

# Time-to-Amplitude Converter



- For time spectroscopy in the range from 10 ns to 2 ms
- Valid Start and Valid Conversion outputs
- Selectable output delay and width
- Output synchronized with a stop or external strobe signal
- Provision to reject unwanted start input signals
- Positive or negative input signals

The ORTEC Model 566 Time-to-Amplitude Converter (TAC) measures the time interval between pulses to its start and stop inputs and generates an analog output pulse proportional to the measured time. Timing experiments requiring time ranges from 10 ns to 2 ms may be performed, giving the experimenter flexibility in analyzing random nuclear events that occur within a selected time range. Time ranges from 50 ns to 2 ms are provided via the front-panel controls.

The Model 566's start input can be inhibited by a pulse or a dc level at the rear-panel Gate Input connector.

Valid Start and Valid Conversion outputs are provided for each accepted start and stop input, respectively. The duration of the Valid Start output indicates the interval from the accepted start until the end of reset. The Valid Conversion output occurs from the end of the internal delay after stop to the end of reset.

The selectable TAC output width and variable delay, which are easily adjusted, further serve to make the Model 566 a flexible instrument, easily adapted into many time spectroscopy systems. The output of the TAC may be synchronized with the stop signal or an external strobe signal to further enhance its versatility.

The Model 566 is dc-coupled and gated so that input count rates will not paralyze or otherwise hinder normal operation. The TAC output should be connected to the dc-coupled input of a multichannel analyzer for optimum high-count-rate performance.

## PERFORMANCE

**TIME RESOLUTION FWHM**  $\leq 0.01\%$  of full scale plus 5 ps for all ranges.

**TEMPERATURE INSTABILITY**  
 $\leq \pm 0.01\%/^{\circ}\text{C}$  ( $\pm 100$  ppm/ $^{\circ}\text{C}$ ) of full scale or  $\pm 10$  ps/ $^{\circ}\text{C}$  (whichever is greater), 0 to 50 $^{\circ}\text{C}$ .

**DIFFERENTIAL NONLINEARITY**  
Typically,  $< 1\%$  from 10 ns or 2% of full scale (whichever is greater) to 100% of full scale.

**INTEGRAL NONLINEARITY**  $\leq \pm 0.1\%$  from 10 ns or 2% of full scale (whichever is greater) to 100% of full scale.

## CONTROLS (Front Panel)

**RANGE (ns)** Three-position rotary switch selects full scale time interval of 50, 100, or 200 ns between accepted Start and Stop input signals.

**MULTIPLIER** Five-position rotary switch extends time range by a multiplying factor of 1, 10, 100, 1K or 10K.

**DELAY ( $\mu\text{s}$ )** 20-turn screwdriver-adjustable potentiometer varies the delay of the TAC output from 0.5  $\mu\text{s}$  to 10.5  $\mu\text{s}$ , relative to an accepted Stop input signal; operable in the Int Strobe mode only.



**RESET CYCLE** Fixed 1.0  $\mu$ s for X1 and X10 Multipliers, fixed 5  $\mu$ s for X100 Multiplier, and fixed 50  $\mu$ s for X1K, and X10K Multipliers. Occurs after Over Range, Strobe cycle, or Ext Strobe Reset cycle.

#### **START-to-STOP CONVERSION TIME**

Minimum  $\leq 5$  ns.

**INPUT COUNT RATE**  $>30$  MHz.

### **ELECTRICAL AND MECHANICAL**

#### **POWER REQUIRED**

##### **Logic Current Switch**

###### **$\pm 6$ V**

+24 V, 35 mA; +12 V, 70 mA; +6 V, 140 mA;  
-24 V, 50 mA; -12 V, 105 mA; -6 V, 300 mA.

###### **$\pm 12$ V**

+24 V, 35 mA; +12 V, 210 mA; -24 V, 50 mA;  
-12 V, 405 mA.

