OPERATION AND SERVICE MANUAL

MODEL AC1000

Power Source

1 kVA Linear Power Source

SERIAL NUMBER

Model
AC1000

13860 West Laurel Drive
Lake Forest, Illinois, 60045-4546
U.S.A.

Item 38771 ***Ver 1.01***

Printed May 25, 2006

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1. Introduction

1.1. Warranty Policies

Associated Research, Inc., certifies that the instrument listed in this manual meets or exceeds published manufacturing specifications. This instrument was calibrated using standards that are traceable to the National Institute of Standards and Technology (NIST).

Your new instrument is warranted to be free from defects in workmanship and material for a period of (1) year from date of shipment. You must complete the online registration at www.asresearch.com/register or call 1-800-858-TEST (8378) ext. 210 to register over the phone.

5-Year Program

Associated Research, Inc. recommends that your instrument be recertified on a twelve-month cycle. Instruments purchased and used in North America only may have their warranty extended in one year increments to a maximum of **(5) years** provided they are serviced by an Associated Research, Inc. technician for recertification and inspection. The recertification and inspection must be performed annually following receipt of the instrument. Any instrument not recertified and inspected annually will not be eligible for extended warranty status. This extended warranty is non-transferable and is offered only to the original purchaser. A return material authorization (RMA) must be obtained from Associated Research, Inc. before returning this instrument for warranty service. Please contact our customer support center at 1-800-858-TEST (8378) to obtain an RMA number. It is important that the instrument is packed in its original container for safe transport. If the original container in not available or in good condition please contact our customer support center for proper instructions on packaging. Damages sustained as a result of improper packaging will not be honored. Transportation costs for the return of the instrument for warranty service must be prepaid by the customer. Associated Research, Inc. will assume the return freight costs when returning the instrument to the customer. The return method will be at the discretion of Associated Research, Inc.

3-Year Program

A 3-Year warranty is also available for instruments purchased and used in North America. All costs for this warranty are paid with the initial purchase and include warranty coverage, annual recertification and standard ground return freight for three years. However, unlike our 5-year program, annual recertification and inspection by Associated Research, Inc. is not required.

Except as provided herein, Associated Research, Inc. makes no warranties to the purchaser of this instrument and all other warranties, express or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

Any non-authorized modifications, tampering or physical damage will void your warranty. Elimination of any connections in the earth grounding system or bypassing any safety systems will void this warranty. This warranty does not cover batteries or accessories not of Associated Research, Inc. manufacture. Parts used must be parts that are recommended by Associated

Research, Inc. as an acceptable specified part. Use of non-authorized parts in the repair of this instrument will void the warranty.

1.2. Safety Symbols

1.2.1. Product Marking Symbols

Product will be marked with this symbol when it is necessary to refer to the operation and service manual in order to prevent injury or equipment damage.

Product will be marked with this symbol when hazardous voltages may be present.

Product will be marked with this symbol at connections that require earth grounding.

1.2.2. Caution and Warning Symbols

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 condition that could possibly cause damage to equipment or permanent loss of data.

1.3. Glossary of Terms

(As used in this manual)

Alternating Current, AC: Current that reverses direction on a regular basis. Utility power is usually generated in the form of a sinusoid at a frequency of 60 times per second in the United States and 50 times per second in other countries.

Conductor: A solid or liquid material which permits the flow of electrons. A material which has a volume resistivity of no more than 10^3 Ω-cm.

Current: The movement of electrons through a conductor. Current is measured in amperes (A), milliamperes (mA), microamperes (uA), nanoamperes (nA), or picoamperes (pA). Symbol = **I**

Direct Current, DC: Current that flows in one direction only. The source of direct current is said to be polarized and has one terminal that is always at a higher potential than the other.

Earth: The point in a circuit or system that is referenced to the earth, also known as Earth Ground.

Frequency: The number of cycles an AC waveform repeats over time. Usually given in Hertz (Hz).

Ground: Refers to the point of low potential in a circuit to which all other voltages are referenced. May or may not be tied to the earth. Also referred to as Neutral, Common, or Earth.

Neutral: The point of low potential in a circuit to which all other voltages are referenced. Also known as Common or Ground.

Peak Current: The maximum amplitude of an AC current waveform. For a sinusoid, 1.414 x the RMS value.

Power: The amount of work performed by an energy source over time, given in Watts (W).

Resistance: The property of a substance that impedes current and results in the dissipation of power in the form of heat. The practical unit of resistance is the *ohm* (Ω). Symbol = **R**

RMS: The Root Mean Squared value of a voltage or current waveform. An RMS waveform delivers the same amount of energy to a load as a DC waveform of the same value. For a sinusoid, the RMS value is .707 x the peak value.

VA: A rating of instantaneous power found by multiplying an instrument's maximum output current by its maximum output voltage.

Voltage: The force which causes current through an electrical conductor, given in volts (V). Symbol = **V**

More Information

For more information please visit the Events and Training section of our website at www.asresearch.com/events-training/index.shtml

1.4. Safety

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

This product is a Safety Class I instrument (provided with a protective earth terminal). Before applying power verify that the instrument is set to the correct line voltage (115 or 230 volts). Adjust both voltage select switches to 115 for use with a 115 volt input. Adjust both voltage select switches to 230 for use with a 230 volt input.

- **NOTE: The AC1000 is internally fused and is not user serviceable. Please contact Associated Research, Inc. for an RMA number to have the fuse replaced.**

WARNING

The AC1000 produces voltages and currents that can cause **harmful or fatal electric shock.** To prevent accidental injury or death, these safety procedures must be strictly observed when handling and using the instrument.

1.4.1. Service and Maintenance

User Service
To prevent electric shock do not remove the instrument cover. There are no user serviceable parts inside. Routine maintenance or cleaning of internal parts is not necessary. Avoid the use of cleaning agents or chemicals on the instrument, as some chemicals may damage plastic parts or lettering. Any external cleaning should be done with a clean dry or slightly damp cloth. Schematics, when provided, are for reference only. Refer servicing to an Associated Research, Inc. authorized service center.

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www.asresearch.com

Service Interval
This instrument and its accessories must be returned at least once a year to an Associated Research, Inc. authorized service center for certification and inspection of safety related components. Associated Research, Inc. will not be held liable for injuries suffered if the instrument is not properly maintained and safety checked annually.

User Modifications
Unauthorized user modifications will void your warranty. Associated Research, Inc. will not be responsible for any injuries sustained due to unauthorized equipment modifications or use of parts not specified by Associated Research, Inc. Instruments returned to Associated Research, Inc. with unsafe modifications will be returned to their original operating condition at the customer's expense.

1.4.2. Test Station

Location
Select an area away from the mainstream of activity where employees do not walk while performing their normal duties. If this is not practical because of production line flow, then the area should be roped off and marked for **HIGH VOLTAGE TESTING**. No employees other than test operators should be allowed inside.

If benches are placed back-to-back, be especially careful about the use of the bench opposite the test station. Signs should be posted: **"DANGER – HIGH VOLTAGE TEST IN PROGRESS – UNAUTHORIZED PERSONNEL KEEP AWAY."**

Work Area
When possible, use the power source on a non-conducting table or workbench. If you cannot avoid using a conductive surface, be certain that it is connected to a good earth ground and the high voltage connection is insulated from the grounded surface.

There should not be any metal in the work area between the operator and the location where products being tested will be positioned. Any other metal in the work area should be connected to a good ground, never left "floating".

Keep the area clean and uncluttered. All test equipment and test leads not necessary for the test should be removed from the test bench and put away. It should be apparent to both the operator and to any observers which product is being tested and which product is waiting to be tested or has already been tested.

ESD Testing
Electrical safety tests should not be performed in or around ESD testing areas. ESD methods should not be employed during electrical safety testing, as this could cause a hazardous condition for equipment and test operators.

Power
Power to the test station should be arranged so that it can be shut off by one prominently marked switch located at the entrance to the test area. In case of an emergency, anyone can cut off the power before entering the test area to offer assistance.

More Information
For more information on setting up a safe work station, please visit the Events and Training section of our website at www.asresearch.com/events-training/index.shtml

1.4.3. Test Operator

WARNING This instrument generates voltages and currents that can cause **harmful or fatal electric shock** and must only be operated by a skilled worker trained in its use. **The operator should understand the electrical fundamentals of voltage, current, and resistance.**

Rules
Operators should be thoroughly trained to follow all applicable safety rules and procedures. Defeating any safety system should be considered a serious offense with severe penalties. Allowing unauthorized personnel in the area during a test should also be dealt with as a serious offense.

