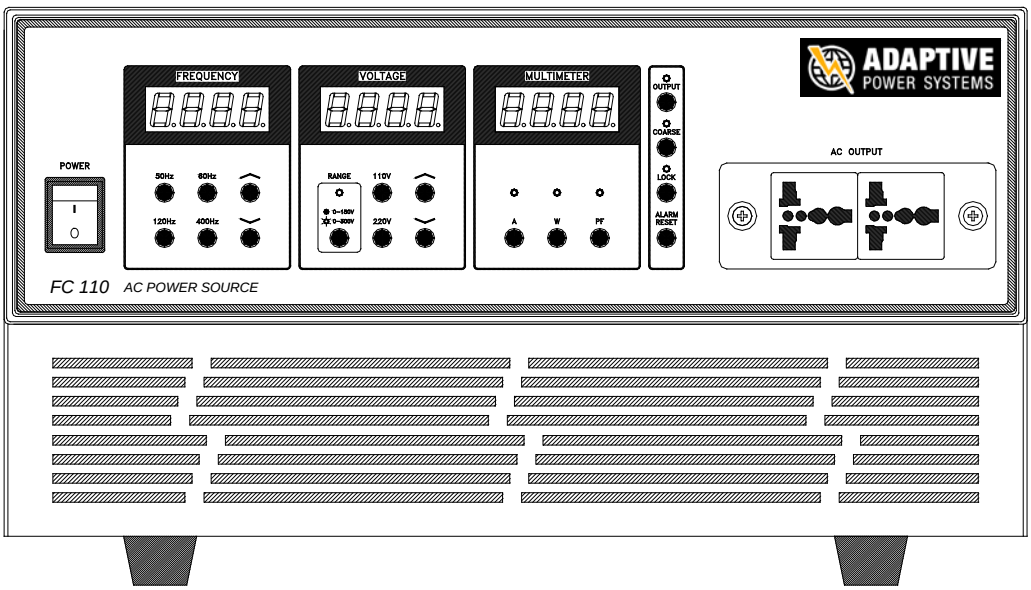
OPERATION & SERVICE MANUAL
FOR
FC 100 SERIES AC POWER SOURCE



ADAPTIVE POWER SYSTEMS

DWG No. FC00001

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CHAPTER 1: INTRODUCTION

1.1 GENERAL

This product and its related documentation must be reviewed for familiarization with safety markings and instructions before operation.

Before applying power, please verify that the instrument is set to the correct input line voltage (115V or 230V) and that the correct fuse is installed.

To prevent electrical shock, do not remove the instrument's cover. There are no user serviceable parts inside the power source. Routine maintenance or cleaning of internal parts is not necessary. Any external cleaning should be done with a clean dry or slightly damp cloth. Avoid the use of cleaning agents or chemicals that could enter the cabinet through ventilation holes and damage controls and switches. Also, some chemicals may damage plastic parts or lettering. Any replacement spare parts should be acquired directly from ADAPTIVE POWER SYSTEMS, INC. or its authorized distributors.

Unauthorized user modifications will render your warranty void. ADAPTIVE POWER SYSTEMS, INC. shall not be responsible for any injuries sustained due to unauthorized equipment modifications, use of parts not specified by ADAPTIVE POWER SYSTEMS, INC. or not following the operating procedures stated in this manual.

ADAPTIVE POWER SYSTEMS, INC. **17711 Mitchell North** **Irvine, CA 92614 USA**	**☎PHONE: 949-752-8400** **FAX: 949-756-0838** **E-MAIL:** sales@adaptivepower.com **Website:** www.adaptivepower.com

1.2 SAFETY SYMBOLS

INSTRUCTION MANUAL SYMBOL. PLEASE REFER TO THE INSTRUCTION MANUAL FOR SPECIFIC WARNING OR CAUTION INFORMATION TO AVOID PERSONAL INJURY OR DAMAGE TO THE PRODUCT.

INDICATES HAZARDOUS VOLTAGES MAY BE PRESENT.

CHASSIS GROUND SYMBOL.

WARNING

CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE BODILY INJURY OR DEATH.

CAUTION

CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR A CONDITION THAT COULD POSSIBLY CAUSE DAMAGE TO EQUIPMENT OR PERMANENT LOSS OF DATA.

1.3 UNPACKING AND INSPECTION

Your instrument was shipped in a cardboard carton. If the shipping carton is damaged, inspect the contents for visible damage such as dents, scratches or broken meters. If the instrument is damaged, notify the carrier and ADAPTIVE POWER SYSTEMS' Customer Service Department immediately. As all shipments are FOB our factory, please file a claim with your freight carrier.

Please save the shipping carton and packing material so you are able to return your power source to us if you wish to have the equipment repaired by our technicians.

1.4 STANDARD ACCESSORIES

The standard accessories should include:

1 each Instruction Manual
1 each input power cable (FC 105 only)

1.5 POWER REQUIRMENT AND LINE VOLTAGE SELECTION

The FC 105 and FC 110 requires an input power of 115 volts AC ± 15%, or 230 volts AC ±15%, 47-63 Hz single phase.

For connection of the FC 105, please check the rear panel to be sure the proper switch setting is selected for your input line voltage requirements before turning your instrument on.

For connection of the FC 110, jumpers are provided instead of the selector switch. To connect for 115 volts input, place one jumper on connections 4 and 3 and the other on 2 and 1. To connect for 230 volts input, only one jumper on connections 3 and 2 is needed.

The FC 120 and the FC 130 input accept 230 volts ±10% only. Connect the input power at the terminal block located on the rear of the unit.

Please be sure the correct fuse is used and installed while the instrument is in the off position. The current rating of the power cable used must be higher than the maximum current drawn by the AC source.

