

**Model 871  
Timer and Counter  
Operating and Service Manual**

# **Advanced Measurement Technology, Inc.**

a/k/a/ ORTEC<sup>®</sup>, a subsidiary of AMETEK<sup>®</sup>, Inc.

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## **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.

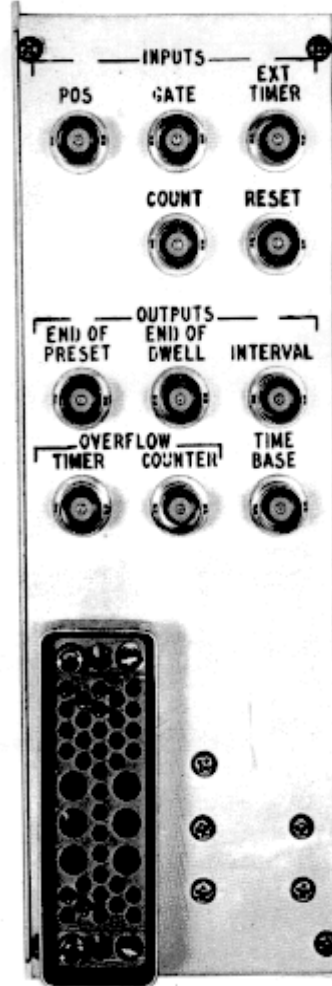
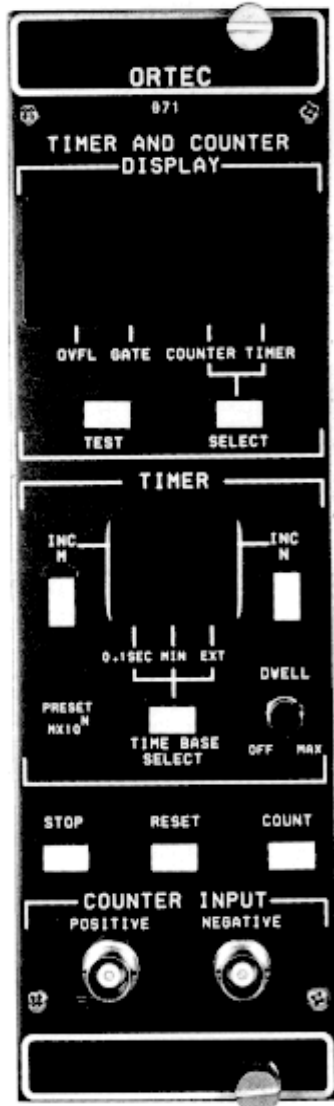
### Cleaning Instructions

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 871 TIMER AND COUNTER

## 1. DESCRIPTION

### 1.1. PURPOSE

The ORTEC 871 is a modular general purpose instrument that includes an 8-decade counter and an 8-decade presettable counter with a time base. For identification purposes, the presettable counter portion of the module is called a timer since the combination of a counter with a timer is a common class of instrument.

The 871 features great flexibility for system applications. For example, it can be used in the classic arrangement in which the presettable portion counts pulses from an internal time base and controls the total time during which the counter portion counts input pulses from some external source. In this arrangement, the 871 can be preset to count from 0.1 second to 90,000,000 minutes, or the preset feature can be turned off and the timer will count and indicate the time during which the counter is permitted to count input pulses.

For a different application, external pulses can be furnished to the presettable portion, as well as to the non-presettable counter, and a ratio of counts from two sources can be obtained by relating the accumulated count totals in the two counters. For this application, if a time measurement were desirable, it could be made with an external timer module that is started, gated, and stopped together with the 871.

The two counting portions of the 871 can be cascaded to provide a total capacity of 16 decades. If input counts are furnished into the nonpresettable counter, and its overflow is used as an external input to the presettable counter, it is possible to preset a count level with any of the eight most significant digits of the 16-digit accumulation.

For the first time, this instrument offers a new and unique arrangement of the two counting portions. It is possible to use the presettable portion as a counter and, at the same time, furnish 0.1 second pulses from the internal time base into the nonpresettable portion of the instrument. Using this arrangement, it is possible to measure the time required to accumulate a preset number of counts.

Both counting portions of the 871 accept NIM-standard slow positive logic signals. The counter section also accepts NIM-standard fast negative input logic pulses. The input count rate is guaranteed to 25 MHz with a 40-nanosecond pulse pair resolution. An overflow output pulse is available from each of the counters to be used when a capacity of more than eight decades is desired.