Dress
Operators should not wear jewelry that could accidentally complete a circuit.

WARNING ESD protocols should not be observed while performing electrical safety tests. Intentionally grounding the test operator could lead to a **harmful or fatal electric shock**.

Medical Restrictions
Personnel with heart ailments or devices such as pacemakers should be informed that the voltages and currents generated by the instrument are very dangerous. If contacted the

instrument may cause heart-related problems. Please have the test operator consult their physician for recommendations.

Key Safety Points to Remember

- Keep unqualified and unauthorized personnel away from the test area.
- Arrange the test station in a safe and orderly manner.
- In case of any problem, turn off the high voltage first.

More Information

For more information on test operator training please visit the Events and Training section of our website at www.asresearch.com/events-training/index.shtml

1.5. Key Features of the AC1000

Key Lockout	This feature locks out the keys on the front panel, preventing the operator from changing parameters or settings during testing.
Software Current Limit	A programmable software current limit keeps the output current from exceeding a pre-programmed level.
Over-current Fold Back	A programmable over-current fold back feature maintains a constant output current even with a varying load. The output voltage will expand or collapse in order to maintain a pre-programmed current level.
3 Way Power On Condition	Controls the way the AC1000 powers up: with the output enabled, with the output disabled, or with the output configured in the same condition as when the source was turned off.
Programmable Voltage and Frequency Limits	Separate programmable HI/LO output voltage and frequency limits.
3 Programmable Memory Locations	Equipped standard with 3 fully programmable memory locations capable of storing voltage, current limit, frequency and power meter configuration. Memory locations can be toggled while the output is enabled.
PLC In/Out	Programmable logic control bus allows the operator to read test processing and failure conditions as well as control the output relay (ON/OFF) and toggle memory locations 1, 2, and 3.
OMNIA 8100 Series Integration	Can be integrated with an OMNIA 8106 multi-function tester to form a complete testing solution. Take control of DUT power settings during Functional Run testing from the OMNIA's easy-to-use interface.

2. Getting Started

Introduction
This section contains information for the unpacking, inspection, preparation for use and storage of your Associated Research, Inc., product.

2.1. Unpacking and Inspection

2.1.1. Packaging
Your instrument was shipped in a custom foam insulated container that complies with ASTM D4169-92a Assurance Level II Distribution Cycle 13 Performance Test Sequence. If the shipping carton is damaged, inspect the contents for visible damage such as dents, scratches or a broken display. If the instrument is damaged, notify the carrier and Associated Research, Inc.'s customer support department. Please save the shipping carton and packing material for the carrier's inspection. Our customer support department will assist you in the repair or replacement of your instrument. Please do not return your product without first notifying us and receiving an RMA (return material authorization) number. To receive an RMA number, please contact our customer support department at 1-800-858-TEST (8378).

- **NOTE: Please retain all of the original packaging materials.**

2.1.2. Contents of the Carton
Inside the carton should be the following:

Description	**AR Part Number**
Power Source	AC1000
2U Rack Mount Handle	38794 (Qty. 2)
2U Rack Mount Bracket	38793 (Qty. 2)
Screw M4 x 12mm FHMS	38549 (Qty. 4) For Rack Mount Handle

2.1.3. Returning the Instrument
When it is necessary to return the instrument for servicing or calibration, repackage the instrument in its original container as long as it is in good condition. Please include all accessories and test leads. Mark the container "FRAGILE" to ensure proper handling. Before shipping, contact an Associated Research, Inc. customer support representative at 1-800-858-TEST (8378) to indicate and explain the reason for service. At this time you will be supplied with an RMA (return material authorization) number. Please refer to this number in all correspondence.

If you do not have the original packaging materials, please follow these guidelines:

- Wrap the instrument in a bubble pack or similar foam. Enclose the same information as above.

- Use a strong double-wall container that is made for shipping instrumentation. 350-lb. test material is adequate.
- Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 inch) thick around all sides of the instrument. Protect the control panel with cardboard.
- Seal the container securely.
- Mark the container "FRAGILE" to insure proper handling.
- Please refer in all correspondence to your RMA number.

2.2. Installation

2.2.1. Work Area

WARNING Locate a suitable testing area and be sure you have read all safety instructions for the operation of the instrument and suggestions on the test area setup in section **1.4. Safety**. Make sure the work area you choose has a three-prong grounded outlet capable of supplying the necessary input current to the power source (see Figure 1.0). Be sure the outlet has been tested for proper wiring before connecting the instrument to it.

2.2.2. Power Requirements

This instrument requires an input of either 115 volts AC ± 10%, 50/60 Hz single phase or 230 volts AC ±10%, 50/60 Hz single phase. Before applying power verify that the instrument is set to the correct line voltage (115 or 230 volts). Adjust both voltage select switches to 115 for use with a 115 volt input. Adjust both voltage select switches to 230 for use with a 230 volt input. See section **3.2.2. Rear Panel Controls** for an image of the rear panel.

CAUTION Do not switch the line voltage selector switches 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.

WARNING The AC1000 must be connected to a good ground. Be certain that the power wiring is properly polarized and that the proper low resistance bonding to ground is in place.

2.2.3. Basic Connections

Input Power Connections

The terminal strip located on the rear panel of the AC1000 is designed to accept line, neutral, and a safety earth ground. See section **3.2. Instrument Controls** for images of the front and rear panels. Connections should be made using properly rated wire based on each application's input current specifications. Refer to the Figure 1.0 for input/output current requirements.

WARNING This instrument comes equipped with a ground connection. Make sure this is connected to a good earth ground.

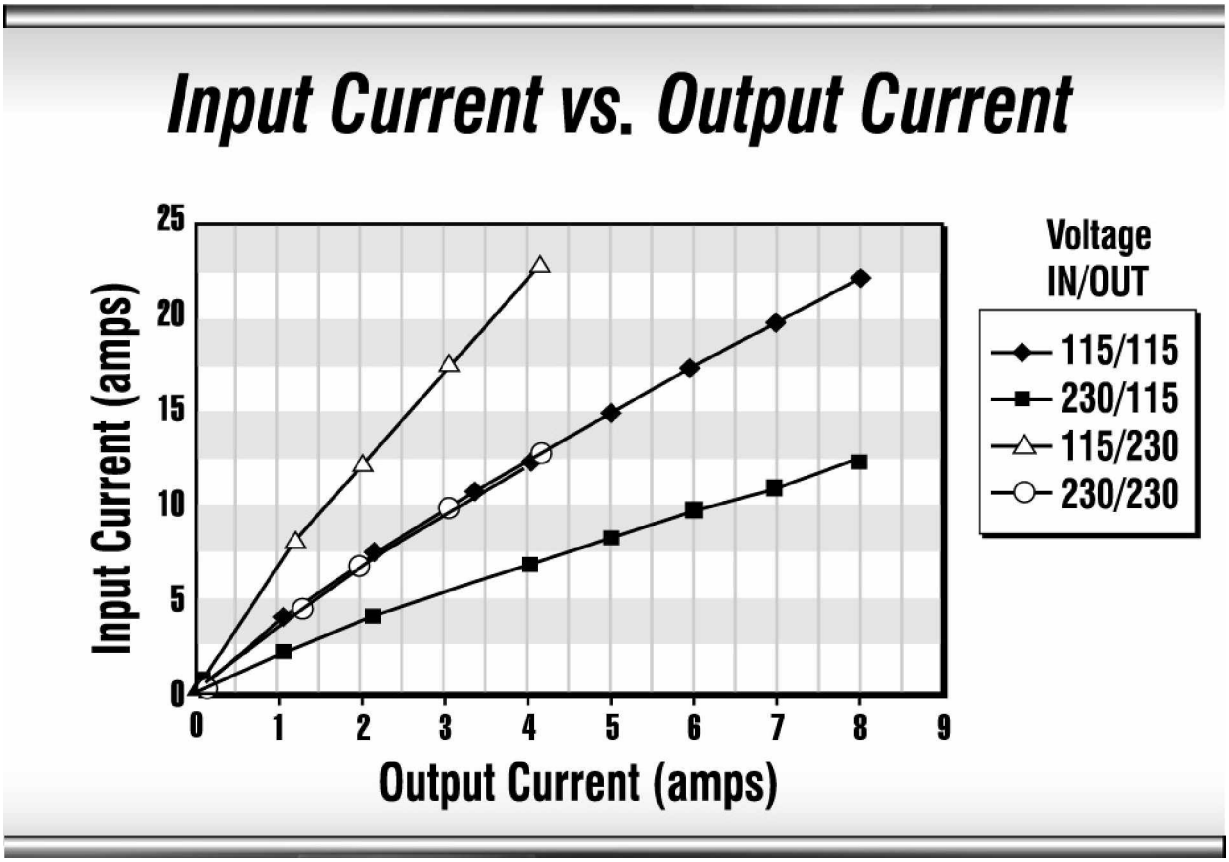


Figure 1.0

Below is the American Wire Gauge (AWG) table which may be used as a reference to determine the appropriate copper wire gauge based on the maximum rated current output of a 15, 20 and 30 Amp circuit breaker.

