Model 729A
Liquid Nitrogen Level Monitor
Operating and Service Manual

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Manual Revision D

1202

Advanced Measurement Technology, Inc.

a/k/a/ ORTEC®, a subsidiary of AMETEK®, 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.

CONTENTS

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.

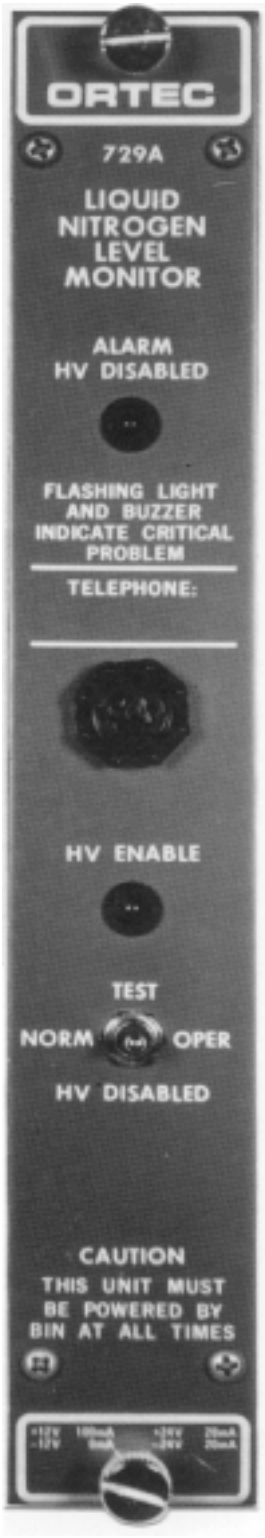
Cleaning Instructions

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
729A
LIQUID
NITROGEN
LEVEL
MONITOR
ALARM
HV DISABLED
FLASHING LIGHT
AND BUZZER
INDICATE CRITICAL
PROBLEM
TELEPHONE:
HV ENABLE
TEST
NORM
OPER
HV DISABLED
CAUTION
THIS UNIT MUST
BE POWERED BY
BIN AT ALL TIMES


SENSOR
BALANCE
ADJ
INTERLOCK
OUTPUT

ORTEC MODEL 729A
LIQUID NITROGEN LEVEL MONITOR

1. DESCRIPTION

The ORTEC 729A Liquid Nitrogen Level Monitor is a NIM-standard single-width module used to sense whether or not the supply of liquid nitrogen in a dewar is adequate to maintain the temperature of a cryogenic detector. Some detectors will be damaged if allowed to warm up while others can be warmed up but must not have bias applied unless they are cold. For either class of cryogenic detector, the 729A provides protection to the detector if the supply of liquid nitrogen in the dewar is permitted to become depleted.

When the liquid nitrogen level drops too far in the dewar, the 729A provides an alarm and disables the detector bias supply so that no bias voltage can be applied to the detector while there is any danger of having it warm up. The 729A module requires an accessory sensing element, which is a high-sensitivity thermistor mounted in a stainless steel tube that extends down into the dewar from its filler cap to a point about 25% from the bottom of the dewar. The sensor is connected to the module by a coaxial cable. The tube must be custom-built for each application.

A bridge-type circuit in the module is used to sense changes of resistance of the thermistor when its temperature changes. When the supply of liquid nitrogen in the dewar is deep enough to immerse the end of the probe, the thermistor is cold and the bridge is balanced. If the liquid nitrogen level becomes depleted enough that the probe is no longer immersed, the thermistor warms and unbalances the bridge. Then a front panel red light flashes, a buzzer sounds, and the detector bias supply is disabled. The module goes into the alarm condition when the sensor temperature rises approximately 10°C. A front panel switch has a setting that can be used to disable the detector bias when this is required and also has a spring-loaded setting that permits the operator to test the alarm conditions during normal operation.

When the warning circuit is triggered, an intermittent buzzer sounds and a red light flashes on the front panel of the module. The intermittent alarm indication by the buzzer and light can, also indicate that the sensor has not been connected or that its circuit has been either shorted or opened.