CAUTION

Do not change the line voltage selector switch position, located on the rear panel, while the instrument is on or operating. This may cause internal damage and represents a safety risk to the operator.

1.5.1 Fuse

	FC 105	FC 110	FC 120	FC 130
Fuse Rating	15 A	30 A	30 A	N/A

1.5.2 Power Cable

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. THIS PROTECTIVE GROUND (EARTH) MUST NOT BE DEFEATED BY THE USE OF AN EXTENSION CORD (POWER CABLE) WITHOUT A PROTECTIVE CONDUCTOR (GROUNDING). NOTE: INPUT POWER CABLES ARE ONLY SUPPLIED FOR THE FC 105.

1.6 OPERATING AND STORAGE ENVIRONMENT

1.6.1 Operating Environment

This instrument may be operated in temperatures from 32° - 104° F,
(0° – 40° C) and Relative humidity of 0 to 80% non-condensing.

1.6.2 Storage Environment

This instrument may be stored or shipped in environments with the following limits:

Temperature..... -22° to +131°F, (-30° - +55° C)
Altitude …… 30,000 feet

The instrument should also be protected against extreme temperatures, which may cause condensation within the instrument.

1.7 FIELD INSTALLABLE OPTIONS

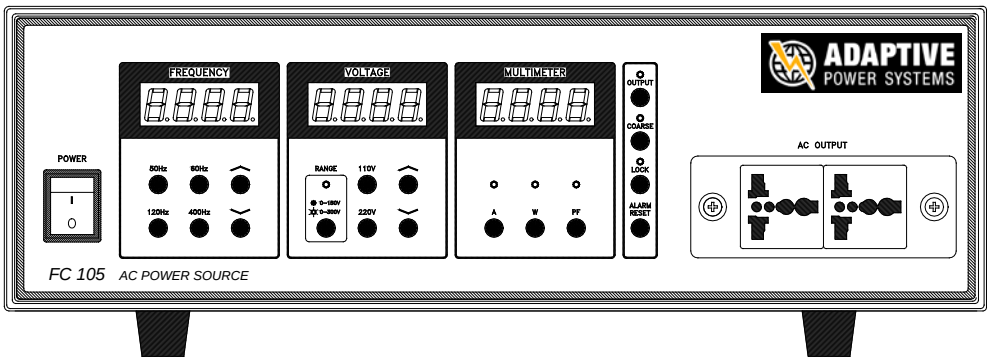
There are no field installable options for this instrument.

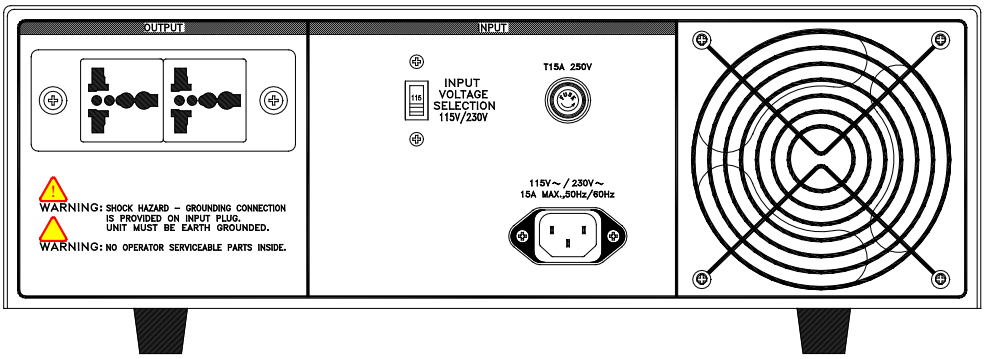
CHAPTER 2: SPECIFICATIONS

Model	FC 105	FC 110	FC 120	FC 130
Output Characteristics				
Power Rating	500 VA	1 KVA	2 KVA	3 KVA
Max. Output Current 0 – 150V 0 – 300V	 4.2 A 2.1A	 8.4 A 4.2 A	 16.8 A 8.4 A	 25.2 A 12.6 A
Output Voltage	0 – 300.0 VAC in 0.1 V step			
Output Frequency	45 – 500 Hz			
Frequency Stability	better than 100 PPM			
Frequency Response	+0.5% recovery time < 100µS			
Waveform	Sine Wave, THD < 0.5%, resistive load			
Load Regulation	<± 0.5 %, recovery time < 100µS			
Measurement				
Frequency Accuracy Resolution	0.1 – 500.0 Hz ± 0.2% 0.1 Hz			
Voltage (V), True RMS Accuracy Resolution	0.0 – 300.0 VAC ±1% of Reading +1 Count 0.1V rms			
Current (I), True RMS Accuracy Resolution Current (II), True RMS Accuracy Resolution	0.000 – 2.000A ±1% of Reading + 5 Counts 1mA 1.80 – 35.00A +1% of Reading + 2 Counts 10mA			
Power (I) Accuracy Resolution Power (II) Accuracy Resolution	0.0 – 360.0 W ±1.5% of Reading + 5 Counts 0.1W 320 – 3500 W ±1.5% of Reading + 1 Count 1 W			
Power Factor (PF) Accuracy Resolution	0.000 to 1.000 +2% of Reading + 2 Counts 0.001			
Calibration	Built in software for front panel calibration			
General				
AC Input Voltage	115/230 V ±10%	115/230 V ±10%	230V ±10%	230V ±10%
AC Input Frequency	47 – 63 Hz			
Operation Environment	32–104º F, 80% RH 0-40° C, 80% RH			
Dimensions (H/W/D) (in) (mm)	 5.25/17/19.7 3U/432/500	 8.75/17/20.5 5U/432/520	 10.5/17/21.7 267/432/550	 18.3/17/25.6 465/432/650
Weight (lbs.) (Kg.)	55 25	77 35	132 60	308 138