The count, stop, reset, and gating functions are imposed on both counting sections simultaneously.

### 1.2. GENERAL DESCRIPTION

The ORTEC 871 Counter and Timer is built into a double-width NIM module that must be installed in a NIM-standard bin and power supply, such as the ORTEC 401/402 Series, for operation. Positive inputs to the counter can be furnished through either a front or rear panel connector. The negative input to the counter is accommodated on the front panel. The positive input to the timer portion is accepted through a rear panel connector.

A Gate LED indicator in the data display area of the front panel lights when both sections of the 871 are in a counting condition. The gate is controlled by Stop and Count pushbuttons on the front panel, by the internal preset condition, and by the rear panel Gate and Count input circuits.

Reset is generated automatically when power is applied to the module from the bin and power supply. Reset can also be provided manually by pressing the front panel Reset pushbutton at any time, whether the 871 is counting or not. Reset can also be provided at any time by a signal through the rear panel Reset connector.

All eight digits for either the counter portion or the timer portion of the 871 are included in the display area at the top of the front panel. An LED below the eight digits lights to indicate whether the current reading is for the counter portion or for the timer. The Select pushbutton below the display area permits the operator to alternate between the two data sources. Also included in this display area are an LED to show when the instrument is in a

counting condition (the Gate LED lights to indicate this) and an OVFL LED that lights at the first overflow of the counting portion that is currently being displayed. Prior to the first overflow, the display has leading zero suppression. A test pushbutton can be pressed at any time to light all seven LED segments of all eight digital characters in this display area and also all seven segments of both digital characters in the display area in the Timer portion of the front panel.

The Timer portion of the panel includes the preset selectors, a time base selector, and a Dwell control. Preset is effective at a count level in the Timer portion of the instrument, and the count level is selected by the INC M and INC N pushbuttons. The display area includes two digital characters to indicate the current selection of a value for M and a value for N, and the preset level is  $M \times 10^N \times \text{Time Base Selection}$ . Pressing the INC M switch will increment the selection of a digit for M in the formula, which can be any number from 0 through 9. When  $M = 0$ , the preset feature is turned off. Pressing the INC N switch will increment the selection of a digit for N in the formula, which can be any number from 0 through 7. Thus preset can be any number that has one significant digit from  $1 \times 10^0$  through  $9 \times 10$ . When that number of counts has accumulated in the Timer portion of the 871, the instrument is gated off and stops counting in both counting sections.

The Dwell control can be rotated to select a delay of less than one second to about 15 seconds following a preset condition, during which the contents of the

counters can be read. At the end of the dwell interval, the instrument is reset and starts another counting interval immediately. If the Dwell control is turned fully counterclockwise, the instrument is not reset automatically and the data can be read at the operator's leisure before reset.

There are three sources of data from which to select the input for the timer portion of the 871. The Time Base Select pushbutton permits the operator to choose which of the sources is effective at any time, and the selection is monitored by three LEDs at the bottom of the timer display area. When 0.1 SEC is selected, the timer counts pulses that are derived from the internal crystal-controlled precision time base at 0.1 second intervals, and the 0.1 second pulses are also available at the rear panel Time Base output connector; when the 8-digit readout at the top of the front panel displays the Timer data, a decimal point is also illuminated between the first and second decades in the display. When MIN is selected, the timer counts pulses that are derived from the internal crystal-controlled precision time base at 1 minute intervals, and the one-minute pulses are also available at the rear panel Time Base output connector. When EXT is selected, the timer counts pulses that are furnished through the rear panel Ext Timer connector and the internal precision time base provides 0.1 second output pulses through the rear panel Time Base output connector; note that these output pulses are from a free-running source so they are not synchronized with the Count-Stop operation of the instrument and are not affected by any gating that may be imposed.

## 2. SPECIFICATIONS

### 2.1. PERFORMANCE

**COUNT CAPACITY** Eight decades in each of the two sections.

**COUNTING RATE** 25 Mhz guaranteed, both sections.

**TIME BASE** 0.1 second and 1 minute increments derived from a 1 Mhz crystal-controlled oscillator; instability  $<2 \text{ ppm}/^\circ\text{C}$ , 0 to  $50^\circ\text{C}$ ; inaccuracy  $<5\text{ppm}$ ; time base register controlled by counting gate.