Power for the sensing circuit is obtained from the bin and power supply into which the 729A is installed. For fail-safe protection, internal batteries are normally installed in the module and they will sound the buzzer and light the alarm indicator continuously if operating power is not being furnished from the bin and power supply. A slide switch, labeled Ship and Use, is accessible through the side panel. With the switch set at ship, the internal battery circuit is disconnected. When the unit is ready for installation in a bin and power supply and the internal battery is installed, this switch must be set at Use to provide the normal protection functions; failure to set the switch at Use will also signal a continuous alarm when power is applied from the bin and power supply.

Normally, when a warning is indicated by the 729A, the liquid nitrogen level in the dewar is low and a detector warmup is imminent unless the supply is replenished. A damaged or disconnected probe will also activate the alarm circuit.

2. SPECIFICATIONS

2.1. INPUT

SENSOR Rear panel BNC connector accepts the cable from the sensing element.

2.2. OUTPUTS

INTERLOCK OUTPUT Rear panel BNC connector for cable to the Remote Shutdown connector on the detector bias supply module such as the ORTEC 743 or 459. Clamps high voltage power supply output to zero when alarm condition is present or when front panel switch is set at HV Disabled.

AUDIO ALARM Warning buzzer mounted at the center of the front panel sounds when the alarm circuit is activated.

ALARM - HV DISABLED Flashing red light on front panel indicates that the alarm circuit is activated.

HV ENABLE Red monitor light on front panel indicates that the signal through the interlock output permits operation of the 743 or 459.

2.3. CONTROLS

TEST/NORM-OPER/HV DISABLED Front panel toggle switch permits normal operation when set at its center position. The switch can be set at Test to check for response of the warning indications and is spring-loaded to return to the Norm-Oper position. The switch can be set at HV Disabled to provide the interlock output signal that clamps the 743 or 459 output at zero; this setting does not affect the alarm circuit.

BALANCE ADJ Rear panel screwdriver control adjusts the sensitivity level of the sensor and bridge circuit to determine the alarm threshold.

SHIP/USE Internal slide switch accessible through the side panel. Set at Ship, the alarm circuit is not activated unless power is applied to the module. Set at Use, the alarm circuit is activated as intended when power is applied to the module; providing the internal batteries are not removed, the alarm is also activated when power is not furnished from the bin to the module.

2.4. ELECTRICAL AND MECHANICAL

POWER REQUIRED (Furnished from NIM-standard bin and power supply.)

+12 V, 100 mA; +24 V, 20 mA; -24 V, 20 mA.

Two internal nickel-cadmium rechargeable battery cells provide a battery backup against power failure; the 729A is normally furnished with the cells installed unless otherwise indicated.

DIMENSIONS NIM-standard single-width module (1.35 by 8.714 in. front panel) per DOE Report TID-20893.

2.5. ACCESSORY

SENSING ELEMENT AND CABLE Custom-built thermistor probe mounted in a 0.200-in. diameter stainless steel tube, extends from the dewar cap to a point about 25% from the bottom of the dewar. A standard BNC coaxial cable connects the sensing element to the 729A module.

3. INSTALLATION

CAUTION

This instrument is intended for use with only ORTEC cryogenic detector systems. ORTEC does not assume or accept responsibility for damage caused by failure of this instrument other than warranty repair of this unit.

3.1. POWER CONNECTION

The ORTEC 729A requires dc power from a Nuclear-standard Bin and Power Supply such as the ORTEC 4001/4002 Series. Turn off the power in the Bin and Power Supply before inserting or removing modules. The ORTEC series of instruments are designed so that the bin power supply is not normally overloaded with even a full complement of modules installed in the bin. Convenient test points are provided on the power supply control panel to monitor the dc voltages and determine that an overload has not occurred. Each voltage should read within ±0.5% of its rated output under load.

Just before the module is inserted into the bin, move the slide switch, available through the left side panel, from Ship to Use. If batteries are installed in the module, the warning signal will occur and will continue until bin power has been applied, the sensor probe has been connected, and the sensor is immersed in liquid nitrogen. When the 729A is to be used in an ORTEC Delphi system, it is furnished without internal batteries; the switch available through the side panel should be set at Use whether batteries are included or not.