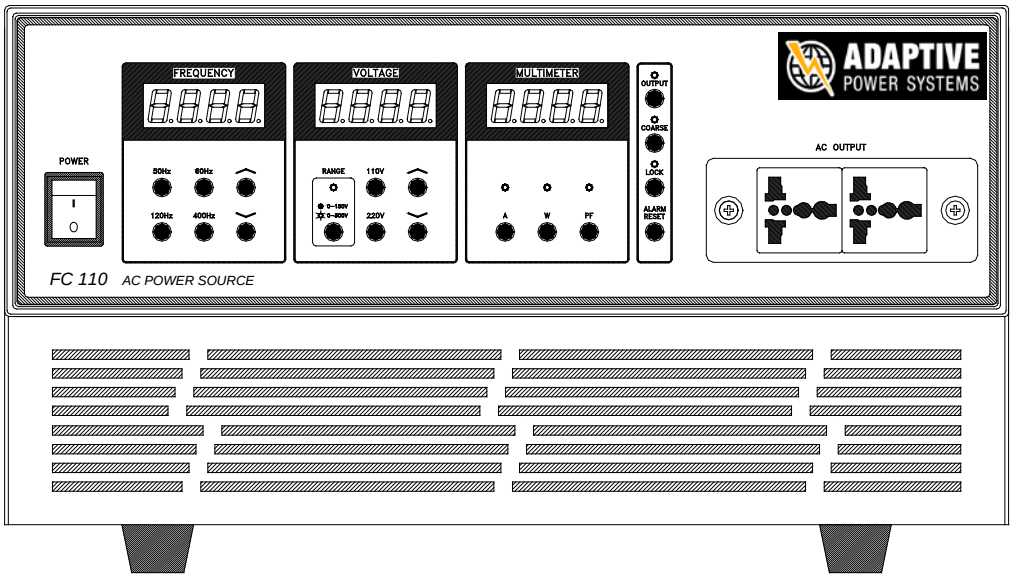
CHAPTER 3: PANEL VIEWS OF THE AC SOURCES

