control	Description
11	VOLTAGE ▲ / ▼ KEYS	These keys increase or decrease the output voltage from the displayed value. Or they be selection keys for System items.
12	HI/LO KEY	Toggles between High Voltage Range (0 -310V) and Low Voltage Range (0 -155V).
13	⏻ / ⏪ KEY	Turns the output ON and OFF. Also, use this key to RESET the unit after an abnormal operation occurs.
14	FREQUENCY ▲ / ▼ KEYS	These keys increase or decrease the output frequency to higher or lower than the displayed value.
15	60 Hz KEY	Press to set the output frequency to 60 Hz.
16	50 Hz KEY	Press to set the output frequency to 50 Hz.
17	POWER FACTOR INDICATOR	When the LED is ON, the display shows the output power factor.
18	WATTMETER INDICATOR	When this LED is ON, the display shows the output power.
19	M3 INDICATOR	When the LED is ON, the output is set according to M3.
20	M2 INDICATOR	When the LED is ON, the output is set according to M2.
21	M1 INDICATOR	When the LED is ON, the output is set according to M1.
22	⚙️ INDICATOR	When the LED is ON, the SYSTEM default setting is activated.




NO.	Display / Control	Description
23	 INDICATOR	When this LED is lit, all the keys are disabled.
24	HI INDICATOR	When the LED is lit, the output is set to high range.
25	LO INDICATOR	When the LED is lit, the output is set to low range.
26	 INDICATOR	When the LED is lit, it is at normal operation, whereas when the LED is blinking, it is at abnormal operation.
27	POWER SWITCH	Rocker style power switch with international ON () and OFF (O) markings.

6.2 Manual Operation

6.2.1 Setting Output Voltage

The high range output voltage can be set between 0 and 310Vac RMS while the low range voltage range is 0 to 155Vac RMS. Press and hold the ▲ or ▼ key will first clear the decimal number of setting to zero. Subsequently, every 0.3 seconds a step change will occur and thereafter the first integer of the setting value will vary and then roll over to the second integer and third integer of the voltage setting respectively. For the third integer, it takes 0.1 seconds only to vary every step in order to speed up the setting change.

Press and hold “^”, decimal (clear to 0) → 1st Integer (0.3sec / step) → 2nd Integer (0.3sec / step) → 3rd Integer (0.1sec / step)

If the voltage is adjusted while the  output indicator is ON, the AC Power Converter will generate the output voltage accordingly. When the voltage display is blinking, the output voltage remains the same as the previous set voltage. After 2 seconds, the voltage display will stop blinking and the newly set voltage value will take effect. Any invalid setting will not be accepted.

6.2.2 Setting Output Frequency

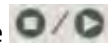
For frequency setting in the range of 40 to 99.9 Hz, each change on the setting are 0.1Hz/step for normal setting and 1Hz/step for coarse setting. In 100 450 Hz range, each change on the setting are 1Hz/step for normal setting and 10Hz/step for coarse setting. As the 50 Hz or 60 Hz key is pressed, the desired frequency will update immediately. (The same method to scroll the display as described under “Setting Output Voltage” applies).

6.2.3 Selecting Voltage Range

If the desired output voltage is below 155 V, press the HI / LO Key first. The LO LED is lit to indicate the AC source is in 0 155 Volt range which supports a higher current limit setting range.

For the 0 to 310V of high voltage range, the current limit setting range drops to half compared to the current limit on the 0 155 V range. (See section 4.1, “Specifications Table” on page 13).

Note: Changing between voltage ranges will may not affect the existing output voltage setting if the setting is still within the allowable range values.

Note: Changing the voltage range while the  OUTPUT indicator is ON will result in the output voltage dropping to zero volt for about 20 msecs while the voltage range change takes place. This should be avoided if possible as they EUT likely shut down momentarily.

6.2.4 Setting Current Limit

While the OUTPUT is not activated, pressing the ▲ or ▼ key will enter the setting mode of the low current limit. Press the same ▲ or ▼ key again to continue scrolling the display in order to change the current limit. If the setting is held for 2 seconds, it will return to a standby mode from current setting mode. Meanwhile, while in standby mode, the output capacity (Refer to the specification table) limits the output current or allows setting the low limit current.


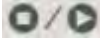
The AC Power Converter cuts off the output immediately when the actual current exceeds the limits and an HI A error message is shown. Any invalid current setting will not be accepted.