3.2. SIGNAL CONNECTION

The liquid nitrogen level sensor must be connected to the Sensor connector on the rear panel of the 729A. Use the standard coaxial cable with BNC connectors that is furnished for this purpose. The sensor connector on the probe is located on the side of the fill collar on ORTEC Models 80, 81, and 84, or in the center of the dewar cap on ORTEC Models 85 and 86.This cable may be run with the cable bundle along with the preamplifier power and signal cables.

3.3. DETECTOR BIAS SUPPLY CONNECTION

Connect a coaxial cable from the Interlock Output on the 729A rear panel to the Remote Shutdown connector on the 743 or 459 rear panel.

3.4. INITIAL CONTROL SETTING

Set the front panel toggle switch of the 729A at Norm-Oper when the system has been connected and the bias supply is to be operated. When the bias supply can be used, the HV Enable monitor light on the 729A lights to show the condition.

CAUTION

Never allow an alarm signal in the 729A to continue without correction.

4. OPERATING INSTRUCTIONS

4.1. INITIAL SETUP

During installation, the alarm circuit will be activated under normal conditions. If the internal batteries are included in the 729A, the alarm will be continuous from the time the Ship/Use switch is set at Use until power is applied to the bin and power supply in which the module is installed; the alarm will continue on an intermittent basis. When the sensor is then immersed in liquid nitrogen and its cable is attached to the rear of the 729A module, the alarm should be turned off unless the Balance Adj control needs adjustment. When all conditions are correct, the Balance Adj control can be adjusted until the warning signal stops. The control was adjusted at the factory just prior to shipment and should not normally require any readjustment at the time of installation.

If internal batteries are not included in the module, the alarm will be activated intermittently when power is furnished from the bin and power supply and will continue until all conditions are correct.

The front panel toggle switch on the 729A can be set at HV Disabled initially to inhibit operation of the 743 or 459 bias supply until the recommended delay interval has elapsed following addition of liquid nitrogen into the dewar. See the instructions for the detector to determine how long this delay interval should be.

4.2. REFILLING DEWAR

If the buzzer alarm and light indicate intermittently, at about 1 Hz, set the front panel toggle switch at HV Disabled and refill the dewar with liquid nitrogen immediately. The warning signal will continue until the liquid nitrogen level is again above the sensor location in the dewar.

After the sensor has been immersed in liquid nitrogen, the alarm condition will be discontinued. Then, after the required delay interval following the refill (typically 20 minutes), return the toggle switch to its center Norm-Oper setting. The front panel monitor lights indicate enable or disable conditions that are furnished to the Interlock Output circuit.

4.3. NORMAL OPERATION

Power should be left turned on for the bin and power supply in which the 729A is installed. This maintains the warning system whether the associated detector is being used or not and prevents the occurrence of accidental warmups. If power is turned off for any reason and the internal batteries are installed in the 729A, the warning system can still provide a continuous alarm indication for a period of at least 30 hours.

When desired, the toggle switch can be set at Test to check the responses of the alarm circuit. This will not interrupt the high voltage enable condition, but it will sound the buzzer and light the HV Disabled indicator LED. When the switch is released, it returns to the center Norm-Oper setting. A small dip in the high voltage level should occur when the switch returns to its Norm-Oper setting.

5. MAINTENANCE

The 729A Liquid Nitrogen Level Monitor should require no regular maintenance other than replacement of components that have failed due to age. Always ensure that replacement components are equivalent to the original parts.

This instrument may be returned to the ORTEC factory at any time for repair service at a nominal cost. The standard procedure for repair includes the same extensive quality control tests that are used for anew instrument. Please contact Customer Services at the factory, (865) 482-4411, before sending in an instrument for repair so that the required Return Authorization Number can be assigned to the instrument. Include this number on the shipping carton and on any communication regarding the instrument so that it will receive prompt attention at the factory.

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.