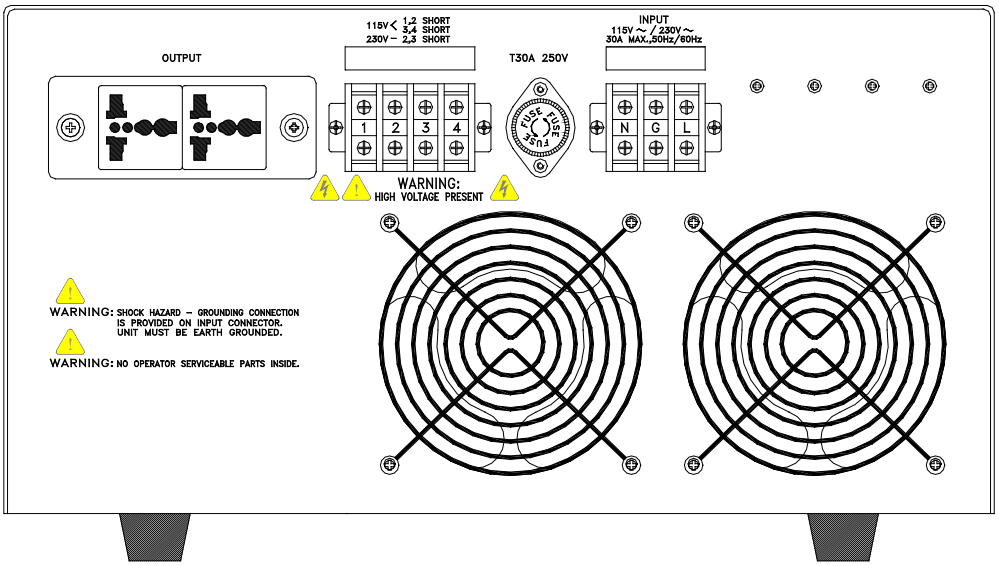
3.1 FRONT AND REAR VIEWS OF THE FC 105



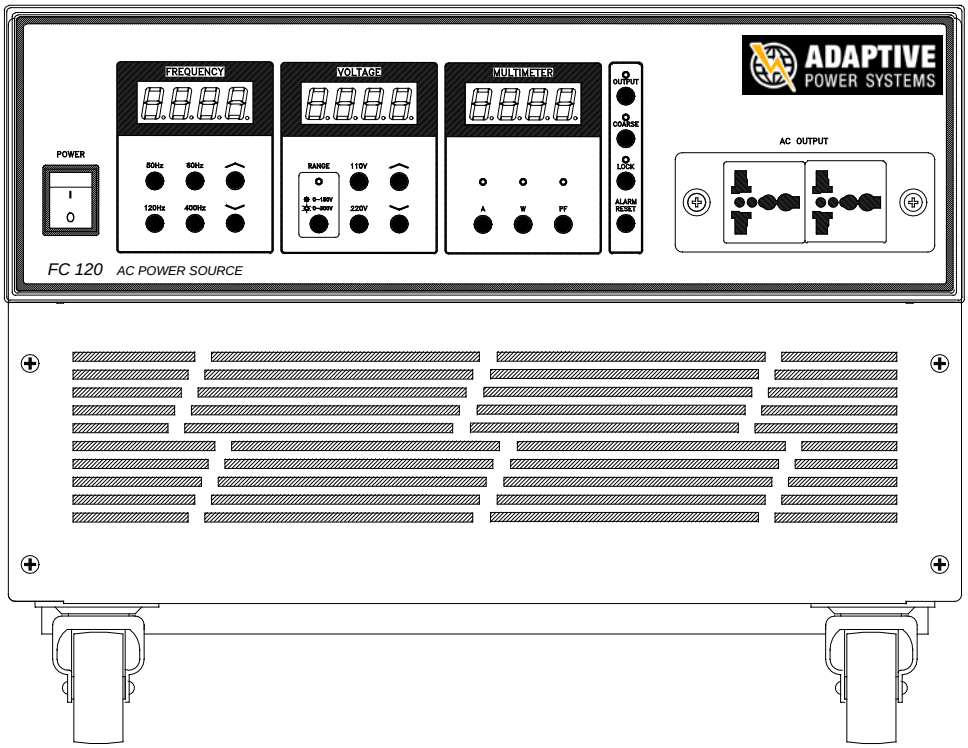


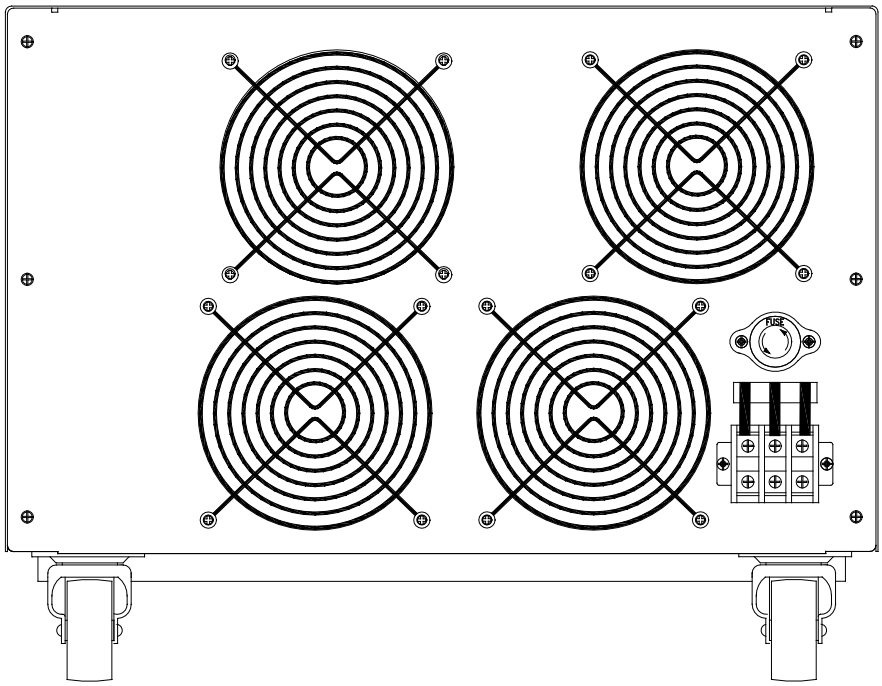
3.2 FRONT AND REAR VIEW OF THE FC 110



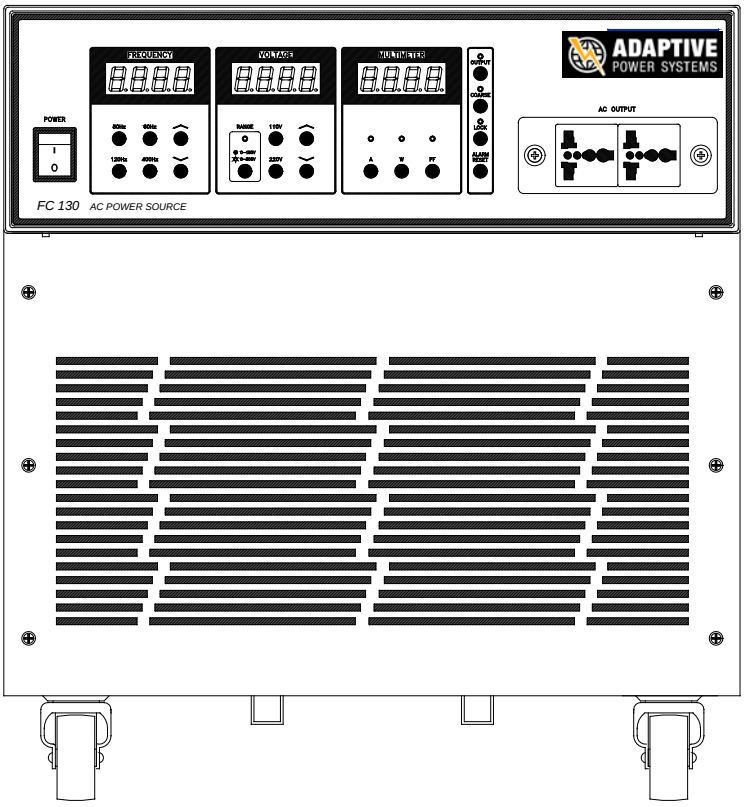


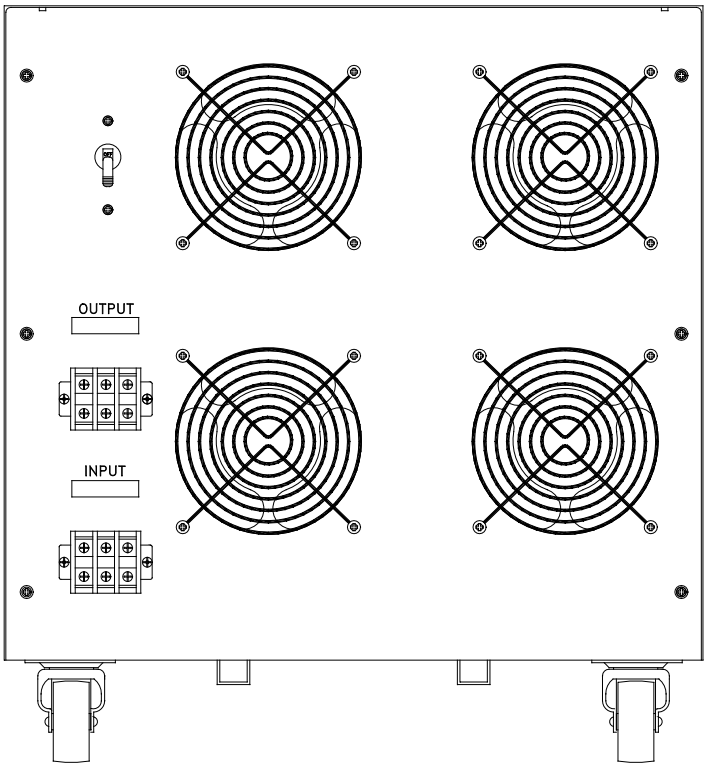
3.3 FRONT AND REAR PANEL OF THE FC 120



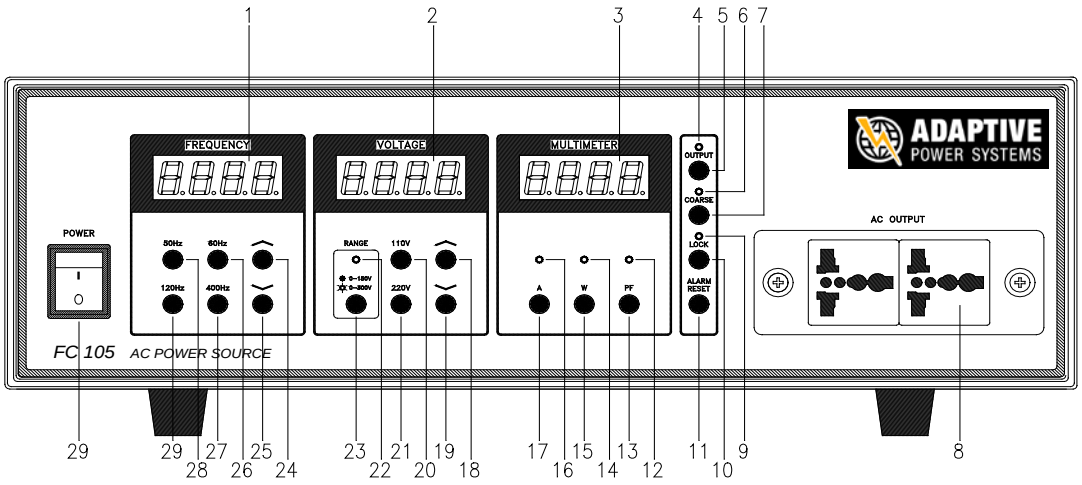


3.4 FRONT AND REAR PANEL OF THE FC 130





3.4 FRONT PANEL DESCRIPTION



1. **Frequency Display.** When the output is OFF, it shows the frequency setting. Otherwise, it shows the actual frequency of the output.

2. **Voltage Display.** When the output is OFF, it shows the output voltage setting. Otherwise, it shows the actual voltage of the output.

3. **Multi Function Display.** Displays the value of output current, wattage or power factor.

4. **Voltage Output Indicator.** When it is lit, voltage is present at the universal output connectors.

5. **Output Enable.** To turn the output ON or OFF.