- NOTE: This table corresponds to posted NEC (National Electric Code) specifications for copper wire at an ambient temperature of 30 °C and is provided for reference only.

Conductor Size		**Number of Current Carrying Conductors**			
AWG	**mm^2**	**2**	**3**	**4-6**	**7-24**
18	0.75	10	7	5.6	x
16	1.0	13	10	8.0	x
14	1.5	18	15	12.0	x
12	2.5	25	20	16.0	x
10	4.0	30	25	20.0	x
8	6.0	40	35	28.0	x
6	10.0	55	45	36.0	x
Note: Conductor sizes do not represent exact dimensional equivalents.					

Installing the Power Line Cord

Once the proper wire gauge has been selected and a suitable input power cable has been assembled, it must be connected to the AC1000's input terminal block. The input terminal block is located on at the rear of the unit under a plastic shield. In order to access the screw terminals, two screws binding the shield to the terminal block must be removed. When mounting the lugs to the screw terminals, be sure that the wire comes from underneath the protective shield. The protective shield should be remounted once the line cord has been connected to the input terminal block. See section **3.2.2. Rear Panel Controls** for an image of the back panel.

Output Connections

The AC1000's output is single phase and can be accessed from both the front and back panel of the instrument. The output on the front panel is a single phase universal socket designed for use with a line cord. The output on the back panel is located on the terminal strip and consists of two screw-on terminal connections. See section **3.2. Instrument Controls** for images of the front and rear panels.

- NOTE: The output of the AC1000 has been intentionally grounded at the factory before shipment. This has been done by means of a jumper from the output neutral to the input ground connection on the rear panel terminal block. Please check your standard to be sure if your DUT requires an isolated output. If so, you must remove the jumper from the back of the instrument.

2.2.4. Environmental Conditions

This equipment is intended for indoor use only. The equipment has been evaluated according to Installation Category II and Pollution Degree 2 as specified in IEC 664.

This instrument may be operated in environments with the following limits:

Temperature…..... 32° - 104° F (0° - 40°C)
Relative humidity…..... 0 – 80%
Altitude…..... 6560 feet (2,000 meters)

Storage and Shipping Environment

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

Temperature…..... -40° - 167° F (-40° - 75°C)
Altitude…..... 50,000 feet (15,240 meters)

The instrument should also be protected against temperature extremes that may cause condensation within the instrument.

CAUTION Failure to operate this instrument within the specified conditions could result in damage.

More Information

For more information on test operator and workstation safety please visit the Events and Training section of our website at www.asresearch.com/events-training/index.shtml

3. Specifications and Controls

3.1. AC1000 Functional Specifications

INPUT	
Phase Voltage	Single Phase 115 / 230V selectable, ± 10 % variation
Frequency	50/60 Hz ± 5%
Fuse	115 VAC – 30A Slow-Blo 250VAC Internal 230 VAC – 15A Slow-Blo 250VAC Internal
OUTPUT	
Max Power	1000 VA
Max Current	Volt Range 1: 8.4 Amps Volt Range 2: 4.2 Amps
Phase	Single Phase, 2 wire
Total Harmonic Distortion (THD)	≤ 0.5% at 45 - 500Hz (Resistive Load)
Crest Factor (Output Current)	≥ 4
Line Regulation	± 0.1V
Load Regulation	± 0.5% (Resistive Load)
Combined Regulation (Hardware)	± (0.5% + 0.1V) (Resistive Load) Response Time < 100µS
Combined Regulation (Firmware)	± 0.1V (Resistive Load) Response Time < 1S
SETTING	
Voltage Setting	Range 1: 0 - 150V Range 2: 0 - 300V Resolution: 0.1V Accuracy: ± (1.5% of setting + 2 counts)
Frequency Setting	Range: 45-500Hz Resolution: 0.1Hz, 45.0 - 99.9Hz, 1Hz, 100 - 500Hz Accuracy: ± 0.02% of setting
Current Hi Limit (OC Fold=OFF) OC Fold Back (OC Fold = ON)	Volt Range 1: OFF, 0.01 - 8.40 Resolution: 0.01 Amps Accuracy: ± (2.0% of setting + 2 counts) Volt Range 2: OFF, 0.01 - 4.20 Resolution: 0.01 Amps Accuracy: ± (2.0% of setting + 2 counts) OC Fold Back Response Time: < 1.5S

MEASUREMENT	
Voltage Measurement	Range: 0.0 - 300.0V Resolution: 0.1V Accuracy: ± (1.5% of reading + 2 counts)
Frequency Measurement	Range: 0.0 - 500.0Hz Resolution: 0.1Hz Accuracy: ± 0.1Hz
Current Measurement	Range 1: 0.000-3.500A Resolution: 0.001A Accuracy: ± (2.0% of reading + 2 counts) Range 2: 3.00 - 35.00A Resolution: 0.01A Accuracy: ± (2.0% of reading + 2 counts)
Power Measurement	Range 1: 0.0 - 350.0W Resolution: 0.1W Accuracy: ± (5.0% of reading + 3 counts) PF ≧ 0.05 Range 2: 300 - 4000W Resolution: 1W Accuracy: ± (5.0% of reading + 3 counts) PF ≧ 0.05
Power Factor	Range : 0.000 - 1.000 Accuracy: ± (8.0% of reading + 2 counts) W / VA, calculated and displayed to three significant digits.
GENERAL	
PLC Remote Control	Input: Test, Reset, Recall memory 1 through 3 (Standard), Recall memory 1 through 7 (Optional)
	Output: Fail ,Test-in Process
Memories	3 Memories (Standard), 7 Memories (Optional)
Safety	Over Current, Over Voltage, Over Temperature
OC Fold Back	On/Off , Setting On when output current over the Hi-Limit setting it will fold back output voltage to keep output current constant at the Hi-Limit.
Security	Lock key to prevent accidental parameter changes
PLC Remote Control	Input: Test, Reset, Recall memory 1 through 3 (Standard), Recall memory 1 through 7 (Optional)
Dimensions	2U (W x H x D) (430 X 89 X 560 mm) (16.93” x 3.50” x 22.05”)

* Product specifications are subject to change without notice.

3.2. Instrument Controls

3.2.1. Front Panel Controls

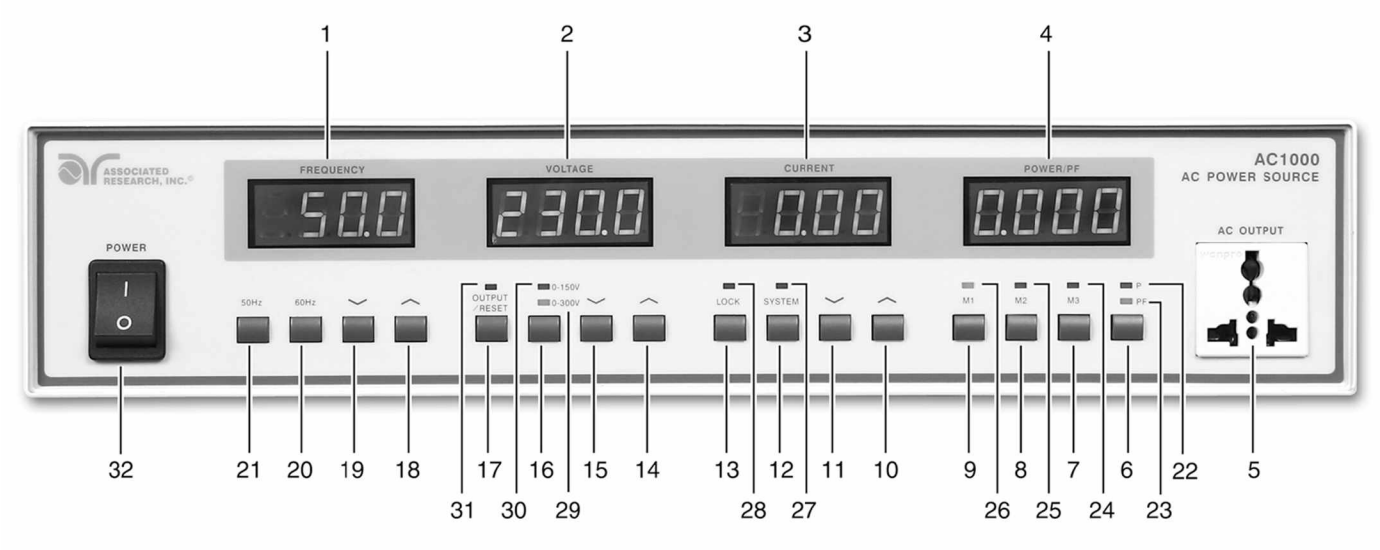


Figure 2.0(a)

1. **Frequency Display:** Shows the output frequency during operation. Shows the parameter item when in the system setting mode. Shows the error condition if an error has occurred.