If the system parameter “OC Fold” is ON and current high limit is set, the output voltage will drop to maintain the output current. If the High Limit is OFF, the output will cut off until the output current is over the current of the current protection circuit.



6.2.5 Power or Power Factor Selection

Press the PF/P select key to view either Power Factor or Power (Watts) measurement.

6.2.6 Output Enable/Disable Button

This key is used to turn the output voltage ON or OFF. When the  indicator is lit, the voltage is presence at the universal output socket. If the indicator is blinking, an abnormal operation or condition was encountered and the output voltage will be cut off immediately. Pressing the  key will reset the audible alarm and display an error message.

6.2.7 Front Panel Lockout

Press the  key to light up the LOCK indicator and disable all keys on the front panel except the PF/P display selection key. Pressing the  key again will reactivate all keys to normal functions. The Lockout feature is to prevent any unauthorized alteration of settings by an operator.

6.2.8 Memory Locations 1~3 Storage


There is a feature to store the voltage, current and power setting to a memory location of which there are three in total. In order to store into a particular memory location, press the M1, M2 or M3 keys for at least **one second**. To recall a memory, press the M1, M2 or M3 briefly to retrieve the setting stored there.

6.2.9 Power On Setting

Every time the AC Power Converter is turned on, the voltage and current displays will indicate model and version respectively for the particular AC Power Converter.



6.3 System Settings

When the output is in OFF condition, press the  key to enter the system parameter setup mode. The SYSTEM indicator will light up. The indication of system parameter setup will be shown at the Voltage/Frequency display. By pressing the ▲ or ▼ key from the Voltage display, you can now scroll to these system parameter setup menus:

- Power Up
- Frequency HI Limit
- Frequency Low Limit
- Voltage HI Limit
- Voltage Low Limit
- Over Current Fold Back settings.

The following table summarizes available System Settings and LED displays.

FREQUENCY	VOLTAGE	CURRENT	Text	Description
	P.P.P	0.000	P-UP OFF	Output status of power up.
		0.000	P-UP On	
		0.000	P-UP LAsT	
0610	0000	310.0	Volt HI 310.0	Maximum voltage setting limit
0610	0000	0.000	Volt LO 0.0	Minimum voltage setting limit
0209	0000	450.0	FrEq HI 450.0	Maximum frequency setting limit
0209	0000	0.400	FrEq LO 40.0	Minimum frequency setting limit
0000	0000	0.000	OC Fold OFF	Output Current fold back disable
		0.000	On	Output Current fold back enable

6.3.1 Power Up Settings

While the Voltage display indicates “P UP”, press the ▲ or ▼ key from the Current display to select ON/OFF/LAST for the output state.

- If the Power Up setting is OFF, the output is set to the OFF condition after cycling input power to the AC source.
- When the Power Up setting is ON, the output is instantly ON after cycling input power to the AC source.
- When the Power Up setting is LAST, the display will indicate last output setting status after cycling input power to the AC source.

6.3.2 Voltage HI Limit Setting

The Frequency display will indicate “Volt” and the Voltage display shows “HI”. Press the ▲ or ▼ key from the Current display to adjust the high limit voltage within the range of 0 to 310V.

6.3.3 Voltage LO Limit Setting

The Frequency display will indicate “Volt” and the Voltage display shows “LO”. Press the ▲ or ▼ key from the Current display to adjust the low limit voltage within the range of 0 to 310V.

Note: Make sure the LO limit set point is always lower than the HI limit set point. If not, the voltage cannot be adjusted. (LO < HI).

6.3.4 Frequency HI Limit Setting

The Frequency display will indicate “FrEq” and the Voltage display shows “HI”. Press the ▲ or ▼ key from the Current display to adjust the high limit frequency within the range of 40 to 450Hz. 450Hz. When the frequency is set in the range of 40 to 99.9Hz, the resolution is 0.1 Hz/step. In the 100 to 450Hz range, the resolution becomes 1 Hz/step.

6.3.5 Frequency LO Limit Setting

The Frequency display will indicate “FrEq” and the Voltage display shows “LO”. Press the ▲ or ▼ key from the Current display to adjust the low limit frequency within the range of 40 to 450Hz. 450Hz. When the frequency is set in the range of 40 to 99.9Hz, the resolution is 0.1 Hz/step. In the 100 to 450Hz range, the resolution becomes 1 Hz/step.

