

ORTEC[®]
MODEL 427A
DELAY AMPLIFIER

.25 μ sec
 .5 μ sec
 1 μ sec
 1 μ sec
 2 μ sec

DELAY OUT DELAY IN

DC ADJ INPUT

OUTPUT

+12V 15mA
+12V 30mA
+24V 25mA
+24V 35mA

OUTPUT
93 Ω

ORTEC 427A DELAY AMPLIFIER

NOTICE

Slide switches are used in the 427A to select the desired amount of signal delay. The contacts of these switches are coated with a lubricant to prevent them from oxidizing. If this lubricant is removed from a portion of the contact, oxidation will occur and make it difficult for the switches to make contact properly. If a switch does not make contact, the signal will either not appear at the output or appear at a reduced amplitude. When the switches do not make contact, simply operate them a few times; this will remove the oxide and restore the contacts to their proper state.

1. DESCRIPTION

The ORTEC 427A Delay Amplifier has a nominal gain of unity and can delay a linear or logic signal from zero to $4.75 \mu\text{s}$ in $0.25\text{-}\mu\text{s}$ increments. The amount of delay is selected by five front-panel switches. This delay is accomplished by inserting any combination of five delay lines of 0.25 , 0.5 , 1.0 , 1.0 , and $2.0 \mu\text{s}$ in series with the signal path. These delay lines are terminated in their characteristic impedances at both ends to minimize impedance mismatching and resultant pulse reflections on the lines.

The 427A features a gain of 1 from the input to the output. It is completely dc-coupled from the input to the output, which permits the delay amplifier to be used in high count rate circuits with excellent fidelity. Any required

baseline restoration may be accomplished at the most convenient place, either before or after the 427A.

NOTE: The 427A has a limited bandwidth as shown in the Specifications. Consequently, this instrument should not be used to delay signals of varying bandwidth. Such signals are obtained when a biased amplifier without a stretcher is used following a shaping amplifier. The ORTEC 444 Biased Amplifier has an internal stretcher that precedes the biased amplifier section and therefore produces constant bandwidth signals. In older spectroscopy systems using a biased amplifier and stretcher (the 408 and 411) the droop of the stretched output was so large that the biased amplifier had to be used before the stretcher. In these systems the 427A should follow the stretcher in the signal path.

2. SPECIFICATIONS

PERFORMANCE

GAIN Unity $\pm 2\%$ at zero delay.

GAIN VARIATION WITH DELAY $+10\%$, -2% for any combination of delays (1- μ s DRC-shaped pulse).

FEEDTHROUGH AND DELAY RIPPLE $<2\%$ (1- μ s DRC-shaped pulse).

PROPAGATION DELAY 200 ns typical.

DELAY LINE TOLERANCES $\pm 5\%$.

RISE TIME AND BANDWIDTH AS A FUNCTION OF DELAY

Delay (μ s)	Rise Time (ns)	Bandwidth (MHz)
0	280	1.25
0.25	280	1.25
0.5	290	1.20
1.0	310	1.13
2.0	340	1.03
3.0	360	0.972
4.0	370	0.945
4.5	380	0.920
4.75	400	0.875

INTEGRAL NONLINEARITY $<\pm 0.05\%$, 0 to +10V.

TEMPERATURE STABILITY Gain shift of the amplifier is $<\pm 0.01\%$ per $^{\circ}\text{C}$; additional shift of -0.013% per $^{\circ}\text{C}$ should be expected for each microsecond of delay used; operating temperature range, 0 to 50°C .

CONTROLS

LINEAR DELAY Any combination of the following: 0.25, 0.5, 1.0, 1.0, and 2.0 μ s; maximum 4.75 μ s.

DC OUTPUT LEVEL ADJ. ± 1 V.

DC OUTPUT LEVEL STABILITY 0.1 mV/ $^{\circ}\text{C}$.

INPUT AND OUTPUT CONNECTORS BNC; types UG-1094/U and UG-1094A/U.

INPUTS

POLARITY Either positive or negative.

SIGNAL SPAN ± 10 V linear range.

IMPEDANCE $>1\text{k}\Omega$, dc-coupled.

OUTPUTS

There are 2 outputs, each with a linear range of 0 to ± 10 V, 0 to ± 11 V maximum.

IMPEDANCE $<0.1\Omega$ dc-coupled, short-circuit protected, front-panel BNC; 93Ω dc-coupled, rear-panel BNC.

POWER REQUIRED

+24 V, 55 mA; +12 V, 10 mA; -12 V, 10 mA; -24 V, 50 mA.

3. INSTALLATION

3.1 GENERAL

The 427A is used in conjunction with an ORTEC 401/402 Series Bin and Power Supply, which is intended for rack mounting; therefore if vacuum tube equipment is operated in the same rack with the 427A, there must be sufficient cooling by circulating air to prevent any localized heating of the all-transistor circuitry used throughout the module. The equipment mounted in racks should not be subjected to temperatures in excess of 120°F (50°C).

3.2 CONNECTION TO POWER

Since the 427A contains no internal power supply, it must obtain power from a Nuclear Standard Bin and Power Supply such as the 401A/402A. It is recommended that the Bin Power Supply be turned off when modules are inserted or removed. ORTEC modules are designed so that the Bin Power Supply cannot be overloaded even when there is a full complement of modules in the Bin. Since this may not be true, however, when the Bin contains modules other than