2. **Voltage Display:** Shows the output voltage during operation. Shows the parameter item when in the system setting mode.

3. **Current Display:** Shows the Hi-limit of output current during operation. Shows the parameter condition and value when in the system setting mode.

4. **Power/PF Display:** Displays the output power (watts) or power factor.

5. **Universal AC Output Socket:** Output Socket (15A).

6. **P/PF Select Button:** Toggles display of output power or power factor.

7. **M3 Button:** Stores settings in memory or recalls memory M3.

8. **M2 Button:** Stores settings in memory or recalls memory M2.

9. **M1 Button:** Stores settings in memory or recalls memory M1.

10. **Current Up Key:** Increments the output current to a higher value during operation or selects the system condition in the system setting mode.

11. **Current Down Key:** Increments the output current to a lower value during operation or selects the system condition in the system setting mode.

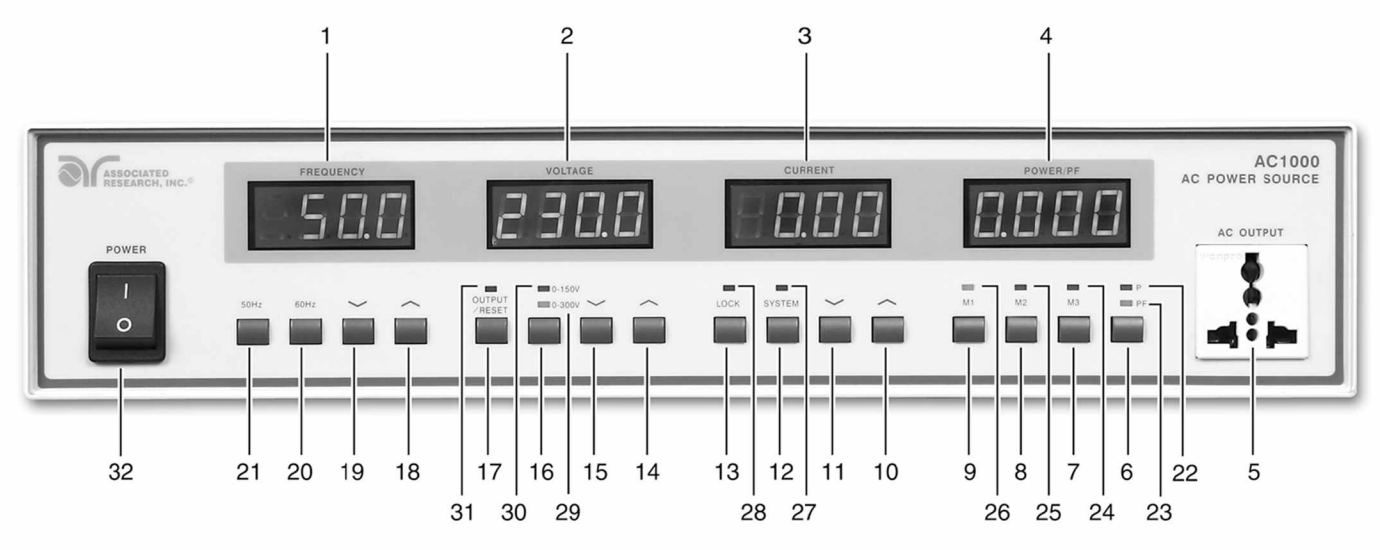


Figure 2.0(b)

12. SYSTEM Key: Enters or exits the system setting mode.

13. LOCK Key: Disables all the keys on the front panel.

14. Voltage Up Key: Increments the output voltage to a higher value during operation or selects the system item in system setting mode.

15. Voltage Down Key: Increments the output voltage to a lower value during operation or selects the system item in system setting mode.

16. Range Key: Toggles between the High (0-300V) and Low Voltage Ranges (0-150V).

17. OUTPUT/RESET Key: Turns the output ON and OFF. Resets the source if an error occurs.

18. Frequency Up Key: Increments the output frequency to a higher value during operation.

19. Frequency Down Key: Increments the output frequency to a lower value during operation.

20. 60 Hz Frequency Key: Press to set the output frequency to 60 Hz.

21. 50 Hz Frequency Key: Press to set the output frequency to 50 Hz.

22. Wattmeter Indicator: When this LED is ON, the display shows the output power.

23. Power Factor Indicator: When the LED is ON, the display shows the output power factor.

24. M3 Indicator: When the LED is ON, the output is set according to M3.

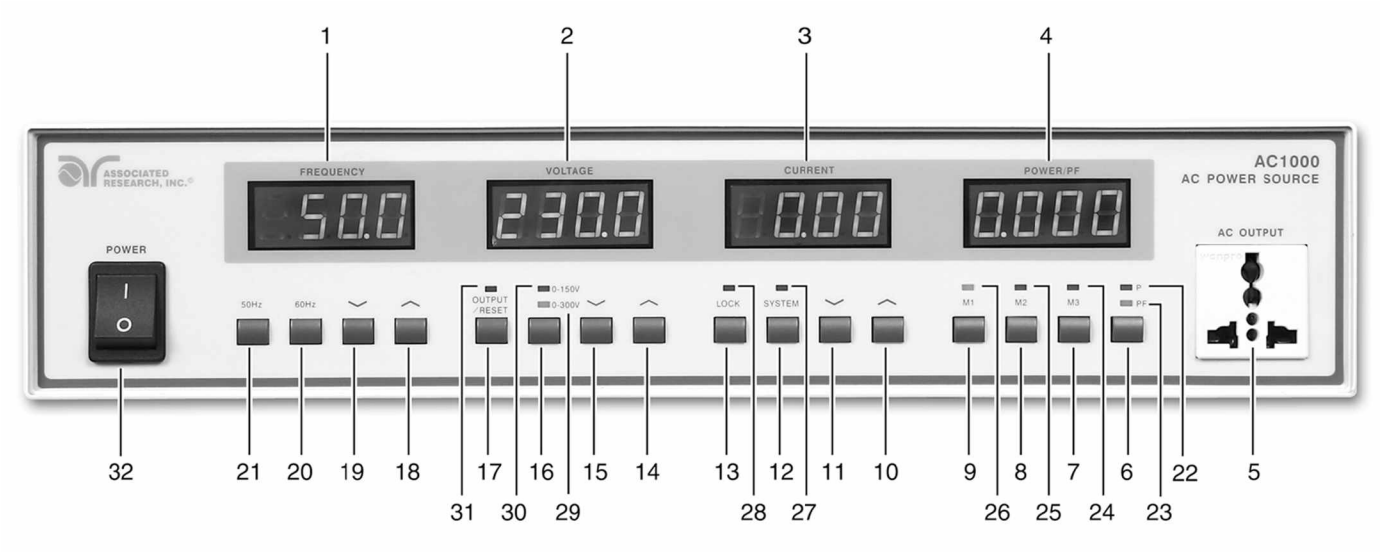


Figure 2.0(c)

25. M2 Indicator: When the LED is ON, the output is set according to M2.

26. M1 Indicator: When the LED is ON, the output is set according to M1.

27. SYSTEM Indicator: When the LED is ON, the system setting menu is activated.

28. LOCK Indicator: When this LED is ON, all the keys are disabled.

29. 0-300V Indicator: When the LED is ON the output is set to High range.

30. 0-150V Indicator: When the LED is ON, the output is set to Low range.

31. OUTPUT/RESET Indicator: When the LED is ON the source is operating normally. When the LED is blinking the source has experienced an error.

32. Power Switch: Turns the power source ON or OFF.

3.2.2. Rear Panel Controls

Figure 3.0

1. **Line Output Terminal:** High voltage output screw terminal.

2. **Neutral Output Terminal**: Neutral (return) screw terminal.

3. **Ground Input Terminal**: Earth ground (chassis) connection for line cord.

4. **Line Input Terminal**: High voltage input screw terminal for line cord.