6. **Coarse Adjust LED.** When the LED is lit, the coarse adjust function for voltage or frequency is enabled.

7. **Coarse Adjust Key.** To toggle between coarse and fine adjustment of voltage or frequency.

8. **Universal socket.** AC power output socket. The universal socket on the FC 130 has an integral circuit breaker that is rated for a maximum usage of 15 A. Please use the external output terminal strip on the rear of the machine for full power capabilities.

9. **Lock Indicator.** When this LED is lit, all the keys are disabled.

10. **Lock Key**. To disable all the keys on the front panel. It toggles between Lock and Unlock.

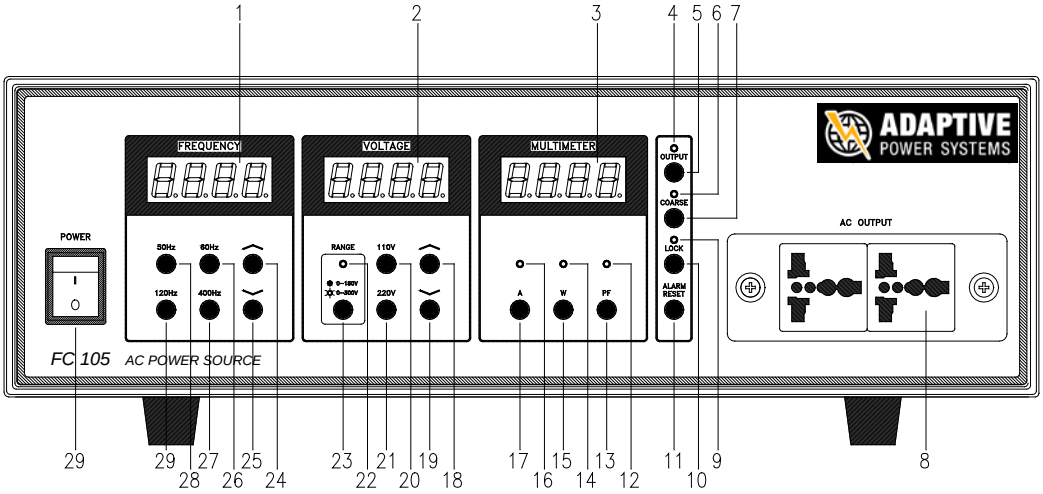
11. **Alarm Reset.** Reset Key to stop the audible alarm and reset the output to OFF.

12. **Power Factor Indicator.** When the LED is ON, the display shows the output power factor.

13. **Power Factor Key.** To select the display of output power factor.

