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## AMI MODEL 601 ENERGY ABSORBER INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

### I. INTRODUCTION

The AMI Model 601 Energy Absorber is designed to provide a compact, fast-rampdown option of up to 5 VDC for AMI power supply systems. The Model 601 is designed to operate safely in the event of loss of facility AC power by drawing the necessary power for internal cooling from the superconducting magnet. Upon loss of AC power to a power supply system, the Model 601 will ramp the system to zero current at a discharge rate of approximately 5 VDC.

### II. SPECIFICATIONS @ 25°C

AC Input Ratings: . . . . . 100 to 240 VAC  $\pm$  10%, 50/60 Hz,  
100 VA max

DC Input Ratings: . . . . . 5 VDC  $\pm$  5%, 4 A max

Maximum Magnet Operating Current: . . . . . 130 A @ 25°C, derated linearly to  
100 A @ 40°C

Nominal Discharge Voltage: . . . . . 5.0 VDC  $\pm$  2%

Discharge Voltage Temperature Coefficient: . . . . .  $\pm$  150 ppm/°C max

Internal Series Resistance:<sup>1</sup> . . . . . 2 m $\Omega$   $\pm$  1 m $\Omega$

Rated Operating Temperature: . . . . . 0 to 40°C @ 100 A,  
0 to 25°C @ 130 A

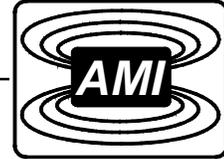
Rated Operating Relative Humidity: . . . . . 0 to 95% non-condensing

Torque Limit on Current Terminals: . . . . . 50 in-lbs.

<sup>1</sup>(nominally adds 200 mV voltage drop at 100 A)



Instruction manual symbol: the product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the product or personal injury.



### III. INSTALLATION

The AMI Model 601 is designed to operate in an AMI power supply system consisting of a unipolar power supply, a power supply programmer, and a superconducting magnet. The following paragraphs document the procedures and interconnects necessary to use the Model 601.

***WARNING:*** *If the Model 601 is used in a manner not specified by AMI, the protection provided by the equipment may be impaired.*

- A. Carefully remove the Model 601 from the shipping container and remove all packaging material.

***NOTE:*** *If there is any shipping damage, save all packaging material and contact the shipping representative to file a damage claim. Do not return the instrument to AMI unless prior authorization has been received.*

- B. If the Model 601 is to be mounted in a rack:

Install the Model 601 in a 19" wide instrument rack by securing the front panel to the rail in each of the four corners with mounting hardware supplied by the cabinet manufacturer.

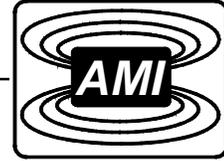
- C. Install the Model 601 in a magnet power supply system by completing the following steps:

***CAUTION:*** *Do not overtighten the nuts on the current lugs of the Model 601 (maximum torque is 50 in-lbs). Overtightening can result in damage to the terminals.*

1. Connect a power lead cable from the power supply positive (+) output lug to the positive (+) lug on the rear of the Model 601. No other connections should be made to the Model 601 positive (+) lug.
2. Connect a power lead cable to the negative (-) lug on the rear of the Model 601 to the positive (+) current lead of the superconducting magnet. No other connections should be made to the Model 601 negative (-) lug.



***WARNING:*** *Exercise care near the power lugs when operating a magnet. Metallic objects shorted across the lugs may conduct large DC currents which are capable of melting the object and causing severe burns.*

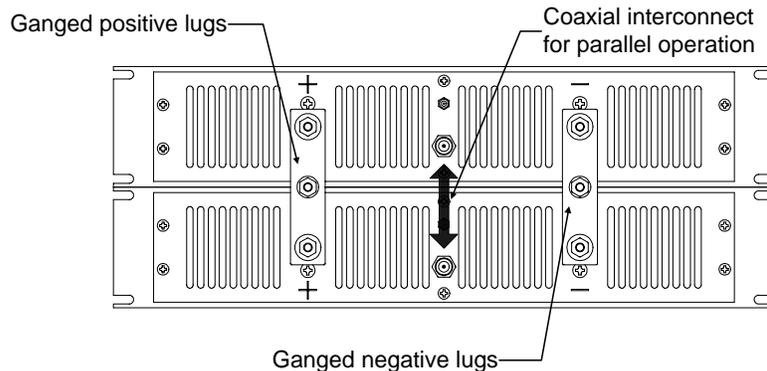


***CAUTION:*** Current flow should be from the positive (+) to negative (-) lug of the Model 601. If this is reversed, severe damage of the Model 601 will result.