#### **WEIGHT**

Net 1.5 kg (3.3 lb).

**Shipping** 3.0 kg (7 lb).

**DIMENSIONS** NIM-standard single-width module 3.43 X 22.13 cm (1.35 X 8.714 in.) per DOE/ER-0457T.

### **OUTPUTS**

**TAC OUTPUT** Front-panel BNC connector provides unipolar pulse.

**Amplitude** 0 V to +10 V proportional to Start/Stop input time difference.

**Time** End of delay period in Int Strobe mode; prompt with Strobe input in Ext Strobe mode.

**Width** Adjustable by PWB potentiometer from  $\leq 1$   $\mu$ s to  $\geq 3$   $\mu$ s.

**Impedance**  $Z_o < 1 \Omega$ .

**Rise Time**  $\sim 250$  ns.

**Fall Time**  $\sim 250$  ns.

**VAL ST** Rear-panel BNC connector provides NIM-standard slow positive logic level signal.

**Amplitude** Nominally +5 V. Complement signal selectable by PWB jumper.

**Time and Width** From accepted Start input to end of reset.

**Impedance**  $Z_o < 10 \Omega$ .

**Rise Time**  $\leq 50$  ns.

**Fall Time**  $\leq 50$  ns.

**STROBE MODE** Two-position locking toggle switch selects either Internal or External source for initiating the strobe cycle to strobe valid information from the TAC output.

### **CONTROLS (Rear Panel)**

**GATE MODE** Two-position locking toggle switch selects Coincidence or Anticoincidence mode of operation for the Start circuitry. Start circuitry is enabled in the Coinc position or inhibited in the Anti position during the interval of Gate input signal.

**LOG CURR** Two-position locking toggle switch selects the use of  $\pm 6$  V or  $\pm 12$  V bin lines to provide current for the internal logic circuitry. In the  $\pm 6$  V position, the Model 566 is within the current allotment for a single NIM width when using a NIM Standard Class V power supply. In the  $\pm 12$  V position, the Model 566 exceeds the current allotment for a single NIM width on the +12 V and -12 V bin lines. However, this position allows the Model 566 to be used with power supplies not providing +6 V and -6 V.

### **INPUTS**

All four inputs listed below are dc-coupled, edge triggered, and printed wiring board (PWB) jumper selectable to accept either negative or positive NIM standard signals. Input impedance is  $50 \Omega$  in the negative position and  $>1k$  in the positive position. The threshold is nominally -400 mV in the negative position and +2 V in the positive position.

**STROBE** Front-panel BNC connector provides an external means to strobe a valid output signal from the TAC in the Ext Strobe mode. The input signal, exceeding threshold within the Ext Strobe reset interval after the Stop input, initiates the read cycle for the linear gate to the TAC output. Factory-set in the positive input position. Ext Strobe reset interval has a minimum value of  $\sim 0.5$   $\mu$ s and a maximum value of nominally 10  $\mu$ s.

**START** Front-panel BNC connector initiates time conversion when Start input signal exceeds threshold. Factory-set in the negative input position.

**STOP** Front-panel BNC connector terminates time conversion when Stop input signal exceeds threshold. Factory-set in the negative input position.

**VALID CONV** Rear-panel connector provides NIM-standard slow positive logic level signal to indicate a Valid Conversion.

**Amplitude** Nominally +5 V. Complement signal selectable by PWB jumper.

**Time and Width** From end of internal delay after Stop to end of reset.

**Impedance**  $Z_o < 10 \Omega$ .

**Rise Time**  $\leq 50$  ns.

**Fall Time**  $\leq 50$  ns.

**GATE** Rear-panel BNC connector provides an external means of gating the Start circuitry in either Coincidence or Anticoincidence with the Start input signal. Gate input signal must cross threshold  $\geq 10$  ns prior to the Start input signal and must overlap the trigger edge of the Start input signal. Factory-set in the positive input position.