5. **Neutral Input Terminal**: Neutral (return) screw terminal for line cord.

6. **Terminal Block Shield**: Screw-mounted plastic shield limits access to high voltage terminals.

7. **Calibration Key**: Press and hold during power-up to enter Calibration Mode.

8. **Remote Signal Output**: 6-pin mini-DIN female connector for monitoring FAIL and PROCESSING output relay signals (see **Section 5.0** for more detailed information).

9. **Input Voltage Selection Switch 1**: Configures the power source to accept 115 VAC or 230 VAC inputs (must be set in the same configuration as Input Voltage Selection Switch 2).

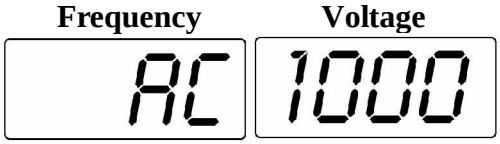
10. **Input Voltage Selection Switch 2**: Configures the power source to accept 115 VAC or 230 VAC inputs (must be set in the same configuration as Input Voltage Selection Switch 1).

11. **Remote Signal Input**: 9-in D sub-miniature female connector for remote control of TEST, RESET, and MEMORY SELECTION functions (See **Section 5.0 Connection of Remote I/O** for more detailed information).

4. Programming Instructions

4.1. Power On

When the AC1000 is powered up the Frequency and Voltage Displays will indicate the model and version. The alarm will provide a beep and the previous setting will be displayed.



4.2. System Setup

1. With the AC1000 powered up and the output in the OFF condition, press the SYSTEM key to enter the system setting mode. The SYSTEM indicator light will illuminate. The system setting screen cannot be entered when the output is ON.
2. 8 system parameters may be configured and stored from the system setting mode (refer to following System Parameters table for more information): PLC Remote, Alarm, OC Fold Back, Voltage LO Limit, Voltage HI Limit, Frequency LO Limit, Frequency HI Limit, P-UP.
3. The parameter item currently selected will be shown in the Frequency and Voltage Displays. The Current Display will show the current parameter condition and value.
4. To exit the system setting, press the SYSTEM key.

4.2.1 System Setup Keys

In the system setting mode, the keys on the front panel act in the following manner:

Current Up Key: Selects the system condition
Current Down Key: Selects the system condition
Voltage Up Key: Selects the system parameter
Voltage Down Key: Selects the system parameter

SYSTEM PARAMETERS			
Front Panel Displays			Explanation
FREQUENCY	VOLTAGE	CURRENT	
	PLC	OFF	Enables or disables the PLC Remote
		ON	
Alar	m	1-9	Alarm volume setting
	P-UP	OFF	Adjusts the output status at power up
		ON	
		LAST	
Freq	HI	500.0	Maximum frequency setting limit
Freq	LO	45.0	Minimum frequency setting limit
Voltage	HI	300.0	Maximum voltage setting limit
Voltage	LO	0.0	Minimum voltage setting limit
OC	Fold	ON	Enables or disables the over current fold back
		OFF	

4.2.2 System Parameters

PLC Remote
When the PLC Remote parameter is active, the overall operation of the AC1000 may be controlled through the PLC connector on the rear of the instrument. When enabled, all keys on the front panel will be disabled except the LOCK, SYSTEM and P/PF keys.

Alarm
Sets the volume of the alarm from 0-9.

Over-current Fold Back
This feature regulates the output current to a set value in less than 1500 ms.

Voltage LO Limit
Sets the LO Limit voltage from 0-300 volts. The output voltage cannot be lowered to value that falls below this limit during a test.

Voltage HI Limit
Sets the HI Limit voltage from 0-300 volts. The output voltage cannot be raised to a value that exceeds this limit during a test.

Frequency LO Limit
Sets the LO Limit frequency from 45-500 Hz. The output frequency cannot be lowered to a value that falls below this limit during a test.

Frequency HI Limit
Sets the HI Limit frequency from 45-500 Hz. The output frequency cannot be raised to a value that exceeds this limit during a test.

Power Up Status
This parameter controls the output configuration during power up and can be changed to one of three conditions: ON, OFF, or LAST. If Power Up Status is set to OFF the output will be disabled when the unit is powered up. If Power Up Status is set to ON the output will be enabled when the unit is powered up. If Power Up Status is set to LAST the output will be enabled in the same condition as it was when power was turned off.

4.2.3 Default System Parameters

PLC	OFF
Alarm	5
OC Fold back	OFF
Voltage LO Limit	0 V
Voltage HI Limit	300 V
Frequency LO Limit	45 Hz
Frequency HI Limit	500 Hz
P-UP	OFF

4.3. Test Setup

4.3.1 Test Parameters

P/Pf Select Key
Press P/PF select key to view output power (watts) or power factor.

Output/Reset Key
Enables or disables the power source output. Enabling the output will cause the OUTPUT/RESET indicator to illuminate and the decimal points on the LED displays to blink. **At this point high voltage is present at the universal socket output.** If the OUTPUT/RESET indicator is blinking an abnormal operation has occurred. This condition will result in an audible alarm and the output voltage will be disabled immediately. An error message will be displayed.

Lock Key
Press the LOCK key to enable or disable all keys on the front panel except the P/PF key. When this feature is active the LOCK indicator will illuminate. The power source will beep to indicate if a button is depressed when the Lock feature is enabled.

Memory Keys
Current limit, and voltage and frequency settings may be stored in 3 different memory locations, along with the power meter configuration (display power or power factor). To store

test parameters, press and hold the M1, M2 or M3 keys until the corresponding LED stops flashing. To recall each memory, press and release the M1, M2 or M3 keys.

4.3.2 Default Test Parameters

The AC1000 has specific default test parameters that have been preconfigured upon shipment from the factory. The Default Parameters are as follows:

Test Parameter	Value
Frequency	60 Hz
Voltage	100 V
Current Hi-Lmt	OFF
Power/PF Display	Watts
Lock	OFF

4.3.3 Setting Test Parameters

Setting Output Voltage

Press and hold the "^" or "v" keys to increment or decrement the voltage setting. The maximum allowable voltage setting is dependent on the range.

Low Range voltage: 0 – 150 volts
High Range voltage: 151 – 300 volts

The Voltage Display will blink once to signal that the new value has been accepted. Any invalid setting will not be accepted.

Setting Output Frequency

The output frequency may be adjusted in one of two ways:

Press the "^" and "v" keys to adjust the frequency manually
Press the 50Hz and 60Hz keys to output utility standards frequencies

The Frequency Display will blink once to signal that the new value has been accepted. Any invalid setting will not be accepted.

Setting Output Voltage Range

If the desired voltage is lower than 150 volts, press the RANGE key. The 0-150V LED will illuminate indicating the power source is in the low range. If the desired voltage is greater than 150 volts, press the RANGE key. The 0 – 300V LED will illuminate indicating the power source is in the high range. Any invalid setting will not be accepted.

- NOTE: Increasing the output voltage range from Low to High decreases the maximum output current capability of the power source.

Setting Output Current
With the output disabled, press the "^" or "v" key to set the current limit. This current limit corresponds to the current hi limit or the over-current fold back limit, depending on which mode has been selected in the system setting mode. The Current Display will blink once to signal that the new value has been accepted. Any invalid current setting will not be accepted.

With the output enabled, press the "^" or "v" key to change the current limit. This current limit corresponds to the current high limit or the over-current fold back limit, depending on which mode has been selected in the system setting mode. The Current Display will blink once to signal that the new value has been accepted. Any invalid current setting will not be accepted.

Enabling the Output
Once all test parameters have been set or a memory location has been selected, press the OUTPUT/RESET button to turn the power source output ON. The OUTPUT/RESET LED will illuminate to signal that the output is ON and the decimal points on the various Display screens will blink. Press the OUTPUT/RESET button again to disable the output.

4.4. Error Messages

If for any reason an error occurs during testing the following actions will occur:

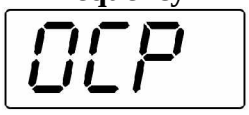
- The output will disable.
- The alarm will sound.
- The OUTPUT/RESET LED will start blinking.
- A corresponding error message will be displayed on the LED screens.

Pressing the OUTPUT/RESET key will reset the audible alarm and disable the OUTPUT/RESET LED. The error message will remain on the LED screens. Pressing the OUTPUT/RESET key a second time will clear the error message and the power source will revert to its idle state.

WARNING All error messages are the result of an abnormal condition and should be recorded. Check the cause of error to ensure the problem is eliminated before restarting the operation, or contact Associated Research, Inc.