***NOTE:*** If an AMI Model 420 Power Supply Programmer is to be used with the system, refer to the appropriate installation section in the Model 420 Power Supply Programmer manual for a complete system diagram and step-by-step instructions for all the system interconnects.

- D. If you have purchased multiple Model 601 units with the *Parallel Operation Option*, then up to five Model 601 units may be operated in parallel with a total current rating of 90% of the sum of the ratings for each individual unit.

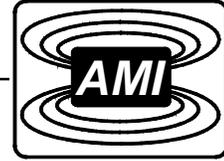
Typically, if multiple Model 601 units are to be connected, the positive (+) and negative (-) lugs will be ganged together as illustrated below using a conductive plate. Simply follow the installation directions in *Step C* above by treating each ganged lug as a single output lug. The power leads, from the supply and to the magnet, may be connected to any mounting lug if an additional lug is not provided in the ganged conductive plate.



In addition to the ganged lugs, the coaxial connectors on the rear of each Model 601 must also be connected. If more than two units are connected in parallel, the middle units may be connected to the coaxial cable by using standard BNC "T" adaptors. The "end" units should be connected directly to the coaxial cable — no BNC "terminators" should be used.

- E. Supply power to the Model 601 by connecting the supplied external DC power converter to the matching connector at the rear of the Model 601, and then connecting the AC power cord to the appropriate power receptacle. The Model 601 is operational *immediately* upon connection to a power receptacle.

***WARNING:*** Do not position the external power supply or the Model 601 so that it is difficult to disconnect the power cords.



The Model 601 DC power converter is designed to operate with 50/60 Hz power and voltages of 100 to 240 VAC  $\pm$  10%.

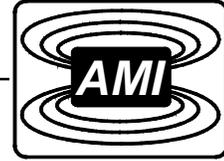
***NOTE:*** *If the Model 601 is operated without supplied power, the unit will function normally at currents above 0.5 A. Below 0.5 A, the Model 601 will not develop the full discharge voltage of 5 volts if operated without power supplied to the rear-panel DC power converter connector. Operation without supplied power is only provided as a safety feature for situations where all facility power is lost to the magnet system. The Model 601 should not be routinely operated without supplied power.*

#### **IV. OPERATION**

- A. During normal operation of the Model 601, no operator intervention is required.
- B. The Model 601 is operating correctly if the FAULT LED is *not* energized.
- C. If the FAULT LED is energized, then one or more of the internal energy absorbing elements has malfunctioned or power has been lost to the rear-panel power connector. An audible alarm will also sound when the FAULT LED is energized. If the unit is in operation, proceed immediately to a safe magnet system state (typically zero current or a cooled persistent switch in a connected magnet). Do not continue to operate the unit and refer to the *Troubleshooting* section below for further direction.
- D. Remember to adjust the voltage limit settings of any power supply programmer to account for the additional voltage (5 V) required to operate the system with a Model 601 installed.

#### **V. TROUBLESHOOTING**

- A. *The magnet system does not appear to charge.*
  - 1. Check the system wiring and verify that the current flow direction through the Model 601 is from the positive (+) to the negative (-) lug.
  - 2. Verify that the supplied external DC power converter is connected to the rear of the Model 601, and the AC power cord is also connected to the appropriate power receptacle.
  - 3. Check the voltage limit settings of any power supply programmer and verify the limits are set to a value greater than 5 volts plus the charging voltage and any power lead voltage drops.