14. **Wattmeter Indicator.** When this LED is ON, the display shows the output power.

15. **Wattmeter Key.** Displays the output power.



16. **Ammeter Indicator.** When this LED is ON, the display shows the output current.

17. **Ammeter Key.** To display the output current.

18. **Voltage Up Key.** To increase the output.

19. **Voltage Down Key.** To reduce the output voltage.

20. **110 V Output Voltage Key.** Press to set output voltage to 110 V.

21. **220 V Output Voltage Key.** Press to set output voltage to 220 V.

22. **Voltage Range LED.** When the LED is lit, the output is set in the 0-300V range. Otherwise, it is set in the 0-150 V range.

23. **Range Key.** To toggle between the 0-300V and the 0-150V range. When the voltage LED is lit, press the Range key and it will turn the LED OFF. The range is now changed to 0-150V or vice versa.

24. **Frequency Up Key.** To increase the output frequency.

25. **Frequency Down Key.** To reduce the output frequency.

26. **60 Hz Frequency Key.** Press to set the output frequency to 60 Hz.

27. **400 Hz Frequency Key.** Press to set the output frequency to 400 Hz.

28. **50 Hz Frequency Key.** Press to set the output frequency to 50 Hz.

29. **120 Hz Frequency Key.** Press to set the output frequency to 120 Hz.

30. **Input Circuit Breaker.** To turn the input power ON/OFF.

CHAPTER 4: USING THE AC POWER SOURCES

The FC 100 series AC Power Source's have a common front panel. The height changes depending on the output power rating. It has only a few keys and it is very easy to use.

Model	**FC 105**	**FC 110**	**FC 120**	**FC 130**
Power Rating	500 VA	1000 VA	2000 VA	3000 VA
Height	3U	5U	6U	9U

Step 1. Power Up
Check the input power selector switch on the rear of the machine to make sure that the correct input voltage is selected before turning the AC Source ON.

Step 2. Select Output Frequency
To set the output frequency, press the Frequency Key for 50 Hz, 60 Hz, 120 Hz or 400 Hz. For any other frequency from 45-500Hz, use the UP or DOWN Key to scroll. The selected frequency is indicated by the LED display.

Step 3. Select Output Voltage
If the voltage is higher than 150 volts, press the 0-300 Volt range key first. The LED is lighted to indicate the AC source is now in 0-300 Volt range. Now select the voltage 110 V or 220 V by pressing the voltage key. Press and hold the UP or Down key to scroll the display. When the desired voltage is reached, release the key. The selected voltage is indicated by the LED display. To speed up the scrolling, press the COARSE key once. The Coarse LED is lighted to indicate that the Coarse scrolling is turned on. The value indicated by the LED changes in larger steps.

Step 4. Select the output display
The user can select one of the three parameters for display in the LED by pressing the A, W or PF key. When the key is pressed, the LED above the key is lighted. The LED display will show the reading of the selected parameter.

Step 5. Turn On the output
After checking to make sure the voltage and frequency are set correctly, press the OUTPUT key. The LED above the OUTPUT key is lighted. This indicates that the AC output voltage is available at the universal socket.

CHAPTER 5: CALIBRATION of FC 100 SERIES

All of the AC sources are calibrated at the factory prior to shipment. We recommend that the power source be calibrated once every 12 months. It is a simple procedure to calibrate the AC power source, as the calibration software is built in each instrument. To calibrate the AC source, the user will need the following equipment:

Calibrated True RMS Voltmeter
Calibrated True RMS Ammeter
Variable Resistive Load

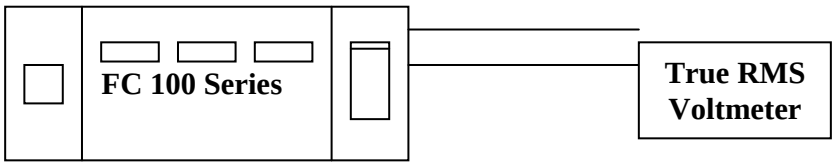
To enter the calibration mode, hold down the LOCK key and turn the power ON. Continue to hold down the LOCK key for about 2 seconds or until the LED displays are stable. Now you are in the Calibration Mode.

5.1 Input the Model Number

Use the Frequency Up Key to enter the model number of your equipment.

Value	Model	Power Rating
1	FC 105	500 VA
2	FC 110	1000 VA
3	FC 120	2000 VA
4	FC 130	3000 VA

5.2 Voltmeter Calibration



Step 1. Connect a calibrated AC voltmeter to the AC source output as shown.

Step 2. NOTE: This step will activate the unit's output at 240 V, regardless of the status of the OUTPUT key. Use caution, as there will now be power at the output terminals. Check that any attached load is rated for 240 V.

Press the **PF** key. The AC source will output a voltage about 240 V. Look at the Voltmeter reading and use ∧ **and** ∨ key to adjust the reading on the voltmeter to 240 V.

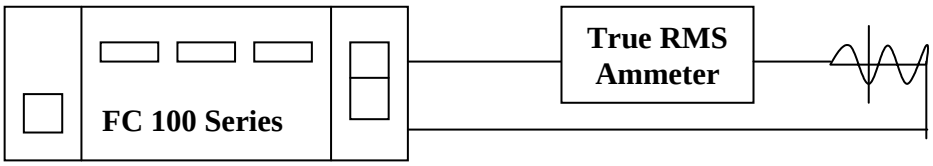
Step 3. Press the **LOCK** key to confirm.

The Voltmeter of the AC source is now calibrated.

5.3 AMMETER CALIBRATION

The Ammeter of the AC source has two current ranges, Low and High. The ranges are calibrated separately as follows.

5.3.1 LOW RANGE CALIBRATION



Step 1. Connect a Calibrated True RMS Ammeter and a variable resistive load to the output of the AC source as shown.