**PULSE PAIR RESOLUTION** 40 ns minimum.

**AUTOMATIC RESET** Generated when power is applied.

### 2.2. INDICATORS

**COUNTER/TIMER DISPLAY** Contains eight characters, 7 LED segments per character, plus decimal point.

**TIMER PRESET** Contains two characters, 7 LED segments per character.

**GATE** An LED illuminates when the unit is in the counting condition.



**OVFL** An LED illuminates from the first overflow of the counter or timer that is currently being displayed.

**COUNTER** An LED illuminates when counter data are being displayed.

**TIMER** An LED illuminates when timer data are being displayed.

**0.1 SEC** An LED illuminates when the time base is 0.1 second.

**MIN** An LED illuminates when the time base is 1 minute.

**EXT** An LED illuminates when the timer section is selected to count pulses that are input through the rear panel Ext Input.

### 2.3. CONTROLS

**TEST** Pushbutton switch illuminates all seven segments in each of the ten digital characters in the displays; a character reads 8 when all seven segments are lighted.

**SELECT** Pushbutton switch in the Display portion of the front panel permits alternate selection of the register whose counts are displayed, either Counter or Timer.

**INC M** Pushbutton used to select the significant digit of a preset value where  $\text{preset} = M \times 10^N \times \text{Time Base}$ . This switch increments the value of M, indicated in the adjacent display, each time it is pressed. M = 0 is preset off; M = 9 is maximum value.

**INC N** Pushbutton used to select the power of 10 for the value of N in the preset formula. This switch increments the value of N, as indicated in the adjacent display, each time it is pressed. N can be any digit, 0 through 7.

**TIME BASE SELECT** Pushbutton switch in the Timer portion of the front panel permits selection of the source of counts for the timer portion of the instrument and determines the source of output through the rear panel Time Base connector; the selection increments through the three possible choices when this switch is pressed.

**DWELL** Single turn control with switch at full counterclockwise setting for Off. Off inhibits recycled operation of a preset counting interval. With the control turned clockwise, recycling is permitted with a dwell time between counting intervals that can be adjusted from about 0.3 second to 15 seconds.

**STOP** Pushbutton switch selects noncounting condition for both portions of the instrument.

**RESET** Pushbutton switch resets the internal registers for both counting portions of the instrument and for the time base register, and turns off the OVFL indicator.

**COUNT** Pushbutton switch enables counting condition for both portions of the instrument, provided the timer is not at its preset level and the Gate input is not held below +1.5 V.

### 2.4. INPUTS

**COUNTER POSITIVE** Front and rear panel BNC connectors; either accepts positive unipolar or bipolar signals to  $\pm 10$  V linear,  $\pm 25$  V max; threshold set at +1.5 V; minimum pulse width above threshold 20 ns.  $Z_{in} = 1K$  to ground, DC-coupled.

**COUNTER NEGATIVE** Front panel BNC connector accepts fast negative logic pulses, 16 mA into 50 $\Omega$ ; threshold set at -250 mV; minimum pulse width over threshold 4 ns; input protected to  $\pm 25$  V at 10% duty cycle.

**EXT TIMER** Rear panel BNC connector; accepts positive unipolar or bipolar signals to  $\pm 10$  V linear,  $\pm 25$  V max, and counts these pulses in the timer portion of the instrument if the Time Base Select is set at EXT; threshold set at +1.5 V; minimum pulse width above threshold 20 ns.  $Z_{in} = 1K$  to ground, DC-coupled. When using the Ext Timer input and Preset operation, the minimum setting is M = 1 and N = 1 for 25 MHz operation.

**GATE** Rear panel BNC accepts standard slow positive logic or DC level to control the input gate for both counting sections;  $> +3$  V or open circuit allows counting;  $< +1.5$  V inhibits counting; 25 V max; driving source must be capable of sinking 0.5 mA positive current during inhibit.

**COUNT** Rear panel BNC accepts standard slow positive logic signal to remotely initiate a counting condition;  $>+3$  V for  $>100$  ns to start the counting condition; 25 V max.  $Z_{in} = 6K$  to ground, DC-coupled.

**RESET** Rear panel BNC accepts standard slow positive logic signal to remotely reset both counting sections and the time base register to zero;  $>+3$  V to reset;  $<+1.5$  V or open to not reset; 25 V max; pulse width  $> 100$  ns.  $Z_{in} = 6K$  to ground, DC-coupled.