OCP
If the output current exceeds 110% of maximum hardware current rating, the Frequency Display will indicate "OCP" and the alarm will sound. The OUTPUT/RESET LED indicator will blink and the Voltage and Current Displays will show the overloaded voltage and current respectively.

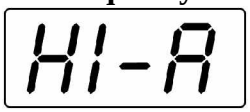
Frequency



HI-A

If the output current has exceeded the HI Limit, the Frequency Display will indicate “HI-A” and the alarm will sound. The OUTPUT/RESET LED indicator will blink and the Voltage and Current Displays will show the overloaded voltage and current respectively.

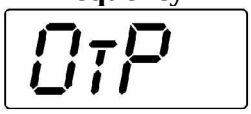
Frequency



OtP

If the heat sink of the instrument has exceeded 130 °C, the Frequency Display will indicate “OtP”. The alarm will sound, the OUTPUT/RESET LED indicator will blink and the Voltage and Current Displays will show the overloaded voltage and current respectively. This error may be cleared by pressing the OUTPUT/RESET key. It is a good idea to allow the power source to remain powered but with the output relay disabled so the fans have a chance to bring the internal temperature to an acceptable level.

Frequency



5. Connection of Remote I/O

One 9-pin D sub-miniature female connector is mounted on the rear panel that provides REMOTE-INPUT control and information. This connector mates with standard 9-pin D-sub-miniature connector provided by the user. The female (socket) connector on the power source mates to a male (plug) connector. For best performance, a shielded cable should be used. To avoid ground loops the shield should not be grounded at both ends of the cable.

One 6-pin mini-DIN female connector is mounted on the rear panel that provides the REMOTE-OUTPUT information. This connector mates with a standard 6-pin mini-DIN connector provided by the user. The female (socket) connector on the power source mates to a male (plug) connector.

Suggested AMP part numbers for interconnecting to the REMOTE-INPUT are shown below:

205204-4	PLUG SHELL WITH GROUND INDENTS
205203-3	RECEPTACLE SHELL
745254-7	CRIMP SNAP-IN PIN CONTACT (for plug)
745253-7	CRIMP SNAP-IN SOCKET CONTACT (for receptacle)
745171-1	SHIELDED CABLE CLAMP (for either plug or receptacle)
747784-3	JACKSCREW SET (2)

Suggested MOUSER part number for interconnecting to the REMOTE-OUTPUT is as follows:

171-2606	6 PIN MINI-DIN PLUG

5.1. Remote Signal Outputs

The 6-pin mini-DIN female connector provides output signals to remotely monitor FAIL, and PROCESSING conditions. These signals are provided by two normally open internal relays that switch on to indicate the current condition of the tester. These are normally open free contacts and will not provide any voltage or current. The ratings of the contacts are 1 A / 250 VAC (0.5 ADC). Below is a listing that indicates what conditions activate each pin. When a terminal becomes active, the relay closes thereby allowing the external voltage to operate an external device.

Pins 3 and 4 provide the FAIL signal.
Pins 5 and 6 provide the PROCESSING signal.

The following describes how the relays operate for each test condition:

PROCESSING - The relay contact closes the connection between pin 5 and pin 6 while the instrument is performing a test. The connection is opened at the end of the test.

FAIL - The relay contact closes the connection between pin 3 and pin 4 after detecting that the item under test failed any test. The connection is opened when the next test is initiated or the reset function activated.

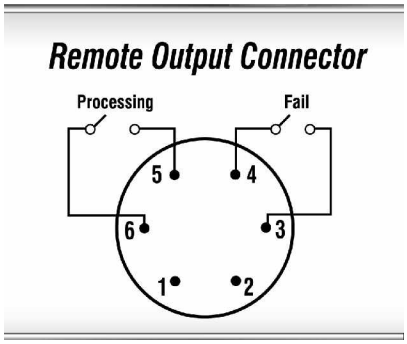


Figure 4.0

5.2. Remote Signal Inputs and Memory Access

Introduction
The 9-pin D sub-miniature female connector enables remote operation of the OUTPUT/RESET functions and allows the operator to toggle and select memory location 1, 2, and 3.

When the PLC Remote mode is ON, the AC1000 will respond to simple switch or relay contacts closures. At this point the OUTPUT/RESET switch on the front panel cannot be used to enable the output, but can be used to return the power source to its idle state.

Below is the pin configuration of Remote Input:

1. TEST	Connect between PIN 3 and PIN 5
2. RESET	Connect between PIN 2 and PIN 5
3. Memory Input Control	
a. Memory 1 (M1)	Connect between PIN 8 and PIN 5
b. Memory 2 (M2)	Connect between PIN 9 and PIN 5
c. Memory 3 (M3)	Connect PIN 8 and PIN 9 with a series diode (D4148 or equivalent) at each pin and the joint point is connected to PIN 5. PIN 5 is the Common of the input signals (COM).

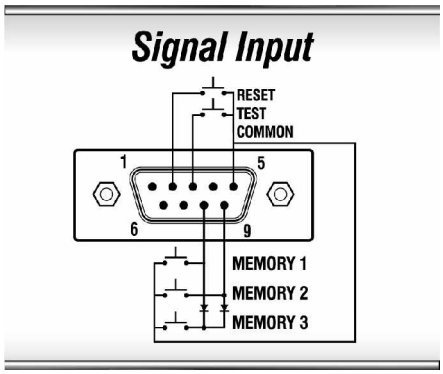


Figure 5.0

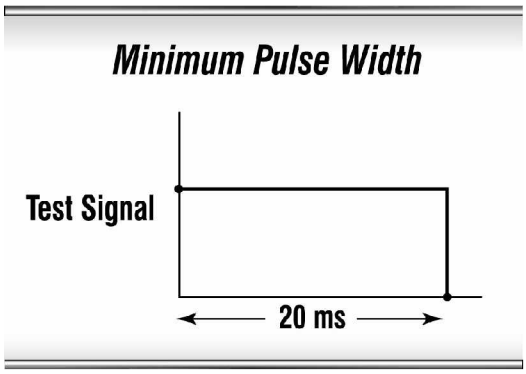
WARNING THE OUTPUT OF THE POWER SOURCE IS CONTROLLED EXTERNALLY WHEN USING THE PLC REMOTE

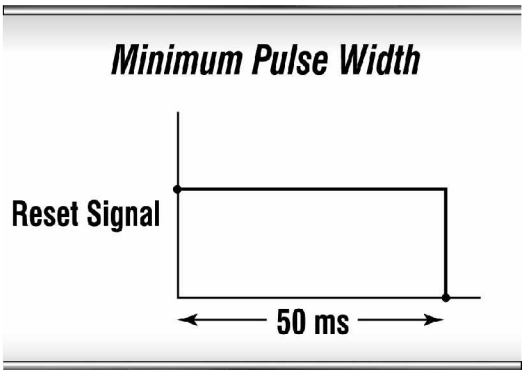
WARNING ACTIVATING MEMORY PROGRAM FUNCTIONS THROUGH THE REMOTE CONNECTOR SELECTS THE PROGRAM AND ENABLES THE OUTPUT WHICH IS PREPROGRAMMED INTO THAT MEMORY

CAUTION DO NOT CONNECT VOLTAGE OR CURRENT TO THE SIGNAL INPUTS, THIS COULD RESULT IN DAMAGE TO THE CONTROL CIRCUITRY.

Timing Information

A minimum pulse width or contact closure of 20 ms is required to guarantee activation of the OUTPUT/RESET relay to start a test. A minimum pulse width or contact closure of 50 ms is required to disable the OUTPUT/RESET relay while a test is running. The memory select bits should be set simultaneously and remain set for a minimum of 20 ms to guarantee that the correct memory will be selected. However, the memory select bits may be set in sequential manner, provided that the time delay between each bit is less than 4 ms. When the desired bit pattern has been established it should remain set for a minimum of 20 ms to guarantee that the correct memory will be selected.