Step 2. Make sure that the **COARSE** LED is OFF. If it is lit, press the **COARSE** key to turn it OFF.

Step 3. NOTE: This step will activate the unit's output at 110 V, regardless of the status of the OUTPUT key. Use caution, as there will now be power at the output terminals. Check that any attached load is rated for 110 V.

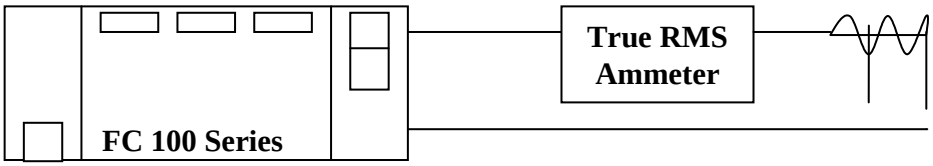
Press the **A** key. The AC source will output 110 V immediately.

Step 4. Adjust the variable resistive load until the reading on the Ammeter is 1.800A.

Step 5. Press the **LOCK** key to confirm.

The Low Range of the current meter is now calibrated.

5.3.2 HIGH RANGE CALIBRATION



Step 1. Connect a Calibrated True RMS Ammeter and a variable resistive load to the output of the AC source as shown above.

Step 2. Make sure that the **COARSE** LED is ON. If it is NOT lighted, press the **COARSE** key to turn it ON.

Step 3. NOTE: This step will activate the unit's output at 110 V, regardless of the status of the OUTPUT key. Use caution, as there will now be power at the output terminals. Check that any attached load is rated for 110 V.

Press the **A** key. The AC source will output 110 V immediately.

Step 4. Adjust the variable resistive load until the reading on the Ammeter reads as follows:

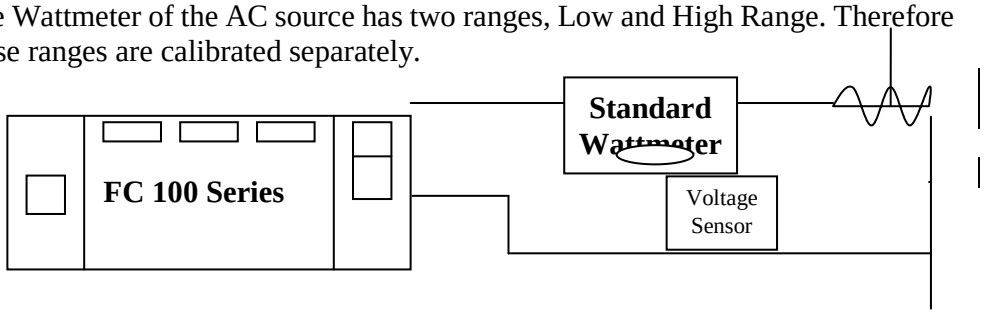
MODEL	CAPACITY	READING OF AMMETER
FC 105	500 VA	4.0 A
FC 110	1000 VA	8.0 A
FC 120	2000 VA	16.0 A
FC 130	3000 VA	24.0 A

Step 5. Press the **LOCK** key to confirm.

The HIGH Range of the current meter is calibrated

5.4 WATTMETER CALIBRATION

The Wattmeter of the AC source has two ranges, Low and High Range. Therefore these ranges are calibrated separately.



5.4.1 LOW OUTPUT POWER RANGE CALIBRATION

Step 1. Connect a Standard Wattmeter and a variable resistive load to the output of the AC source as shown above. Make sure that the voltage sensing points are as close to the AC source output as possible to achieve best results.

Step 2. Make sure that the **COARSE** LED is OFF. If it is lighted, press the **COARSE** key to turn it OFF.

Step 3. NOTE: This step will activate the unit's output at 240 V, regardless of the status of the OUTPUT key. Use caution, as there will now be power at the output terminals. Check that any attached load is rated for 240 V.

Press the **W** key. The AC source will output 240 V immediately.

Step 4. Adjust the output voltage or the variable resistive load until the reading on the Wattmeter reads 300 W.

Step 5. Press the **LOCK** key to confirm.

The Low Range of the Wattmeter is now calibrated.

5.4.1 HIGH OUTPUT POWER RANGE CALIBRATION

Step 1. Connect a Standard Wattmeter and a variable resistive load to the output of the AC source as shown above. Make sure that the voltage sensing points are as close to the AC source output as possible to achieve best results.

Step 2. Make sure that the **COARSE** LED is ON. If it is not lighted, press the **COARSE** key to turn it ON.

Step 3. Press the **W** key. The AC source will output 110 V immediately.

Step 4. Adjust the output voltage or the variable resistive load until the reading on the Wattmeter reads as follows:

MODEL	CAPACITY	READING OF WATTMETER
FC 105	500 VA	450 W
FC 110	1000 VA	900 W
FC 120	2000 VA	1800 W
FC 130	3000 VA	2700 W

Step 5. Press the **LOCK** key to confirm.