## 2.5. OUTPUTS

NOTE: All outputs are through BNC connectors on the rear panel and are short-circuit protected.

**END OF PRESET** Provides a standard slow positive logic pulse at the end of each preset interval; nominally +5 V, 5.0  $\mu$ s wide, through  $<10\Omega$ , DC-coupled.

**END OF DWELL** Provides a standard slow positive logic pulse at the end of each dwell interval; nominally +5 V, 500 ns wide, through  $<10\Omega$ , DC-coupled.

**INTERVAL** Provides a positive level signal through the duration of each counting condition interval; nominally +5 V through  $<30\Omega$ , DC-coupled.

**TIME BASE** Provides standard slow positive logic pulse at intervals that are determined by the Time Base Select function on the front panel. For 0.1 SEC and MIN selections, the signals through the connector are the same as those that are furnished to the Timer section, and these are present only when the Gate input is not held below +1.5 V and the preset condition has not been reached. For the EXT selection, the signals through the rear panel connector are at 0.1 second intervals and are furnished from a free-running oscillator and countdown circuit. Nominally +5 V, 500 ns wide, through  $<10\Omega$ , DC-coupled.

**TIMER OVERFLOW** Provides a standard slow positive logic pulse at each overflow of the Timer section from 99,999,999 to 0. Nominally +5 V, 500 ns wide, through  $<10\Omega$ , DC-coupled.

**COUNTER OVERFLOW** Provides a standard slow positive logic pulse at each overflow of the Counter section from 99,999,999 to 0. Nominally +5 V, 500 ns wide, through  $<10\Omega$ , DC-coupled.

## 2.6. ELECTRICAL AND MECHANICAL

**POWER REQUIRED** +12 V, 280 mA; -12 V, 117 mA; +24 V, 161 mA; 110 V, 40 mA.

**DIMENSIONS** NIM-standard double-width module, 2.70 by 8.714 in. front panel, per TID-20893 (Rev).

# 3. INSTALLATION

## 3.1. GENERAL

The 871 Timer and Counter operates on input power that must be furnished from a NIM-standard Bin and Power Supply such as the ORTEC 4001-4002 Series. If any vacuum tube equipment is operated in the same rack with the 871, there must be sufficient cooling air circulating to prevent any localized heating of the integrated circuitry used throughout the 871. The temperature of equipment mounted in racks can easily exceed the maximum limits of 120°F (50°C) unless precautions are taken.

## 3.2. CONNECTION TO POWER

Turn off the Bin Power Supply when inserting or removing any modules. The ORTEC modules are

designed so that it is not possible to overload the Power Supply with even a full complement of modules in the Bin. Since, however, this may not be true when the Bin contains modules other than those of ORTEC design, the Power Supply voltages should be checked after all modules have been inserted. The 4001/4002 has test points on the Power Supply control panel to permit monitoring the DC voltages easily.

When power is turned on for the Bin and Power Supply in which the 871 is installed for operation, the power is automatically turned on for the 871. When power is first applied, an automatic reset function in the 871 resets its counters and time base register to zero, and provides a standard set of startup conditions.

When using the 871 outside the 4001/4002 Bin and Power Supply, be sure that the power extension cable that is used properly accounts for extension of the AC power and for the power supply grounding circuits that are provided according to the recommended AEC standards outlined in TID-20893 (Rev). Both high-quality and power return ground connections are provided to ensure proper reference voltage feedback into the power supply, and these must be preserved in remote cable installations. Be careful also to avoid ground loops when the module is operated outside the bin.

### 3.3. SIGNAL CONNECTIONS

**COUNTER INPUTS** The 871 accepts and counts either fast negative logic pulses or slow positive logic pulses. Determine the type of input pulses that will be furnished and use the appropriate input connector.

Positive logic or analog signals can be connected to either the front or rear panel Positive input connector. These two connectors are **not isolated** from each other, so signals from two sources should not be connected simultaneously to the two Positive input connectors. The input circuit in the 871 is DC-coupled to eliminate baseline shifts associated with changing counting rates. External capacitance coupling must be provided by the user for signals superimposed on a DC level greater than +1.5 V since the counter is designed to respond to signal transitions through the fixed threshold level of +1.5 V.

