



**Model 4001C  
Modular System Bin  
Operating and Service Manual**

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This manual applies to instruments marked  
"Rev 19" on rear panel

# Standard Warranty

for  
EG&G ORTEC Instruments

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## Quality Control

Before being approved for shipment, each EG&G 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

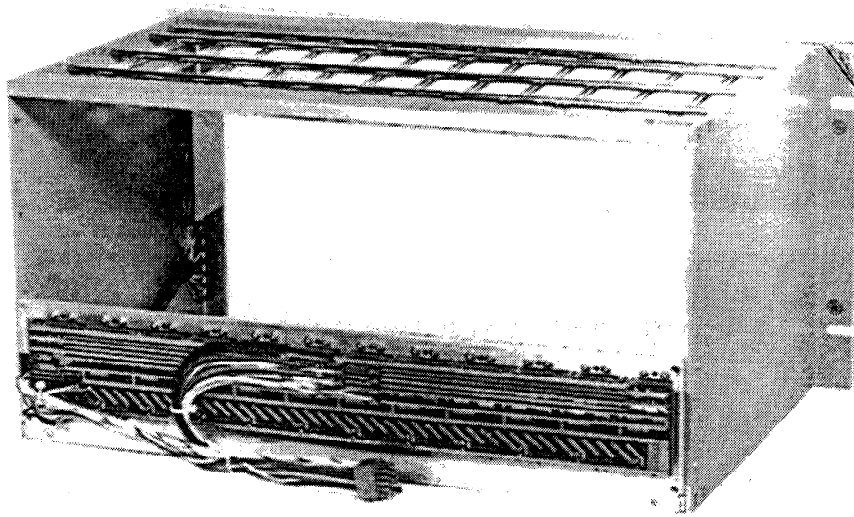
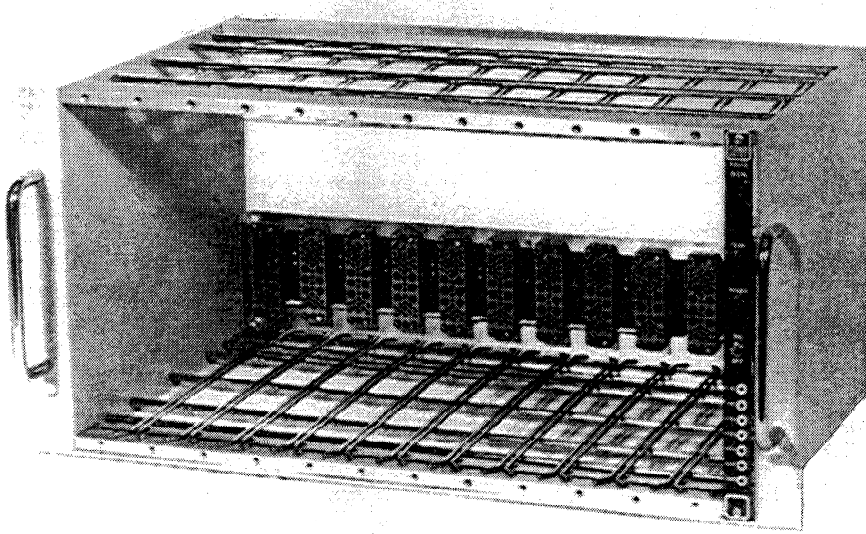
If it becomes necessary to return this instrument for repair, it is essential that Customer Services be contacted in advance of its return so that a Return Authorization Number can be assigned to the unit. Also, EG&G ORTEC must be informed, either in writing, by telephone [(423) 482-4411], or by facsimile transmission [(423) 483-0396], 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 EG&G 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 nearest EG&G 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 will be repaired at the standard charge unless they have been grossly misused or mishandled, in which case the user will be notified prior to the repair being done. A quotation will be sent with the notification.

## 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 EG&G 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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## EG&G ORTEC 4001C MODULAR SYSTEM BIN

### 1. DESCRIPTION

#### 1.1. AEC STANDARD MODULE PROGRAM

The EG&G ORTEC 4001C Modular System Bin is compatible with the recommended standards of the "Standard NIM Instrumentation System" Report DOE/ER-0457T. This report provides standards for a modular instrument system that allow electrical and mechanical interchangeability of units made in conformance with the standards. The standards prescribe the necessary mechanical dimensions and connector types to ensure mechanical interchangeability. They also specify standard power supply voltages and pin assignments in the connectors so that electrical interchangeability is assured, at least with respect to the main connector joining module to bin.

