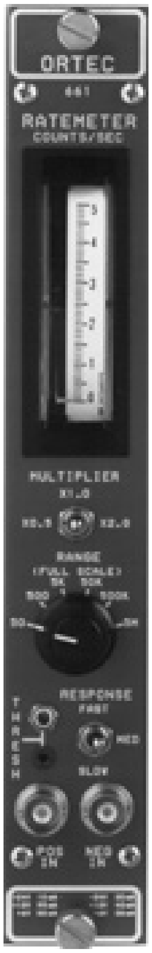
PerkinElmer instruments. ORTEC Products

661 Ratemeter



- Measures counting rates up to 10^7 counts/s
- 18 full-scale meter ranges from 25 counts/s to 10^7 counts/s
- Fast, medium, and slow response selections offer <1%, <3%, or <10% standard deviation in the measurement
- Fast response circuit permits settling to 1% precision in a fraction of the normal time
- Positive and negative inputs
- Adjustable positive input discriminator
- Flexible analog output for strip chart recorders

The ORTEC Model 661 Ratemeter measures the counting rate of randomly arriving pulses, or the frequency of periodic signals in the range of 0 to 10^7 counts/s (0 to 10 MHz). This range of counting rates is covered with 18 different scales. The scales are arranged in a 25, 50, 100 sequence from 25 counts/s to 10^7 counts/s full scale.

A positive input accepts and counts signals in the amplitude range of +150 mV to +10 V. The signals can be either positive unipolar pulses or bipolar pulses. With bipolar pulses, only the positive lobe will be counted. The positive input includes a discriminator whose threshold can be adjusted over the range of 150 mV to 10 V. In many cases, this eliminates the need for an external precision discriminator. Only those pulses whose amplitudes exceed the positive discriminator threshold are counted.

A negative input is provided to count NIM-standard fast negative logic pulses in the amplitude range of –600 to –1800 mV. The negative input threshold is fixed at –250 mV. Pulses as narrow as 4 ns can be counted through this input.

A front-panel switch permits selection of the ratemeter response time, which determines the random error in the measurement. Three response times are provided: FAST, MED, and SLOW. When measuring the steady-state counting rate of randomly arriving pulses, the standard deviation of the instantaneous meter reading is <1% on the SLOW response, <3% on the MED response, and <10% on the FAST response setting (Table 1).

The settling time for 1% precision on the SLOW response time can be quite long at low counting rates. To overcome this limitation, the Model 661 Ratemeter includes a special, fast response circuit. With this feature, the measurement can be started with the RESPONSE switch in the FAST position. When the meter has settled, the RESPONSE switch is moved to the MED position, and then to the SLOW setting. This technique significantly reduces the time to settle to 1% precision, since the FAST, MED, and SLOW response times are maintained in a 1:9:100 ratio.

A rear-panel ANALOG OUTPUT is included for use with strip chart recorders. The full-scale output can be selected to be 100 mV, 1 V, or 10 V. A ±10% fine-adjustment potentiometer is provided for the calibration of this output.

PERFORMANCE

COUNTING RATES Measures counting rates in the range from 0 to 10 MHz (0 to 10^7 counts/s).

METER RANGES Provides 18 full-scale meter ranges from 25 counts/s to 10^7 counts/s in a 25, 50, 100 step sequence.

ANALOG OUTPUT RANGES Same as meter ranges. Full-scale output can be selected as 100 mV, 1 V, or 10 V.

PULSE-PAIR RESOLUTION <40 ns on both positive and negative inputs.

STANDARD DEVIATION The ratemeter time constants yield a standard deviation in the instantaneous meter reading of <10% for the FAST RESPONSE, <3% for the MED RE-SPONSE, and <1% for the SLOW RESPONSE setting, when measuring the steady-state counting rate of randomly spaced events. See Table 1 for details.

CALIBRATION ACCURACY
Meter: <2% of full scale.
Analog Output: <1% of full scale.

NONLINEARITY <±0.1% of full scale at the analog output.

TEMPERATURE SENSITIVITY <0.02% of full scale per °C, 0 to 50°C.

ELECTRICAL AND MECHANICAL

POWER REQUIRED The Model 661 Ratemeter derives its power from a NIM bin supplying ±12 V and ±24 V, such as the ORTEC Model 4001A/4002A NIM Bin/Power Supply. The power required is +12 V at 95 mA, –12 V at 40 mA, and +24 V at 10 mA.

WEIGHT
Net 0.68 kg (1.5 lb).
Shipping 1.6 kg (3.5 lb).

DIMENSIONS Standard single-width NIM module, 3.43 X 22.13 cm (1.35 X 8.714 in.) front panel per DOE/ER-0457T.