Negative logic signals for the counter must be furnished to the front panel Negative input connector. The input impedance in this circuit is 50 $\Omega$ , DC-coupled. This is the standard impedance for which the fast negative logic pulse is defined.

There are two important points to remember when supplying signals to either counter input: (1) The signal should cross the threshold level only one time. Signals with overshoot, ringing, etc., will be counted more than once if the discriminator level coincides with a level at which perturbations occur. (2) Signals with slow rise and fall times should be as clean (noise-free) as possible to prevent multiple counting because of the high gain and bandwidth of the 871 discriminator. As a slow signal approaches the threshold, a small spurious noise pulse can traverse the threshold and return, causing an extra count to be added to the contents of the counter.

**TIMER INPUTS** The timer portion of the 871 is a presettable counter. The source of pulses that are counted in this section is a function of operator selection on the front panel, as indicated by LED lights in the display. No connections are required when the selection is either 0.1 SEC or MIN, since the pulses to be counted are furnished from the internal crystal-controlled time base register at either 0.1 second or 1 minute intervals. When the selection is EXT, positive logic or analog signals can be provided through the EXT TIMER connector on the rear panel. The input circuit, using this connector, is the same as was explained for the positive input to the counter section except that there is only one connector that will accommodate the input pulses.

**GATE INPUT** A gate input signal or DC level can be connected to the 871 through the rear panel connector. With no connections made to this BNC, the input voltage level is about +3 V and the counter and timer gate will permit both sections of the unit and the time base register to operate. To cut off the gate, the signal input must be pulled down to below +1.5 V. To do this, the driving circuit must be capable of absorbing 0.5 mA from the gate input circuit. The gate circuit will permit counting when the signal level is +3 V or greater.

**RESET INPUT** A reset input signal can be connected to the 871 through the rear panel BNC Reset connector. To reset the unit to zero, a positive signal of +3 V or greater, with a minimum width of 100 ns, must be used. The input impedance is approximately 6K $\Omega$ . Negative signals will not perform any useful function at the Reset input.

**COUNT INPUT** A signal can be furnished through the rear panel Count connector to initiate the counting condition in the 871. To initiate the counting condition, a positive signal of +3 V or greater, with a minimum width of 100 ns, must be used. The input impedance is approximately 6K $\Omega$ .

### 3.4. OUTPUT CONNECTIONS

**END OF PRESET** A standard positive logic pulse through this connector can be used to signal an external instrument that the preset count level in the timer channel has been reached. Its use is optional and depends on the relevance of this information to operation of the external equipment.

**END OF DWELL** If preset is being used and automatic recycling is also selected by the front panel controls, an adjusted period of dwell will occur following each preset condition during which the data can be read. At the end of dwell, an internal automatic reset of both counting sections will start a new counting interval. A signal through this connector indicates when the reset occurs and thus when the new counting interval begins.

**INTERVAL** A DC level is available through this connector that monitors the counting condition in the 871. When the unit is able to count, the DC level is at a nominal +5 V; when counting is inhibited (by gating, by having reached preset, or by being manually stopped), the DC level is at nominal ground. The output through this connector can be used to gate a counting condition in another instrument, or for any other similar function.

**TIME BASE OUTPUT** The signals available through this connector are timing units, selected by the front panel Time Base Select operation. When the input to the timer section of the 871 is 0.1 SEC or MIN, as shown by the LED in the display, a pulse is furnished through this connector that is simultaneous with each pulse that is furnished from the time base register to the Timer section. When the input to the timer section of the 871 is EXT, pulses are furnished through this connector at 0.1

second intervals from a free-running oscillator circuit; internal gating does not affect the accumulation of time base counts to generate the 0.1 second intervals and to generate the output pulses.

**TIMER OVERFLOW** The Timer Overflow output signal is available through its BNC on the rear panel. A slow positive logic signal appears at this connector each time the contents of the timer section of the 871 change from 99 999 999 to 0. The output signal is 500 ns wide, and can be used as the input signal to another counter to increase the total counting capacity beyond the eight decades that are included in the 871 Timer section. Note that an overflow in this presettable section can occur only if the preset function is turned off.

**COUNTER OVERFLOW** The Counter Overflow output signal is available through its BNC on the rear panel. A slow positive logic signal appears at this connector each time the contents of the counter section of the 871 change from 99 999 999 to 0. The output signal is 500 ns wide and can be used as the input signal to another counter to increase the total counting capacity beyond the eight decades that are included in the 871 Counter section.