The Model 4001C Bin is constructed of wire-form grids to ensure unimpeded ventilation for the instruments that are operated in the bin. The adjustment-free modules guides are superior to the requirements specified in DOE/ER-0457T. These hardened steel guides feature generous openings, and because of their highly-polished nickel plating, offer a low friction coefficient. Aluminum alloy side plates are precision-formed and protected with a painted finish. Either the Model 4002A or 4002D Power Supply may be attached to the precision-stamped plated-steel connector mounting plate.

The Model 4001C Bin distributes all dc and ac power from the power supply to the module connectors. Very low impedance levels are provided by the use of heavy-duty copper bus bars, wire, and printed wiring board (PWB), ensuring a uniform voltage output to even high-power modules. Also available by special order is a wired-bus bin which enables the user to adapt the standard wiring to meet special needs.

The standards currently specify power supply voltages of plus and minus 6, 12, and 24 V dc and of 117 V ac delivered to assigned module connector pins. The available current specified to each pin has undergone some change with successive issues of the standards. Refer to the most recent issue of DOE/ER-0457T and addenda for current requirements. Also, since power supplies of earlier manufacture conformed to earlier versions of the standards, the user should become familiar with the specifications of the particular supply in use to determine the available current at each voltage.

Twelve basic module widths of 3.43 cm (1.35 in.) each are provided in a standard bin. Modules may be of single width or any multiple thereof as required by the individual module design. However, all 12 module connectors are provided in the standard bin, allowing any desired combination of module location. Two module and bin heights are provided by the standards: 22.23 cm (8-3/4 in.) and 13.34 cm (5-1/4 in.). These standard heights, as well as the basic external mounting dimensions of the bin, conform to the established ASA standards for relay rack mounting of electrical equipment. Therefore the DOE/ER-0457T standard bins will mount in standard relay racks along with other rack-mounted equipment.

The DOE/ER-0457T standards deal only with requirements for electrical and mechanical interchangeability. They do not deal with circuit designs or methods except to the extent of the power supply voltage standards.

In addition to the firm requirements designated as "Standards" in DOE/ER-0457T, there are "Preferred Practices" which deal with subsidiary matters in the interest of suggested further compatibility. Included in the Preferred Practices are standard linear and logic signal parameters which, if observed, allow compatible interconnections between instruments.

#### 1.2. EG&G ORTEC MODULAR INSTRUMENTS

EG&G ORTEC modular nuclear instruments conforming to the standards of DOE/ER-0457T are designed for insertion and operation in a Model 4001C Bin with an attached mating power supply. In addition to meeting the basic requirements of DOE/ER-0457T, each EG&G ORTEC module also provides two additional compatibility features:

1. Where applicable, the standard linear and logic signal parameters of the Preferred Practices of DOE/ER-0457T are used, providing compatible interconnections between instruments.
2. The power supply demand of any given EG&G ORTEC module is generally limited to no more than its proportional share of the occupancy of bin space. In this way, the user does not have to compute the power supply total demand and compare this to the capability of the supply.

These EG&G ORTEC instrument modules are made only in the 22.23 cm (8-3/4 in.) high standard module package. The panel space requirements of this type of research instrumentation have precluded the use of the smaller 13.34 cm (5-1/4 in.) standard height.

### 1.3. EG&G ORTEC 4001C MODULAR SYSTEM BIN

The EG&G ORTEC 4001C Modular System Bin provides mounting space for 12 standard module widths of the 22.23 cm (8-3/4 in.) high type. The 12 corresponding module connectors are provided with necessary wiring for distribution of all of the standard power supply voltages. The Model 4001C Bin has standard power supply voltages that are distributed to the module connectors through bus bars. These power distribution circuits terminate in the standard connector prescribed by DOE/ER-0457T for connection to the power supply. A small control panel, not occupying any of the available module space, is located at the right

side of the bin, providing test points, a control switch, and indicator lamps for the power supply. Further description of the Model 4001C Bin is given in the remaining sections of this manual.