Note: Make sure the LO limit set point is always lower than the HI limit set point. If not, the frequency cannot be adjusted. (LO < HI).


6.3.6 Over Current Fold-Back Settings


The Frequency display will indicate “OC” and the Voltage display shows “Fold”. Press the ▲ or ▼ key from the Current display to select the ON/OFF for the output status setting. (The same method applied as for voltage limit setting).


In the On setting, if output current is higher than the “HI A” current set value, the AC power converter will keep a constant HI A level output current by reducing the output voltage as needed.

6.4 Displayed Messages

Following are the descriptions of any error messages that may occur as a result of abnormal conditions.


At any abnormal conditions, there are several error messages that may be shown on the display LEDs. Also, the output is disabled and the alarm will sound. The  LED Indicator will also light up at the same time. If the indicator is blinking that shows an abnormal operation is encountered and the output voltage is cut off immediately.

Pressing the  key will reset the audible alarm and display an error message.

	CAUTION
<p>All error messages are the result of abnormal conditions and therefore must be recorded. Check the cause of error to ensure the problem is eliminated before restarting use of the power converter. If the condition cannot be cleared, contact Adaptive Power Systems or an authorized distributor for further assistance.</p>	




If the heat sink of the instrument itself has exceeded 130 °C, the Frequency display will indicate “OtP”. This shows that the heat sink is overheated and thus the alarm will sound.

Consequently, the  LED indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.




Over Current Protection will occur if the output is shorted. The system will self-protect within 1 second or the output current has exceeded 110% of maximum current rating for 1 second. At this time, the Frequency display will indicate “OCP” and the alarm will sound.

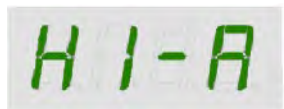
Consequently, the  LED indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



Over Power Protection will occur if output power has exceeded 125% of maximum power rating. The system self protects within 0.5 second or the output power has exceeded 110% of maximum power rating for 1 second. At this time, the Frequency display will indicate “OPP” and the alarm will sound.


Consequently, the  LED indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.

Note: If OCP and OPP occur at the same time, OCP will be activated first.



Hz


If the output current measured exceeds the current limit setting, the Frequency display will indicate “HI-A” and the alarm will sound.

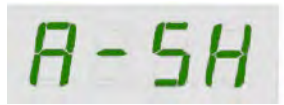
Consequently, the  LED indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



Hz

If the output voltage has exceeded 5V of the set voltage in the 0 - 155V range or has exceeded 10V of setting voltage in the 0 - 310V range, the Frequency display will indicate “OVP” and the alarm will sound.

Consequently, the  LED indicator will blink and the Voltage or Current displays will show the overloaded voltage or current respectively.



Hz

If the Amplifier is fault or abnormal, or an amplifier power device is damaged, the Frequency display will indicate “A-SH” and the alarm will sound.

Volt Err : The amplifier will test first by itself after power on. If this power-on self test fails, the displays will indicate “**Volt Err**” and the alarm will sound. This not only makes sure the AC power converter is functioning normally, it also protects a DUT so it does not get damaged as the result of an incorrect source output.

7 Calibration



7.1 Overview

All Adaptive Power Systems' instruments are factory calibrated prior to shipment. The recommended calibration interval for FC300 Series instruments is one year (every 12 months).

The calibration steps used in this section are specific to an FC310 model but other than current settings, they are the same for the 500VA FC305 model.

7.2 Entering Calibration Mode

Ensure the model version is correct before turn OFF the AC Power Converter.

To enter the calibration mode, press and hold the ,  and keys while turning ON the AC Power Converter using the on/off AC power switch. After two seconds, the AC Power Converter will indicate model number and version. It is now in calibration mode

Press the ▲ or ▼ key to select a calibration menu.

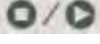



CAUTION

Make sure the device is powered ON for at least 30 minutes before calibrating. This is necessary to stabilize the unit to meet specifications.

7.3 Voltage Calibration

7.3.1 Low Range

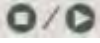
Press the ▲ or ▼ key from the Frequency display to select “V LO”. Connect a calibrated true RMS Voltmeter to the output socket and press the  key in order to activate the CPU to read a low range offset voltage and set a 150VAC output voltage. The RMS Voltmeter will indicate an actual voltage value while the Current display on the AC Power Converter shows the expected value to be calibrated.


