

**Model 495  
Power Supply  
Operating and Service Manual**

# **Advanced Measurement Technology, Inc.**

a/k/a/ ORTEC<sup>®</sup>, a subsidiary of AMETEK<sup>®</sup>, Inc.

## **WARRANTY**

ORTEC\* warrants that the items will be delivered free from defects in material or workmanship. ORTEC makes no other warranties, express or implied, and specifically NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

ORTEC's exclusive liability is limited to repairing or replacing at ORTEC's option, items found by ORTEC to be defective in workmanship or materials within one year from the date of delivery. ORTEC's liability on any claim of any kind, including negligence, loss, or damages arising out of, connected with, or from the performance or breach thereof, or from the manufacture, sale, delivery, resale, repair, or use of any item or services covered by this agreement or purchase order, shall in no case exceed the price allocable to the item or service furnished or any part thereof that gives rise to the claim. In the event ORTEC fails to manufacture or deliver items called for in this agreement or purchase order, ORTEC's exclusive liability and buyer's exclusive remedy shall be release of the buyer from the obligation to pay the purchase price. In no event shall ORTEC be liable for special or consequential damages.

### **Quality Control**

Before being approved for shipment, each ORTEC instrument must pass a stringent set of quality control tests designed to expose any flaws in materials or workmanship. Permanent records of these tests are maintained for use in warranty repair and as a source of statistical information for design improvements.

### **Repair Service**

If it becomes necessary to return this instrument for repair, it is essential that Customer Services be contacted in advance of its return so that a Return Authorization Number can be assigned to the unit. Also, ORTEC must be informed, either in writing, by telephone [(865) 482-4411] or by facsimile transmission [(865) 483-2133], of the nature of the fault of the instrument being returned and of the model, serial, and revision ("Rev" on rear panel) numbers. Failure to do so may cause unnecessary delays in getting the unit repaired. The ORTEC standard procedure requires that instruments returned for repair pass the same quality control tests that are used for new-production instruments. Instruments that are returned should be packed so that they will withstand normal transit handling and must be shipped PREPAID via Air Parcel Post or United Parcel Service to the designated ORTEC repair center. The address label and the package should include the Return Authorization Number assigned. Instruments being returned that are damaged in transit due to inadequate packing will be repaired at the sender's expense, and it will be the sender's responsibility to make claim with the shipper. Instruments not in warranty should follow the same procedure and ORTEC will provide a quotation.

### **Damage in Transit**

Shipments should be examined immediately upon receipt for evidence of external or concealed damage. The carrier making delivery should be notified immediately of any such damage, since the carrier is normally liable for damage in shipment. Packing materials, waybills, and other such documentation should be preserved in order to establish claims. After such notification to the carrier, please notify ORTEC of the circumstances so that assistance can be provided in making damage claims and in providing replacement equipment, if necessary.

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## SAFETY INSTRUCTIONS AND SYMBOLS

This manual contains up to three levels of safety instructions that must be observed in order to avoid personal injury and/or damage to equipment or other property. These are:

**DANGER** Indicates a hazard that could result in death or serious bodily harm if the safety instruction is not observed.

**WARNING** Indicates a hazard that could result in bodily harm if the safety instruction is not observed.

**CAUTION** Indicates a hazard that could result in property damage if the safety instruction is not observed.

Please read all safety instructions carefully and make sure you understand them fully before attempting to use this product.

In addition, the following symbol may appear on the product:



**ATTENTION – Refer to Manual**



**DANGER – High Voltage**

Please read all safety instructions carefully and make sure you understand them fully before attempting to use this product.

## SAFETY WARNINGS AND CLEANING INSTRUCTIONS

**DANGER** Opening the cover of this instrument is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.

**WARNING** Using this instrument in a manner not specified by the manufacturer may impair the protection provided by the instrument.