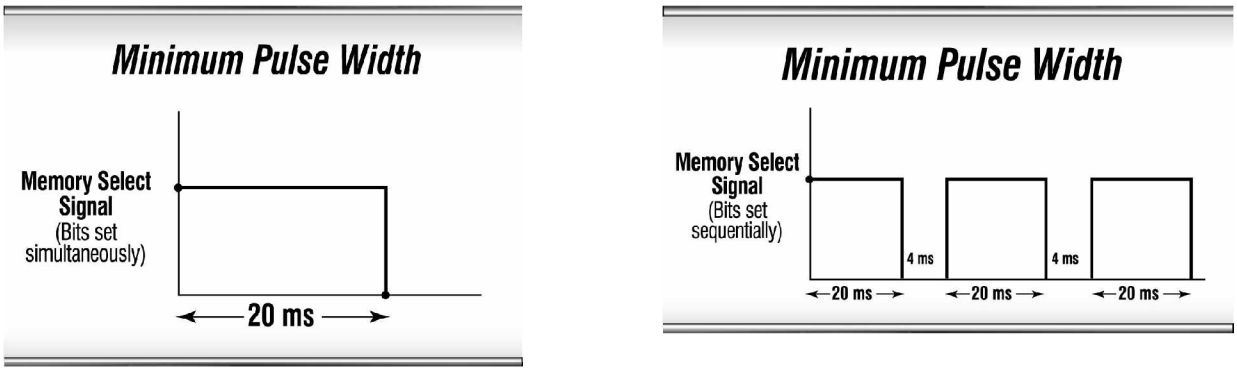


Figure 6.0

5.3. Interfacing the AC1000 with an OMNIA 8006/8106

Introduction
The AC1000 may be integrated with an Associated Research, Inc. OMNIA model 8006 or 8106 to form a complete test system. In this configuration, the AC1000 acts as the DUT power source (replacing line power or an isolation transformer) during Functional Run and Line Leakage testing modes.

Requirements
OMNIA model 8006 or 8106 with one of the following interface options:

8006/8106 Option 04 – 3 Remote Memory Send
This option has the PLC Remote Signal Output Connector reconfigured to provide a control signal that is menu selectable from the Run test and Line Leakage test parameter screen. This option uses cable p/n 38774 to interconnect the OMNIA's PLC Remote Signal Output Connector with the AC1000's Remote Signal Input Connector. This option may be purchased for either OMNIA model 8006 or 8106.

8106 Option 05 – 7 Remote Memory Send
This option has an additional Programmable Output Connector to provide a control signal that is menu selectable from the Run test and Line Leakage test parameter screen. This option uses cable p/n 38772 to interconnect the OMNIA's Programmable Output Connector with the AC1000's Remote Signal Input Connector. This option is only available for OMNIA model 8106 and requires AC1000 Option 01 – 7 Memory Select.

Connection Description
The OMNIA and the AC1000 work in a master/slave configuration. The OMNIA has the capability to change the AC1000's memory location depending on the test that is being performed. The signals are sent via the interconnect cable from the OMNIA to the AC1000.

The output of the AC1000 should be connected to the OMNIA's DUT-IN receptacle via a standard line cord (provided with the OMNIA). The OMNIA will then provide the necessary relay switching network to apply power to the DUT in the Run test and Line Leakage test modes.

- NOTE: The OMNIA cannot disable the AC1000 output relay. The AC1000 output relay will be enabled automatically at the start of each test but if the relay needs to be disabled it must be done manually. Under normal operation the OMNIA's DUT-IN receptacle should be used as the system's output relay. For more on this please consult the OMNIA 8006/8106 manual.

Connection Procedure

1.) Connect the interface cable (p/n 38774 or 38772) between the OMNIA's Remote Signal Output Connector (8006/8106 Option 4, Figure 7.0(a)) or the Programmable Output Connector (8106 Option 5, Figure 7.0(b)) and the AC1000 Remote Signal Input connector.

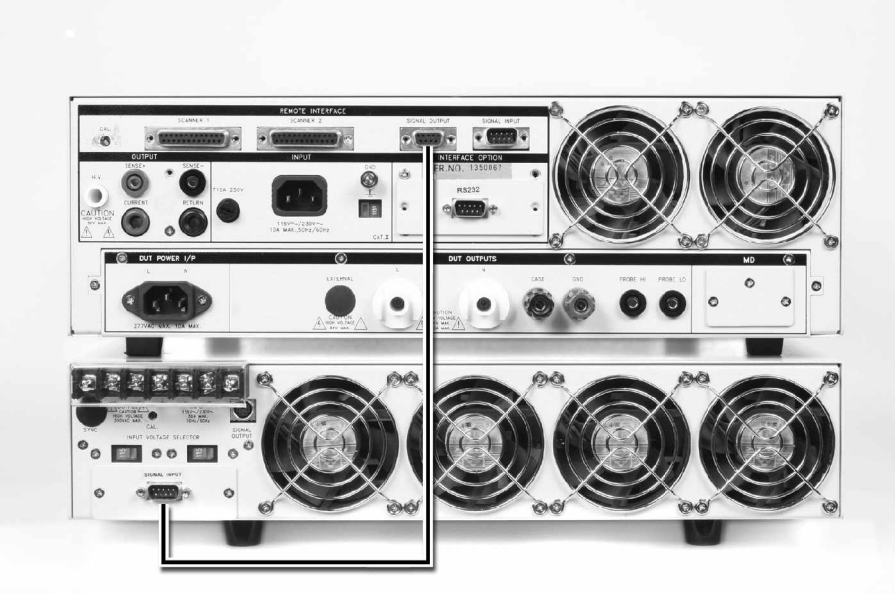


Figure 7.0(a)

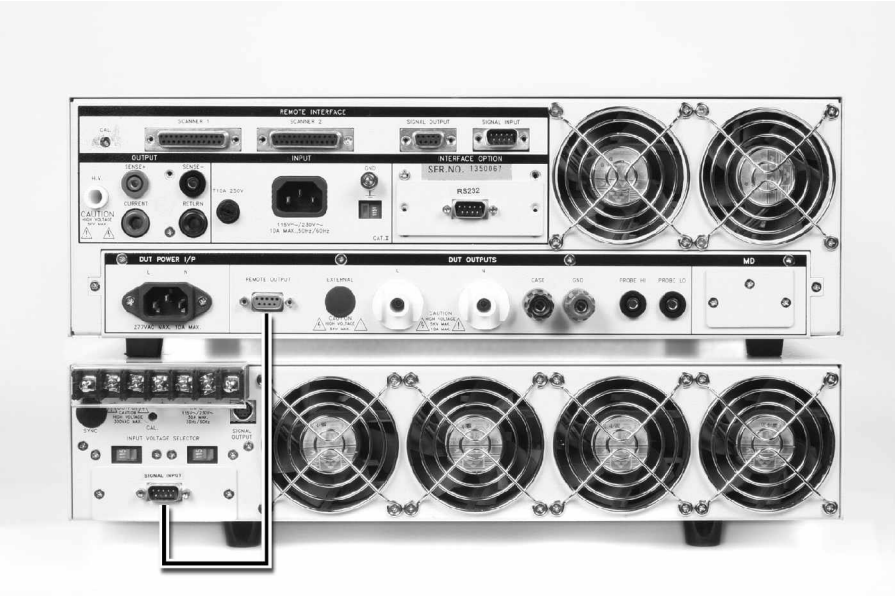


Figure 7.0(b)

2.) Using a line cord, connect the output of the AC1000 to the OMNIA's DUT-IN receptacle. This connection will provide power for the DUT during Run test and Line Leakage test modes.

Figure 8.0

3.) The OMNIA's menu system may then be used to change the AC1000's memory location in the Run test and Line Leakage test menu screens (refer to the OMNIA 8006/8106 manual for more information).

6. Options

Introduction

This section contains a list and descriptions of available factory installed options at the time of this printing. The list of options contains an option code number that can be referenced on the data plate on the rear panel of the unit.

AC1000 Options

Code	Description
01	7 Memory Select

Description

01 7 Memory Select

The 7 Memory Select option increases the number of programmable memory locations from 3 to 7. These locations can be toggled manually, accessed via the PLC input, and controlled from the Associated Research, Inc. OMNIA 8106. To store test parameters in a memory location, press and hold the correct combination of the M1, M2, and M3 keys until the corresponding LED's stop flashing. To recall each memory, press and release the appropriate keys. The following table lists the key combinations for each memory location.

Memory Location	Key
1	M1
2	M2
3	M3
4	M1 + M2
5	M2 + M3
6	M1 + M3
7	M1 + M2 + M3

The following binary truth table shows the different combinations of relay closures and their corresponding memory programs for accessing memory locations via the PLC input. It may be necessary to logically "OR" the relay contacts to prevent incorrect program selection due to timing errors. For more information please review section **5. Connection of Remote I/O**.