## 4. OPERATIONS

### 4.1. STANDARD OPERATION

The ORTEC 871 Timer and Counter is an instrument that is designed for standard use as a counter that operates during a preset amount of time and then stops at the operator-selected preset time. It can stop and hold the data until it is reset manually or by a remote signal, or it can dwell at the preset stop for an adjusted short time interval while the data are copied and then reset and start a new counting interval automatically.

For this type of operation, connect the source of pulses to be counted to a Counter Input - either positive or negative as appropriate. The use of a Gate input is optional, depending on the experimental requirements.

Determine the time during which pulses will be counted. If this is not known, the preset can be set

at off and a counting interval can be controlled manually, using the Stop and Count switches on the front panel.

To set the preset function at off, press INC M repeatedly until the adjacent digital character in the display reads 0. To preset the timer at any other count level, press INC M to select the significant digit and then press INC N to select the power of ten for a multiplier. For example, to preset 600, set M=6 and N=2 ( $600 = 6 \times 10^2$ ). Use the Time Base Select switch to select either 0.1 SEC or MIN for the unit of time. When the selection is 0.1 SEC, a decimal point will appear in the display to aid in interpretation. In the above example, the preset 600 time base units could be either 60.0 seconds or 600 minutes, depending on this selection.

Set the Dwell control as desired. To turn it off, rotate the control fully counterclockwise to actuate the switch. After an operating routine has been established, turn this control to adjust the dwell interval that follows each preset counting interval so that the data can be copied before the 871 is reset.

To monitor the Counter data accumulation, press Select in the Display portion of the front panel until the COUNTER LED lights. Each time this switch is pressed, the number displayed by the eight digital characters in this display will alternate between the counter and the timer.

To start a counting interval, press Stop; then press Reset; and then press Count. To stop the counting interval manually, press Stop. If desired, the counting interval can then be resumed from the point of interruption by pressing Count without using Reset. Note that the Reset and Count commands can be duplicated remotely by signals through rear panel connectors.

#### **4.2. PRESET COUNT OPERATION**

When the EXT TIMER connector on the rear panel is used as the input circuit for pulses to be counted and the Time Base Select switch is used to select the EXT mode for timer operation, the timer section of the 871 operates as a counter that can be preset as desired. For this type of operation, furnish positive logic pulses through the EXT TIMER BNC

and preset the unit as described above for standard operation.

When this type of operation is to be used, the time base operates to generate 0.1 second pulses and provides them through the rear panel Time Base Output connector. If desired, these pulses can be furnished to the Pos Input connector of the Counter section of the unit, and time units can be counted in the nonpresettable section of the instrument. The operator must be aware that the units are 0.1 second increments because the decimal point will not appear in the display to indicate this fact. Also, the accumulated count will be displayed when the Timer LED is lighted, and the time will be displayed when the Counter LED is lighted.

#### **4.3. HIGH CAPACITY PRESET COUNT OPERATION**

By furnishing the Counter Overflow signal into the EXT Timer input and setting the Time Base Select for EXT operation, a counter can be created that includes 16 decades of data and it can be preset at any level in decades 9 through 16. Either positive or negative input pulses can be accommodated since they are furnished into the Counter section of the instrument; the overflow output pulses are compatible with the external timer input requirements. The Time Base output is a series of pulses at 0.1 second increments, and these can be counted in an accessory counter if desired.

## **5. MAINTENANCE**

### **5.1. GENERAL**

The ORTEC 871 Timer and Counter should require very little maintenance other than the replacement of some parts that may deteriorate with age. The circuit description in Section 5 can aid in troubleshooting if this is required.

### **5.2. FACTORY REPAIR**

This instrument can be returned to the ORTEC factory for service and repair at a nominal cost. Our

standard procedure for repair ensures the same quality control and checkout that are used for a new instrument. Always contact the Customer Service Department at ORTEC, (865) 483-2231, before sending in an instrument for repair to obtain shipping instructions and so that the required Return Authorization Number can be assigned to the unit. Write this number on the address label and on the package to ensure prompt attention when it reaches the ORTEC factory.

**Bin/Module Connector Pin Assignments  
For Standard Nuclear Instrument Modules  
per DOE/ER-0457T.**

<b>Pin</b>	<b>Function</b>	<b>Pin</b>	<b>Function</b>
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.