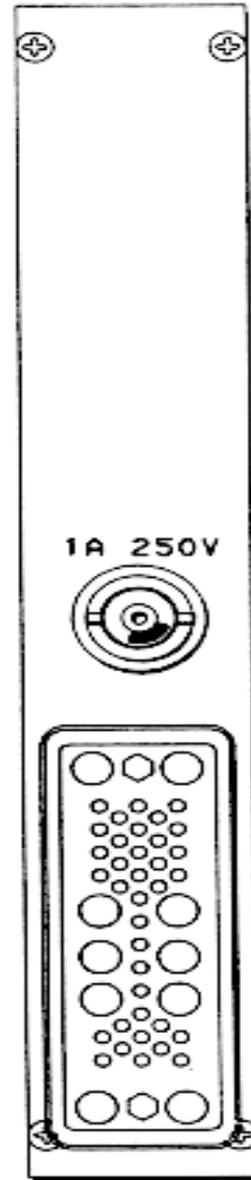
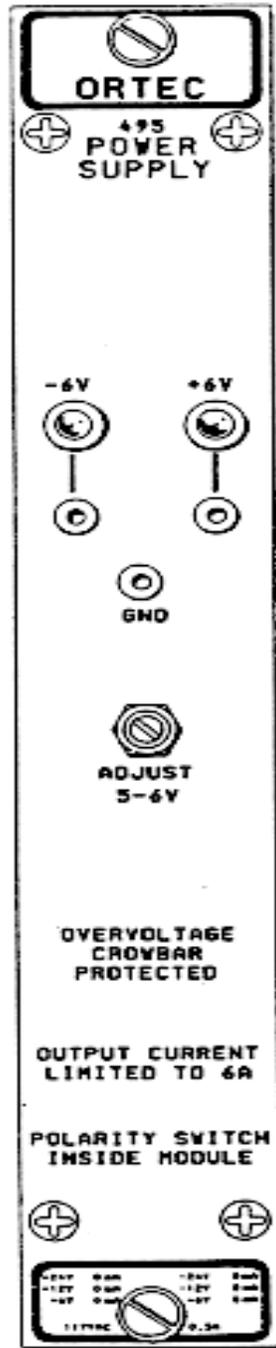
### Cleaning Instructions

To clean the instrument exterior:

- Unplug the instrument from the ac power supply.
- Remove loose dust on the outside of the instrument with a lint-free cloth.
- Remove remaining dirt with a lint-free cloth dampened in a general-purpose detergent and water solution. Do not use abrasive cleaners.

**CAUTION** To prevent moisture inside of the instrument during external cleaning, use only enough liquid to dampen the cloth or applicator.

- Allow the instrument to dry completely before reconnecting it to the power source.



# ORTEC MODEL 495 POWER SUPPLY

## 1. DESCRIPTION

The ORTEC Model 495 Power Supply is a single-width NIM module that can be installed in any NIM Bin to provide either +6V or -6V dc through the distribution bus in the bin. Its intended use is as an addition to NIM Bins that are not equipped with 6V dc bin power.

Either polarity is preselected in the Model 495 before it is inserted into the bin. A set of four jumpers on the printed wiring board, (PWB), provide for polarity selection. No other adjustments or controls are required, and the Model 495 is turned on automatically when the main bin power is plugged in and turned on.

The internal circuit is adjusted at the factory to provide the 6 V dc level and to furnish it to the proper connector pins of the remaining module positions in the bin. The level can be adjusted, if desired, within a range of ~4.5 V through 6.8 V by using a front panel screwdriver control. The selected polarity is shown by a front panel LED, and the voltage level can be monitored (or used externally) at front panel test points.

If the Model 495 is installed in a bin which already has +6 V and -6 V available from its power supply, no damage will be incurred, but both front panel LED lights will be turned on because both polarities of 6 V dc power are available on the distribution bus.

## 2. SPECIFICATIONS

### 2.1. PERFORMANCE

**INPUT** 103 to 130 V ac, 47 to 63 Hz; 0.80 A maximum current.

**TYPICAL EFFICIENCY** 70%.

**OUTPUTS** +6 V or -6 V at 0 to 6 A. Polarity jumper-selectable; output level adjustable.

**REGULATION AND INSTABILITY**  $\pm 0.1\%$  for specified line and load ranges.

**OPERATING TEMPERATURE RANGE** 0 to +60°C (32 to 140°C).

**TEMPERATURE COEFFICIENT**  $\pm 200$  ppm/°C maximum.

**NOISE AND RIPPLE** <30 mV peak-to-peak 20 MHz bandwidth.

**OUTPUT IMPEDANCE**  $<0.12\Omega$  for  $f < 100$  kHz.

**RECOVERY TIME** <3 ms to within  $\pm 1\%$  after no-load to full-load change.

### PROTECTION

**Overvoltage** Latching crowbar shorts output and maintains zero output if output level exceeds crowbar sensitivity of  $6.8 \pm 0.5$  V.