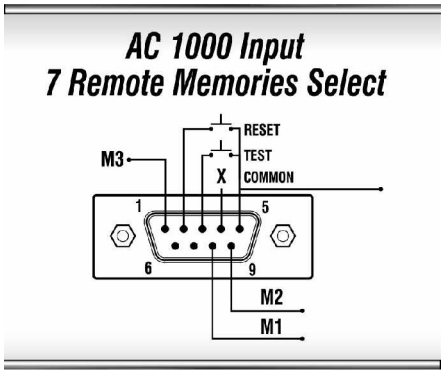


Figure 9.0

7 MEMORIES SELECT TRUTH TABLE			
M3	M2	M1	MEMORY PROGRAM #
0	**0**	**1**	1
0	**1**	**0**	2
0	**1**	**1**	3
1	**0**	**0**	4
1	**0**	**1**	5
1	**1**	**0**	6
1	**1**	**1**	7
1= Momentary Contact closure between BIT and COMMON			
0= No Contact closure between BIT and COMMON			

WARNING ACTIVATING MEMORY LOCATIONS THROUGH THE REMOTE CONNECTOR STARTS THE TEST THAT IS PREPROGRAMMED INTO THAT MEMORY LOCATION.

WARNING DO NOT CONNECT VOLTAGE OR CURRENT TO THE SIGNAL INPUTS. THIS COULD RESULT IN DAMAGE TO THE CONTROL CIRCUITRY.

7. Calibration Procedure

This instrument has been fully calibrated at the factory in accordance to our published specifications. It has been calibrated with standards traceable to the National Institute Standards & Technology (NIST). You will find in this manual a copy of the "Certificate of Calibration". It is recommended that you have this instrument recertified at least once per year. Associated Research, Inc. recommends you use "Calibration Standards" that are NIST traceable, or traceable to agencies recognized by NIST to keep this instrument within published specifications. Unless necessary, do not recalibrate the AC1000 within the first 12 months.

End user metrology standards or practices may vary. These metrology standards determine the measurement uncertainty ratio of the calibration standards being used. Calibration adjustments can only be made in the Calibration mode and calibration checks or verifications can only be made while operating in Test mode.

7.1. Warranty Requirements

Associated Research, Inc. offers a standard one-year manufacturer's warranty. This warranty can be extended an additional four years provided that the instrument is returned each year to Associated Research, Inc. for its annual recertification. In order to be eligible for the extended warranty instruments must be returned to Associated Research, Inc. for certification service at least once every twelve months.

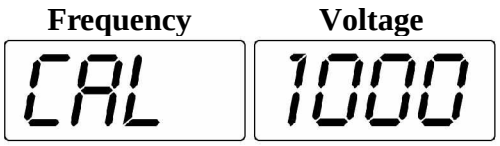
A return material authorization number (RMA) must be obtained from Associated Research, Inc. before returning this instrument for calibration. To obtain an RMA number or for information regarding our warranty, please contact our customer support representatives at 1-800-858-TEST (8378).

Required Calibration Equipment

- 20 AAC True RMS Ammeter.
- 0 - 500 VAC True RMS Voltmeter.
- 12.5Ω/800W Resistor
- 33.3Ω/300W Resistor
- 9Ω/900W Resistor

7.2. Calibration Procedure

Press and hold the CAL key (located on the back of the power source) while powering up the AC1000. After two seconds, the power source will indicate the model number and firmware version: it is now in calibration mode. Press the "^" or "v" key to select the calibration menu.



Low Range Voltage Calibration

Press the "^" or "v" key from the Frequency Display until "V-LO" is displayed. Connect the calibrated true RMS voltmeter across the output and press the OUTPUT/RESET key. This will activate the low range offset voltage while outputting 150 VAC. Using the voltage value from the RMS Voltmeter, press the "^"or "v" key from the Current Display to change the displayed value to the value that corresponds to the voltmeter. After the appropriate value is reached, press the LOCK key to save the data. The low range voltage calibration is now complete.

High Range Voltage Calibration

Press "^" or "v" key from the Frequency Display until "V-HI" is displayed. Connect the calibrated true RMS voltmeter across the output and press the OUTPUT/RESET key. This will activate the high range offset voltage while outputting 300 VAC. Using the voltage value from the RMS voltmeter, press the "^" or "v" key from the Current Display to change the displayed value to the value that corresponds to the voltmeter. After the appropriate value is reached, press the LOCK key to save the data. The high range voltage calibration is now complete.

Low Range Current Calibration

Press the "^" or "v" key from the Frequency Display until "A-LO" is displayed. Connect a variable resistor (33.3Ω/300W) and a calibrated true RMS ammeter in series with the output and press the OUTPUT/RESET key. This will activate the low range offset current while outputting 100 VAC. Adjust the load to get a reading of 3.000 A from the ammeter. Using the current value from the RMS ammeter, press the "^" or "v" key from the Current Display to change the displayed value to the value that corresponds to the ammeter. After the appropriate value is reached, press the LOCK key to save the data. The low range current calibration is now complete.

Frequency	Voltage	Current	Power
A-LO	100.0	3.000	CAL

High Range Current Calibration

Press the "^" or "v" key from the Frequency Display until "A-HI" is displayed. Connect a variable resistor (12.5Ω/800W) and a calibrated true RMS ammeter in series with the output and press OUTPUT/RESET key. This will activate the high range offset current while outputting 100 VAC. Adjust the load to get a reading of 8.00 A from the ammeter. Using the current value from the RMS ammeter, press "^" or "v" key from the Current Display to change the displayed value to the value that corresponds to the ammeter. After the appropriate value is reached, press the LOCK key to save the data. The high range current calibration is now complete.

Frequency	Voltage	Current	Power
A-HI	100.0	8.00	CAL

Low Range Power Calibration

Press "^" or "v" key from the Frequency Display until "P-LO" is displayed. Connect a variable resistor (33.3Ω/300W) and a calibrated true RMS power meter in series with the output and press the OUTPUT/RESET key. This will activate the low range offset power while outputting 100 VAC. Adjust the load to get a reading of 300 W from the power meter. Using the power value from the RMS power meter, press the "^" or "v" key from the Current Display to change the displayed value to the value that corresponds to the power meter. After the appropriate value is reached, press the LOCK key to save the data. The low range power calibration is now complete.

Frequency	Voltage	Current	Power
P-LO	100.0	300.0	CAL

High Range Power Calibration

Press "^" or "v" key from the Frequency Display until "P-HI" is displayed. Connect a variable resistor (9Ω/900W) and a calibrated true RMS power meter in series with the output and press the OUTPUT/RESET key. This will activate the high range offset power while outputting 100 VAC. Adjust the load to get a reading of 900W from the power meter. Using the power value from the RMS power meter, press the "^" or "v" key from the Current Display to change the displayed value to the value that corresponds to the power meter. After the appropriate value is reached, press the LOCK key to save the data. The high range power calibration is now complete.

Frequency	Voltage	Current	Power
P-HI	100.0	100.0	CAL

Calibration Completion

Once calibration is completed, turn OFF the AC1000.

- NOTE: Each calibration item above can be performed independently of the others. If the full calibration procedure has to be terminated for any reason, press the P/PF key to exit the calibration mode.

8. Replacement Parts List

Rev: "A" 5/25/06 ECO "5190"

Part Number	Qty.	Ref. Designator	Description
Supplied Accessories			
38549	4	-	Screw for Rack Mount Handle
38794	2	-	2U Rack Mount Handle
38793	2	-	2U Rack Mount Bracket
Panel Components			
38021	10	-	Diode LED Red Square
38070	1	-	Universal Receptacle 7.5kv
38109	1	-	Power Switch 2P 10A/250V
38121	1	-	Panel Bezel Plastic 2U x 17in
38274	16	-	Button Keypad Rect. 9.8 x 8.0mm
38751	1	-	Front Panel
38752	6	-	Plastic Foot
38759	1	-	Terminal Block
38760	1	-	Terminal Block Cover
38797	1	-	Shorting Bar Terminal Block
PCB Assemblies			
38739	1	AMP6700	Amplifier Board
38740	1	CON6700	Main Control Board
38741	1	DSP6800	Display Board
38742	1	OPT6700	Output Control Board
38743	1	PWR6700	Input Voltage Select Board
38744	1	REC6700	DC Filter Board
38779	1	REM6700	Remote Input Board
Internal Components			
38756	1	-	Input Transformer
38757	1	-	Input Transformer
38780	2	-	Fuse 16A Slow Blow 30mm
38758	1	-	Output Transformer
38262	1	-	IC W78E516B

9. Schematic Index

Drawing Number	Description	Reference Designator	Pages
SAC1000	Wiring Diagram	-	1
S38740	Main Control Board	CON6700	4
S38739	Amplifier Board	AMP6700	1
S38741	Display Board	DSP6800	1
S38742	Output Control Board	OPT6700	1
S38743	Power Board	PWR6700	1
S38744	DC Filter Board	REC6700	1
S38779	Remote Input Board	REM67000	1

10. Index