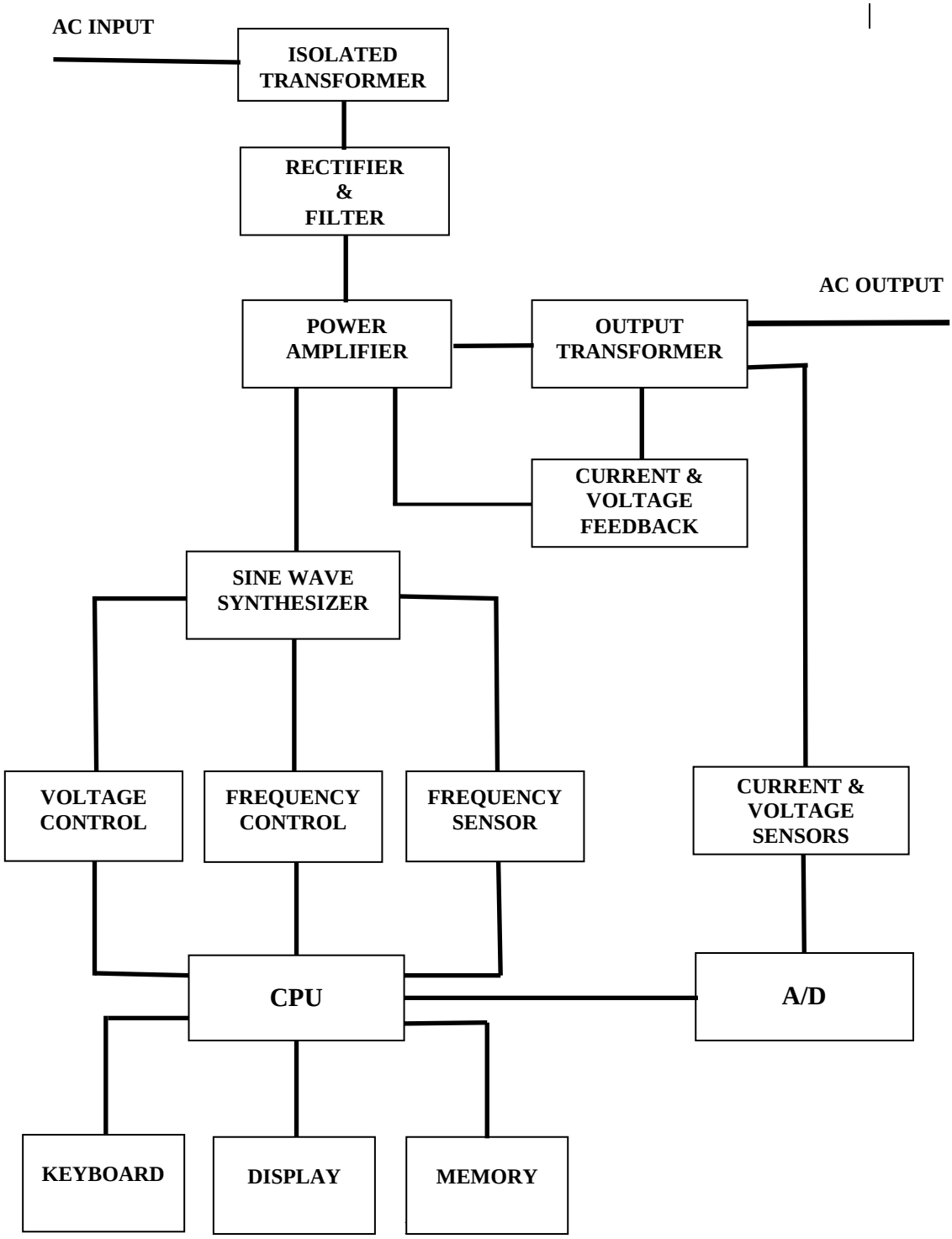
The HIGH Range of the Wattmeter is calibrated.

5.5 EXIT CALIBRATION MODE

To return the FC unit to normal operation after the calibration procedure, cycle the unit-input power off, and then back on again.

CHAPTER 6: MAINTAINANCE

6.1 Block Diagram of the AC Power Source



6.2 THEORY OF OPERATION

The FC 100 Series AC sources use linear isolated transformers and rectify the AC main's voltage to create the DC supply to the power amplifier.

The control circuit of the AC source is microprocessor controlled and is fully digital. The CPU regulates the frequency and amplitude of the sine wave via the digital synthesizer. When the CPU receives a voltage setting, the CPU will generate a sine wave and send a signal to the power amplifier for amplification. The CPU will read back from the digital feedback loop to fine-tune the output voltage to within the specification.

Two feedback loops are used to regulate the stability of the output voltage. One is an analog feedback for quick response, typically within 100μs. Regulation of ± 0.5% of the set voltage is reached. The other feedback loop uses digital feedback. The CPU reads the output voltage and compares it with the setting and adjusts the amplitude of the synthesized voltage accordingly. The accuracy of the output voltage will be within ± 0.1 V of the setting.

The output metering circuits read true RMS values of voltage and current. The LED display shows true RMS readings. The power and power factor readings are derived from the voltage and current measurements.

The accuracy of the metered displays and of the digital feedback loop depends on proper calibration. The calibration data is stored in the EPROM. The calibration is accomplished by using the built-in software, and the front panel key. Using the external standard Voltmeter, Ammeter, Wattmeter and following the instructions described in this manual, the AC source can be easily calibrated. The EPROM is also used for storing the instrument settings. The last used settings remain in the AC source when the power is turn off. When the unit is turned on again, the AC source will return to the last setting.

6.3 WARRANTY

Adaptive Power Systems, Inc. (APS) warrants each unit to be free from defects in material and workmanship. For the period of one (1) year 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. 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.

WARNING

A QUALIFIED ENGINEER OR TECHNICIAN SHOULD ONLY MAKE ANALYZER REPAIRS. MAKING REPAIRS WITHOUT PROPER TRAINING COULD POSSIBLY CAUSE BODILY INJURY OR DEATH.

Symptom	Possible Causes/Solutions
Turn on Power, LED does not light up. No sign of power on.	1. Check input AC voltage setting. Make sure the correct input voltage is set. 2. Check the fuse for proper rating.

There are no serviceable parts inside the AC source. Do not open the instrument. If the instrument is not functioning properly, please contact ADAPTIVE POWER or its authorized distributor.

Customer Support Department

Tel: 949-752-8400
Fax: 949-756-0838
Email: sales@adaptivepower.com
Website: www.adaptivepower.com

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