**Short Circuit and Overload** Accomplished with automatic recovery after a fault has been removed.

**Input Circuits** Include an input line filter and a 1-A fuse.

**TURN ON, TURN OF TRANSIENTS** <5% of nominal output.

### 2.2. CONTROLS

**POLARITY SELECTION** A set of four internal jumpers must all be set to select either positive or negative output polarity before the Model 495 is installed in the bin.

**ADJUST** A front panel screwdriver control permits the output dc level to be adjusted within the range of ~4.5 V to the overvoltage crowbar sensitivity level (nominal 6.8 V).

## 2.3. MECHANICAL

### WEIGHT

**Net** 1.2 kg (2.7 lb).

**Shipping** 2.7 kg (6.1 lb).

**DIMENSIONS** NIM-standard single-width module, 3.43 X 22.13 cm (1.35 X 8.714 in.) Per TID-20893 (Rev).

## 3. INSTALLATION

### 3.1. GENERAL

The ORTEC 495 Power Supply is normally used in conjunction with other modular electronics and is installed in a standard bin and power supply such as the ORTEC 4001A/4002A. The bin and power can be rack-mounted together with other equipment. Therefore, any other equipment that may be installed in the same rack must be sufficiently cooled by circulating air to prevent any localized heating in the 495 circuits. The temperature of equipment installed in racks can easily exceed 60°C (140°F) unless precautions are taken to prevent this from happening, and the 495 circuits may be damaged if they are exposed to such heat levels.

### 3.2. OUTPUT POLARITY SELECTION

#### WARNING

**Insure that all four jumpers are set properly. Damage will result to the instrument if all four jumpers are not set to the same polarity.**

The output polarity of the 495 is determined by the setting of two pairs of jumpers, W1 and W2, on the PWB. Access to the jumper locations is obtained by removing the left side panel of the module (viewed from the front). The two alternate locations for each of the four jumpers are marked on the left side panel.

#### WARNING

**Return the side panel and secure it in place before placing the 495 in a bin for operation; potentially lethal voltage is present on the surface of the PWB when power is supplied to the module.**

### 3.3. NIMBIN WIRING CHECK

The NIMBIN designated for mating with the 495 should be checked for proper wiring before installing the 495. Follow the procedure given below, starting with the NIMBIN power Off.

1. Using an ohmmeter, check for continuity between the NIMBIN front panel +6 V test point and pin 10 of every module connector on the NIMBIN.
2. Similarly, check for continuity between the NIMBIN front panel -6 V test point and pin 11 of every module connector on the NIMBIN.
3. Turn on the NIMBIN power switch with the 495 not yet installed.
4. Using a dc-voltmeter, check for 0 V at the NIMBIN front panel +6 V and -6 V test points.
5. Turn Off the NIMBIN power switch.
6. Should any test result differ from the above description, contact ORTEC Customer Service at 865/483-2231 or your local affiliate.

### 3.4. INSTALLATION IN NIMBIN

The 495 can be installed in any unoccupied module position in any standard NIMBIN. When it has been installed properly, it will be turned on automatically when ac power is turned on to the bin and power supply, and the generated dc level is provided through the rear panel connector into the bin distribution circuit. If the 495 output polarity has been set for positive voltage, the output is provided to pin 10 of the bin distribution bus. If the polarity is negative, the output is provided to the pin 11 bus. Ground for either output polarity is provided through the pin 34 bus.

If a voltage source is required for some external application other than to modules in the bin, pin plugs may be inserted into the front panel test jacks on the 495 to obtain this external dc level. Note that only one polarity is available, as indicated by the LEDs, unless both polarities are present in the bin distribution circuit.

In the event that both positive and negative polarities are desired and are to be furnished from 495 power supplies, two 495 modules can be installed in the same bin, with one set for positive output and the other for negative output. In this case, both LEDs will light on both 495 modules because both polarities are present in the bin.