*B. The system current ramps slowly from zero.*

If the Model 601 is used in conjunction with an AMI Model 420, then an initial charging delay will be observed when operating without an inductive load (e.g. a persistent switch is not heated on a connected magnet). To decrease the amount of time delay, increase the ramp rate to 1 A/sec or greater value. Remember to decrease the ramp rate, if necessary, before heating the persistent switch of the connected magnet and attempting to ramp the current. The charging delay will not be observed when operating with an inductive load.

*C. The FAULT LED is energized with audible alarm.*

1. Verify that the supplied external DC power converter is connected to the rear of the Model 601, and the AC power cord is also connected to the appropriate power receptacle.
2. If the DC power converter is connected properly, observe if an internal green LED is energized by looking through the rear-panel grating. If the green LED is energized, then the DC power converter is operating correctly.

If the green LED is not energized, then the DC power converter has failed, or AC power to the DC power converter has been lost. Contact an Authorized AMI Technical Support Representative for a replacement.

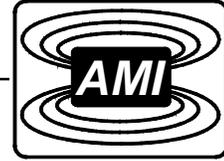
3. If the DC power converter is connected and the internal green LED is energized, then the FAULT LED indicates the failure of an internal energy absorbing element. Do not continue to operate the unit and contact an Authorized AMI Technical Support Representative for further instructions.

## **VI. MAINTENANCE**

The only routine maintenance required is to keep the exterior surfaces of the instrument clean by gently wiping with a damp cloth moistened with a mild detergent. The front and rear panel vents of the Model 601 should also be kept free of obstructions or excessive dust to allow for proper cooling of the unit.

## **VII. WARRANTY**

All products manufactured by AMI are warranted to be free of defects in materials and workmanship and to perform as specified for a period of one year from date of shipment. In the event of a failure occurring during normal use, AMI, at its option, will repair or replace all products or components that fail under warranty, and such repair or replacement shall constitute a fulfillment of all AMI liabilities with respect to its products. All warranty repairs are F.O.B. Oak Ridge, Tennessee, USA.



## **VIII. RETURN AUTHORIZATION**

Items to be returned to AMI for repair (warranty or otherwise) require a return authorization number to ensure your order will receive the proper attention. Please call an AMI representative at (865) 482-1056 for a return authorization before shipping any item back to AMI.

## Declaration of Conformity

**Application of Council Directives:** Low Voltage Directive 72/23/EEC  
EMC Directive 89/336/EEC

**Manufacturer's Name:** American Magnetics, Inc.

**Manufacturer's Address:** 112 Flint Road,  
P.O. Box 2509  
Oak Ridge, TN 37831-2509  
U.S.A.

**Type of Equipment:** Liquid Level Instruments

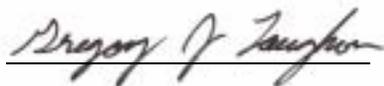
**Model Numbers:** Model 601

**Standards to which Conformity is Declared:**

**Safety:** EN 61010-1 (1993) w/A1, A2

**EMC:** EN55011 (1991) Group 1, Class A  
EN50082-1 (1997) / EN61000-4-2 (1995) 8kV AD, 4kV CD  
EN50082-1 (1997) / EN61000-4-3 (1996) 3V/m  
EN50082-1 (1997) / EN61000-4-4 (1995) 1kV Power Supply  
0.5kV I/O cables  
EN50082-1 (1997) / EN61000-4-5 (1995) 2kV CM, 1kV DM  
EN50082-1 (1997) / EN61000-4-6 (1996) 3V  
EN50082-1 (1997) / EN61000-4-11 (1994) Voltage dips 30% - 10ms  
Voltage dips 60% - 100ms  
Short interruption >95% - 5s

I, the undersigned, hereby declare that the equipment specified above complies with the requirements of the aforementioned Directives and Standards and carries the "CE" mark accordingly.



Gregory J. Laughton  
Quality Assurance Manager

September 12, 2002

American Magnetics, Inc.  
Oak Ridge, TN, U.S.A.