### 1.4. POWER SUPPLY CONSIDERATIONS

The power supply provisions of DOE/ER-0457T allow either a supply mounted on the rear of the standard bin or an external supply, possibly furnishing power to several standard bins. Specified mounting-screw dimensions and a standard power connector make the bin-mounting power supplies interchangeable when they are made to the DOE/ER-0457T standards.

The EG&G ORTEC Model 4002A or 4002D Power Supply, which conforms to the requirements of DOE/ER-0457T in force at time of manufacture, is usually furnished with the Model 4001C Bin. Please refer to the instruction manual provided with these power supplies.

## 2. SPECIFICATIONS

**MECHANICAL TOLERANCES** In accordance with DOE/ER-0457T, provide for interchangeability of all standard modules.

**PANEL DIMENSIONS** Standard relay rack, 22.23 cm (8-3/4 in.) high, 48.26 cm (19 in.) wide.

**DEPTH BEHIND PANEL** Without power supply, 26.6 cm (10.5 in.); with Model 4002A Power Supply, 40.6 cm (16.0 in.); with Model 4002D Power Supply, 53.5 cm (21.1 in.).

**MODULE CONNECTORS** 12 connectors each as specified by DOE/ER-0457T.

**INSTALLED WIRING** All connectors of the Model 4001C are wired in parallel for +6 V, -6 V, +12 V, -12 V, +24 V, -24 V, high-quality power return and 117 V ac, in accordance with DOE/ER-0457T pin assignments, with interface connector furnished for

connection to power supply as required by DOE/ER-0457T. The Model 4001C is equipped with PWB with copper bus bars on the +6 V, -6 V, +12 V, -12 V, +24 V, -24 V (AWG #14 equivalent) and for the power ground return (AWG #10 equivalent).

**CONSTRUCTION** Aluminum alloy side members with nickel-chromium-plated handles on front panel mounting flanges. Top and bottom members are high-tensile steel rod weldments, nickel-plated, containing module guides. Rear connector plate is steel, cadmium-plated.

### WEIGHT

**Net** Model 4001C, 4.5 kg (10 lb); with Model 4002A Power Supply, 10.5 kg (23 lb); with Model 4002D Power Supply, 15.8 kg (35 lb).

**Shipping** Model 4001C, 7.3 kg (16 lb); with Model 4002A Power Supply, 14 kg (30 lb); with Model 4002D Power Supply, 23.2 kg (51 lb).

## 3. INSTALLATION INSTRUCTIONS

### 3.1. POWER SUPPLY INPUT VOLTAGE

The EG&G ORTEC Model 4002A or 4002D Power Supply that usually accompanies the Model 4001C Bin may be used on either 117 V or 230 V, 50 or 60 Hz, input power. The conversion from one voltage to the

other is accomplished by a slide switch located on the rear of the power supply and labeled as to voltage choice. However, it is prudent to check this switch for proper setting before operating the supply on 230 V. The power transformer is tapped for a simple conversion to 100 V or 200 V input levels.

Note that when the power supply is operated from 117 V input power, a direct connection provides the 117 V ac power to the assigned pins in the module connectors and the amount of 117 V power available is limited only by the fuse. However, when input power is 230 V, the 117 V ac power provided for the module connectors is limited by transformer ratings in the power supply, as stated in the power supply specifications.

The fuse supplied in the power supply is the proper one for input voltage selection as shipped. If a field change of input voltage is made, the proper fuse change should be made as outlined in the power supply instruction manual.

### 3.2. INSTALLATION IN RACK

The mounting provisions of the Model 4001C Bin conform to the well-established ASA standards for rack-mounting equipment. The mounting holes at the edge of the panel will match the standard spacing of tapped 10-32 holes provided in the standard relay rack. The use of the usual oval-head screws and cup washers is recommended. Mechanical support of the bin may be entirely from the panel members. However, the use of horizontal guide brackets to support the bottom of the bin will facilitate removal of the bin from the rack and will remove strain from the bin and rack.

The basic design of the DOE/ER-0457T standard bin and modules provides for cooling by natural convection flow. Several bins can be mounted above each other without heat problems in the usual installation. However, one should not mount heat-producing vacuum tube equipment or other large sources of heat in the same cabinet with the standard bin without accounting for the temperature use.