Using the voltage value from the RMS Voltmeter, press the ▲ or ▼ key from the Current display to scroll the display which indicates the present voltage value in order to set the voltage to match the RMS Voltmeter reading. After this is done, press the  key to save the data to non-volatile memory.



This completes the low range voltage calibration.

7.3.2 High Range

Press the ▲ or ▼ key from the Frequency display to select “V HI”. Connect a calibrated true RMS Voltmeter to the output socket and press the  key in order to activate the CPU to read a low range offset voltage and set a 300VAC output voltage. The RMS Voltmeter will indicate an actual voltage value while the Current display on the AC Power Converter shows the expected value to be calibrated.


Using the voltage value from the RMS Voltmeter, press the ▲ or ▼ key from the Current display to scroll the display which indicates the present voltage value in order to set the voltage to match the RMS Voltmeter reading. After this is done, press the  key to save the data to non-volatile memory.



This completes the high range voltage calibration.


7.4 Current Calibration

7.4.1 Low Range

Press the ▲ or ▼ key from the Frequency display to select “A LO”. Connect a variable resistor as a load and a calibrated true RMS Ammeter in series with the resistor to the output socket and press the  key in order to activate the CPU to read a low range offset current and set a 100VAC output voltage.

The RMS Ammeter will indicate an actual current value while the Current display on the AC Power Converter shows the expected value to be calibrated.


Adjust the load or the output voltage setting to get the reading from the ammeter to be 1.000A. Using the current value from the RMS Ammeter, press the ▲ or ▼ key from the Current display to scroll the display which indicates the current value in order to set the current to match the RMS Ammeter reading.

After this is done, press the  key to save the data to non-volatile memory.




This completes the low range current calibration.

7.4.2 High Range

Press the ▲ or ▼ key from the Frequency display to select “A HI”. Connect a variable resistor as a load and a calibrated true RMS Ammeter in series with the resistor to the output socket and press the  key in order to activate the CPU to read a low range offset current and set a 100VAC output voltage.

The RMS Ammeter will indicate an actual current value while the Current display on the AC Power Converter shows the expected value to be calibrated.

Adjust the load or the output voltage setting to get the reading from the ammeter to be 4.50A for a FC305 or 9.00A for a FC310. Using the current value from the RMS Ammeter, press the ▲ or ▼ key from the Current display to scroll the display which indicates the current value in order to set the current to match the RMS Ammeter reading.

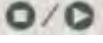
After this is done, press the  key to save the data to non-volatile memory.



This completes the high range current calibration.


7.5 Power Calibration

7.5.1 Low Range

Press the ▲ or ▼ key from the Frequency display to select "P LO". Connect a variable resistor as load and a calibrated true RMS Power Meter on one of the output socket and press the  key in order to activate the CPU to read a low range offset power and set a 100VAC output voltage.

The RMS Power meter will indicate an actual power value while the Current display on the AC Power Converter will indicate the expected value to be calibrated.

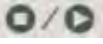
Adjust the load or voltage to get the reading from the RMS Power Meter to be 100.0W. Using the power value from the RMS Power Meter as the reference, press the ▲ or ▼ key from the Current display to adjust the power value reading to match that of the Power Meter.

After this is done, press the  key to save the data to non-volatile memory.




This completes the low range power calibration.

7.5.2 High Range

Press the ▲ or ▼ key from the Frequency display to select "P HI". Connect a variable resistor as load and a calibrated true RMS Power Meter on one of the output socket and press the  key in order to activate the CPU to read a low range offset power and set a 100VAC output voltage.

The RMS Power meter will indicate an actual power value while the Current display on the AC Power Converter will indicate the expected value to be calibrated.


Adjust the load or voltage to get the reading from the RMS Power Meter to be 500.0W for a FC305 or 1000.0W for a FC310. Using the power value from the RMS Power Meter as the reference, press the ▲ or ▼ key from the Current display to adjust the power value reading to match that of the Power Meter.

After this is done, press the  key to save the data to non-volatile memory.



This completes the high range power calibration.

7.6 Exiting the Calibration Mode

Each calibration items of the above is not related to any other one. If the calibration has to be terminated half way, the user can just press the  key to exit the calibration mode at any time.

After the all required calibrations are completed, turn OFF the AC Power Converter to exit calibration mode. The next time the power converter is powered up, the new calibration coefficients will be used.

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