

**Model 9306
1-GHz Preamplifier
Operating and Service Manual**

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.

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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.

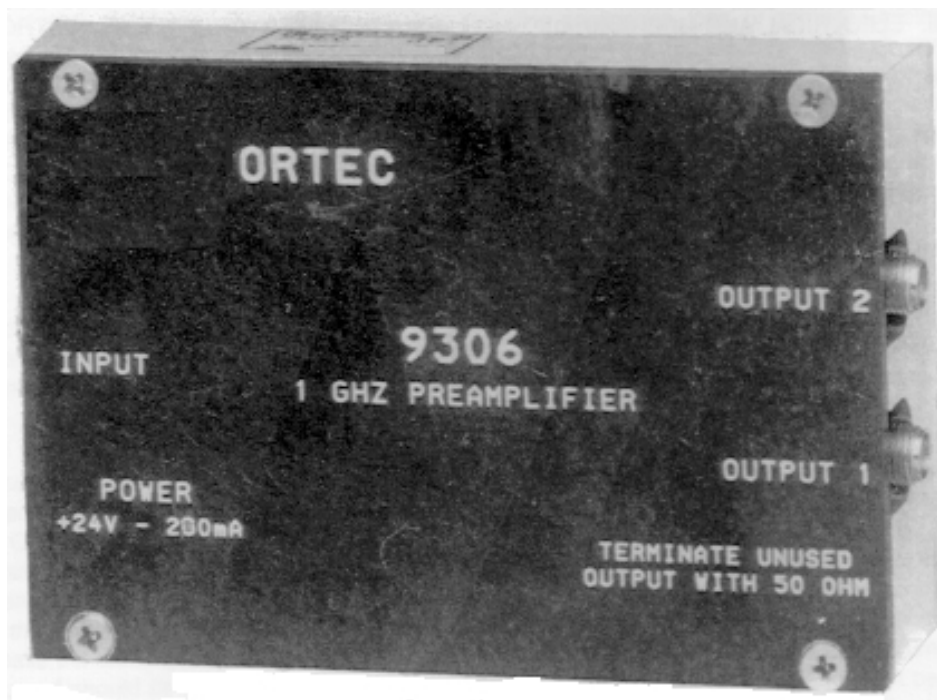
Cleaning Instructions

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 9306 1-GHz PREAMPLIFIER

1. DESCRIPTION

The ORTEC Model 9306 1-GHz Preamplifier is optimized for fast timing and counting applications with detectors that deliver pulses with ultra-fast rise times. An output rise time of 350 ps and a non-inverting gain of 100 make the Model 9306 ideal for use with microchannel-plate photomultipliers, microchannel plates, channeltrons, silicon diodes, fast photomultiplier tubes, and electron multipliers. The compact preamplifier case with captive power cord permits close coupling to the detector to minimize sensitivity to environmental noise.

To preserve the ultra-fast rise time, the Model 9306 is designed to accept and deliver signals on high-quality, 50-ohm, coaxial cables with SMA connectors and 50-ohm terminations. The input is

ac-coupled with a 50-ohm input impedance, and is protected to a maximum of ± 1 V. Two identical outputs are provided for convenient, simultaneous connection to two different instruments. Both outputs are ac-coupled, short-circuit protected, and capable of driving pulse amplitudes from 0 to -2 V into 50-ohm loads.

The 1-GHz Preamplifier derives its $+24$ -V dc power from a NIM module or power supply via the captive power cord and standard, 9-pin, D connector. The ORTEC Model 4002P Portable Power Supply and most NIM amplifiers provide the required power on a compatible preamplifier power connector.

2. SPECIFICATIONS*

2.1. PERFORMANCE

All specification are measured with a pulser having a pulse width of 2 ns FWHM, and a rise time of 150 ps. Where significant, the measurement is corrected for the rise times of the pulser, coaxial cable, and oscilloscope. The specifications are identical for OUTPUTS 1 and 2.

GAIN Nominally 100 (50 to 150), non-inverting, into a 50-ohm output load.

OUTPUT RISE TIME Typically 350 ps.

BANDWIDTH (3 dB) Typically 100 kHz to 1 GHz.

NOISE <100 μ V rms equivalent input noise over the full bandwidth.

2.2. INPUTS AND OUTPUTS

INPUT SMA input connector with 50 ohms input impedance (ac-coupled). Input protected to a maximum of ± 1 V.

OUTPUT 1 SMA output connector provides a linear output range from 0 to -1.75 V and a maximum output of -2 V into a 50-ohm load. Output impedance is 50 ohms, ac-coupled, and short-circuit protected. The unused output must be terminated with a 50-ohm load for proper operation of the other output. An optional SMA 50-ohm terminator is available for this purpose.

OUTPUT 2 Identical to OUTPUT 1

POWER Input power supplied through a captive cable (length: 3 m) with a standard preamplifier power connector (9-pin D type). Compatible with ORTEC instruments that provide a preamplifier power connector.

2.3. ELECTRICAL AND MECHANICAL

POWER REQUIRED $+24$ V at 200 mA. Captive power cord with standard 9-pin D connector derives power from any ORTEC instrument equipped with the standard Preamplifier Power plug (e.g., spectroscopy amplifiers, 4002P Portable Power Supply, etc.).

*Specifications subject to change without notice.

2.4. WEIGHT

Net 0.2 kg (0.4 lb).

Shipping 1.1 kg (2.4 lb).

DIMENSIONS Aluminum housing 9.5 × 6.4 × 2 cm
(3.75 × 2.5 × 0.8 in.).

3. INSTALLATION AND OPERATION

The Model 9306 Preamplifier contains no internal power supply and must obtain power from a separate supply such as that provided in NIM standard supplies. The 9306 comes equipped with a captive power cable that mates directly with the preamplifier power output connectors provided on many NIM instruments. The power supply should be turned off while the 9306 is connected or disconnected.

If only one output of the 9306 is to be used, the other output should be terminated with a 50-ohm terminator. A 50-ohm, SMA terminator is available as an option. Also, it is important to note that it is not possible to provide input over-voltage protection at such high frequencies.

Therefore, the magnitude of the input signal must be less than 1 V. Excessive input voltages will damage the 9306.

To utilize the high-frequency performance of the 9306, careful signal handling is required. The input and output cables for the 9306 should be short, high-quality, 50-ohm cables, since only a few meters of lossy cable will degrade the signal rise time. Keep the sum of the input and output cable lengths less than 1.7 meters to avoid degradation of the signal rise time. The output cable from the 9306 should be terminated with a 50-ohm impedance that provides a good match to the cable impedance at 1 GHz.

The 9306 should not be subjected to temperatures in excess of 50°C.

4. MAINTENANCE

The 9306 requires very little maintenance other than routine removal of dust and tightening of mechanical connections.