## 4. OPERATION

### 4.1. NORMAL OPERATION

After checking both the polarity of the 495 and the NIM-BIN wiring according to the information in Section 3, insert it into any module location in the bin which it is to serve. When power is turned on for the bin power supply, the 495 is turned on automatically. An LED on the front panel serves as a monitor of the polarity that is being furnished into the bin.

### 4.2. RESTORATION AFTER AUTOMATIC SHUTDOWN

In the event of an overvoltage output condition, an internal crowbar protection will automatically short the output voltage to zero, and the front panel monitor LED will turn off. This condition is

unlikely unless the front panel Adjust control has been advanced to produce a higher voltage level. If the condition should occur, simply turn off the power to the bin power supply or pull the module from its location in the bin to remove the ac input voltage to the module. If appropriate, reduce the setting of the Adjust control and apply ac power to the module again. The generated voltage level can be monitored at the front panel test points.

If the current demand from any load that is imposed on the 6 V supply should exceed 6 amperes, an internal foldback circuit in the 495 will limit the current to the safe limit by lowering the output voltage. The front panel monitor LED will turn off to indicate this condition.

## 5. MAINTENANCE AND TESTING

### CAUTION

Voltages are present in this instrument that are hazardous. Do not attempt to operate the 495 power supply while the side cover is removed.

NOTE: If the main bin and power supply provides both of these levels, both LEDs will light and the operation of the 495 cannot be tested.

### 5.1. TEST EQUIPMENT REQUIRED

Nuclear Standard Bin and Power Supply such as the ORTEC 4001A/4002A.

Oscilloscope with sensitivity of 5 mV/cm

Digital voltmeter

Schematic of the 495 power supply

### 5.2. PERFORMANCE TESTS

1. Install the 495 power supply in a bin and power supply. Turn on power for the bin.
2. Observe the front panel LED indicators. Either the +6 V or the -6 V LED should be lit to indicate that an output is being generated.

3. Measure the output voltage level at the front panel test points using a digital voltmeter. If desired, use a screwdriver to change the setting of the front panel Adjust control.
4. An oscilloscope can be connected at the front panel test points to check for ripple in the output without interfering with operation of the other modules that may also be installed in the bin.

### 5.3. TROUBLESHOOTING SUGGESTIONS

1. Ensure that the proper ac input voltage is being supplied to the 495. It requires a nominal 117 V ac input through bin pins 33 and 41.
2. Check the ac input fuse on the rear panel of the 495. Replace, if necessary, with a 1-A fuse.

3. If the output voltage has exceeded the crowbar trigger level, neither front panel LED will light. To restore operation, remove the ac power input from the 495 and then turn it on again.

#### **5.4. FACTORY REPAIR SERVICE**

This instrument can be returned to the ORTEC factory for service and repair at a nominal cost. Our standard procedure for repair includes the same quality control and checkout that are used for a new instrument. Always contact the Customer Service Department at ORTEC, 865/483-2231, before sending in an instrument for repair.

**Bin/Module Connector Pin Assignments  
For Standard Nuclear Instrument Modules  
per DOE/ER-0457T.**

Pin	Function	Pin	Function
1	+3 V	23	Reserved
2	-3 V	24	Reserved
3	Spare bus	25	Reserved
4	Reserved bus	26	Spare
5	Coaxial	27	Spare
6	Coaxial	*28	+24 V
7	Coaxial	*29	-24 V
8	200 V dc	30	Spare bus
9	Spare	31	Spare
*10	+6 V	32	Spare
*11	-6 V	*33	117 V ac (hot)
12	Reserved bus	*34	Power return ground
13	Spare	35	Reset (Scaler)
14	Spare	36	Gate
15	Reserved	37	Reset (Auxiliary)
*16	+12 V	38	Coaxial
*17	-12 V	39	Coaxial
18	Spare bus	40	Coaxial
19	Reserved bus	*41	117 V ac (neutral)
20	Spare	*42	High-quality ground
21	Spare	G	Ground guide pin
22	Reserved		

Pins marked (\*) are installed and wired in ORTEC's 4001A and 4001C Modular System Bins.