OUTPUTS

METER 5.08-cm (2-in.) edge reading meter with a 2% meter movement.

CONTROLS AND INDICATORS

METER Front-panel meter provides visual reading of the counting rate. Actual value for the full-scale reading is determined by the product of the RANGE and MULTIPLIER switch settings.

RANGE Front-panel six-position switch provides the coarse selection of the full-scale counting rate. Coarse ranges of 50, 500, 5000, 50,000, 500,000, and 5,000,000 counts/s are selectable.

MULTIPLIER Front-panel three-position switch provides a fine adjustment of the full-scale value selected by the RANGE switch. The full-scale counting rate is the product of the RANGE and MULTIPLIER values. The MULTIPLIER switch selects a multiplying factor of 0.5, 1.0, or 2.0.

RESPONSE Front-panel 3-position switch selects the ratemeter response time. The three response times are also controlled by the RANGE switch to ensure standard deviations of <10% on the FAST setting, <3% on MED, and <1% on the SLOW setting. See Table 1 for details. The FAST, MED, and SLOW response times are maintained in a 1:9:100 ratio. A special circuit permits using the advantage of the shorter time constants on the FAST and MED switch positions to significantly reduce the time taken to settle to 1% precision on the SLOW position. Using this feature, the measurement is started with the RESPONSE switch in the FAST position. When the meter has settled, the RESPONSE switch is moved to the MED position. After the meter has settled again, the switch is moved to the SLOW setting. This technique provides a significantly shorter response time than would be obtained by leaving the ratemeter in the SLOW RESPONSE setting.

THRESH (Threshold) A front-panel 20-turn potentiometer provides screwdriver adjustment of the positive input discriminator threshold over the range of 150 mV to 10 V.

ANALOG OUTPUT RANGE Printed circuit board jumper, W1, allows selection of a 100-mV, 1-V, or 10-V full-scale output for the ANALOG OUTPUT.

FULL SCALE ADJ A rear-panel 20-turn potentiometer provides a ±10% adjustment of the full-scale output voltage for the selected range of the ANALOG OUTPUT.

ANALOG OUTPUT Rear-panel BNC connector provides an output voltage proportional to the measured counting rate for use with a strip chart recorder. Output is selectable for a 0 to 100 mV, 0 to 1 V, or 0 to 10 V range, using the analog output range jumper. A calibration adjustment of ±10% of full scale is possible with the FULL SCALE ADJ potentiometer. Output impedance is 50 Ω, with short-circuit protection. Maximum output current is 10 mA.

THRESH (Threshold) Front-panel test point adjacent to the THRESH potentiometer monitors the threshold voltage of the positive input discriminator. Test point voltage measured with a high-impedance voltmeter is 1/10 the actual threshold voltage of the positive input discriminator. Output impedance is 15,000 Ω.

INPUTS

POS IN Front- and rear-panel BNC connectors accept positive polarity inputs for counting. Input signals can be unipolar or bipolar. The ratemeter will count signals whose amplitudes are more positive than the input discriminator threshold (THRESH) setting. Linear input range is 0 to +10 V. Inputs protected to ±25 V. Minimum pulse width above threshold is 20 ns at a 50% duty cycle. Input impedance is 1000 Ω to ground, dc-coupled.

NEG IN Front-panel BNC connector accepts NIM-standard, fast negative logic pulses with amplitudes in the range of –600 to –1800 mV. Negative input discriminator has a fixed threshold of –250 mV. Minimum pulse width at threshold is 4 ns. Input impedance is 50 Ω to ground. Input protected to ±25 V at a 10% duty cycle.

Table 1. Standard deviation for various scale and response settings.

Full-Scale Frequency	Standard Deviation (%)		
	Slow	Med	Fast
25 Hz	1.0	3.0	10.0
50 Hz	0.7	2.0	7.0
100 Hz	0.5	1.5	5.0
250 Hz	1.0	3.0	10.0
500 Hz	0.7	2.0	7.0
1 kHz	0.5	1.5	5.0
2.5 kHz	1.0	3.0	10.0
5 kHz	0.7	2.0	7.0
10 kHz	0.5	1.5	5.0
25 kHz	1.0	3.0	10.0
50 kHz	0.7	2.0	7.0
100 kHz	0.5	1.5	5.0
250 kHz	0.3	1.0	3.0
500 kHz	0.22	0.7	2.0
1 MHz	0.16	0.5	1.6
2.5 MHz	0.1	0.3	1.0
5 MHz	0.07	0.2	0.7
10 MHz	0.05	0.15	0.5