The use of cooling fans in equipment cabinets will reduce the operating temperature of the enclosed equipment. However, it will also invariably couple the circuits involved more tightly to the temperature variations of the environment. In systems installations requiring the ultimate in stability of operating parameters, the best practice is to provide only for natural convection cooling of the equipment. This provides long time constants between the equipment and external temperature variations, with resultant smaller variations, even though the average absolute temperature may be higher.

EG&G ORTEC modules are designed with all major signal connections on the front panel; in some cases it is necessary to locate connections on the rear of the module due to panel space limitations. If systems are contemplated that require use of rear panel connections to any great extent, the user may find it convenient to leave open gaps between installed bins for convenience in making front-to-rear connections.

## 4. OPERATING INSTRUCTIONS

### 4.1. CONTROL PANEL FUNCTIONS

**ON-OFF** Switch interrupts both sides of the input power line.

**POWER** Pilot lamp indicates that ac input power is being supplied to the power transformer primary. Either a blown fuse or a temperature cutout will extinguish this lamp.

**TEMP** Warning pilot lamp is illuminated if the power supply temperature rises to within  $\sim 20^{\circ}\text{C}$  of the maximum safe operating temperature. When the maximum safe temperature is reached, an internal cutout in the power supply removes power and neither lamp will be illuminated.

**TEST JACKS** Located on the panel; allow convenient checking of the power supply voltages from the front panel without disassembly of the supply.

### 4.2. POWER SUPPLY LIMITATIONS

The available current at each voltage is dependent on

the power supply. Since the requirements of DOE/ER-0457T have been changed from time to time, the actual capability of any given power supply will depend on its date of manufacture. The instruction manual for the particular power supply in use should be consulted.

The power requirements of individual modules are stated on their front panels. The user should verify that the power supply capability is not exceeded in any given system in one bin.

### 4.3. INSERTION AND REMOVAL OF MODULES

No damage will result to the power supply from insertion or removal of modules while power is on. However, since the sequence of power application to a module is indeterminate when inserted with bin power on, it is prudent to turn off the bin power when modules are being changed or inserted.



## 5. CIRCUIT DESCRIPTION

The bin circuit consists only of passive power distribution wiring. The accompanying wiring diagram (Dwg. No. 679010) provides full information on the wiring. Connector pins are soldered directly to the PWB used for distributing power to the module connectors. Copper bus bars are used on the PWB to provide very low impedance paths for bin currents.

The power supply circuit description is contained in the Model 4002A or 4002D Power Supply instruction manual.

Note the provisions of two "ground" connections in the module connector. Pin 42 is a "high quality ground," and Pin 34 is the "power return ground." The intent is that the high quality ground normally carry negligible current and serve as the reference ground in sensing circuits.

The pins in the module are assigned according to a schedule. Refer to DOE/ER-0457T for details on pin assignments.

### BIN/MODULE CONNECTOR PIN ASSIGNMENTS FOR STANDARD NUCLEAR INSTRUMENT MODULES PER DOE/ER-0457T

| Pin | Function     | Pin | Function             |
|-----|--------------|-----|----------------------|
| 1   | +3 volts     | 23  | Reserved             |
| 2   | -3 volts     | 24  | Reserved             |
| 3   | Spare Bus    | 25  | Reserved             |
| 4   | Reserved Bus | 26  | Spare                |
| 5   | Coaxial      | 27  | Spare                |
| 6   | Coaxial      | *28 | +24 volts            |
| 7   | Coaxial      | *29 | -24 volts            |
| 8   | 200 volts dc | 30  | Spare Bus            |
| 9   | Spare        | 31  | Spare                |
| *10 | +6 volts     | 32  | Spare                |
| *11 | -6 volts     | *33 | 117 volts 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 volts    | 38  | Coaxial              |
| *17 | -12 volts    | 39  | Coaxial              |
| 18  | Spare Bus    | 40  | Coaxial              |
| 19  | Reserved Bus | *41 | 117 volts ac (Neut.) |
| 20  | Spare        | *42 | High Quality Ground  |
| 21  | Spare        | G   | Ground Guide Pin     |
| 22  | Reserved     |     |                      |

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