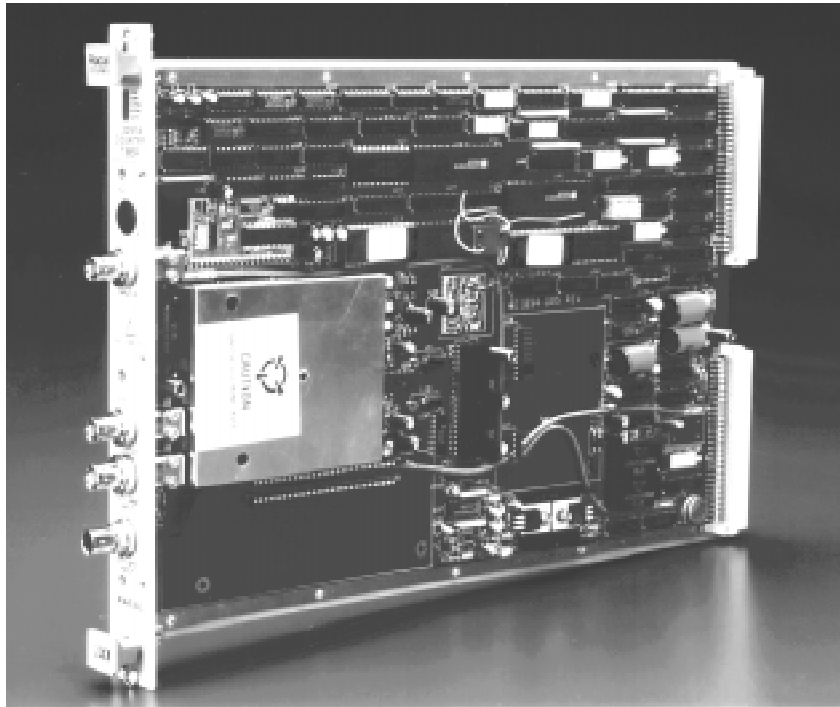




# PRODUCT INFORMATION

**Obsolete Product - for Reference Only**

## 200 MHz Universal Counter/Timer Model 2251A



- **200MHz Frequency Measurement**
- **1ns Single-shot Resolution (100ps with Averaging)**
- **Comprehensive Arming Capabilities and Trigger Control**
- **Peak Signal Amplitude Measurement**
- **Optional Frequency Measurement to 1.3GHz**
- **Optional High Stability Oscillator**

### **High Resolution—Automatically**

The 2251A offers twelve automatic measurement functions including phase, pulse, peak, rise/fall time, interval and ratio measurement, all with extremely high resolution. Frequency profiling may be performed using minimum gate times and external arming. An optional 1.3GHz, 50Ω, fuse-protected third input is available for RF requirements.

### **Cost Effective System Capability**

The Racal Instruments Model 2251A reduces the size and number of instru-

ments in a test system by providing a single circuit board that offers the sophisticated measurement functions the industry expects from full-sized counter/timers.

### **Outstanding Resolution**

Model 2251A features frequency and period resolution of 9 digits in one second. 1Hz resolution at 1GHz and 10nHz resolution at 10Hz are obtainable in just one second. This exceptional resolution permits evaluation of precision frequency standards.

### **High Speed Time Measurement**

By using Time Error Correction (TEC) in combination with traditional reciprocal techniques, long gate times may be eliminated. The TEC technique permits single-shot time interval measurements with one nanosecond resolution or averaged measurements with 100ps resolution on pulses as narrow as 5ns. This capability allows quick and easy measurement of rise/fall times, propagation delay through integrated circuits and even computer memory access times.

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## Powerful VXIbus Format

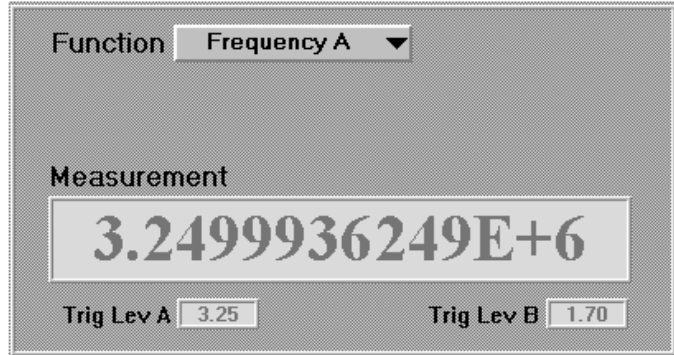
The VXIbus brings the ability to significantly down-size automatic test systems and to facilitate communication and synchronization between instruments. The Racal Instruments 2251A Universal Counter/Timer exploits VXIbus technology by accessing the CLK10, Analog SUMBUS and TTLTRG lines. The 2251A shares the common system clock, CLK10, thus removing error due to multiple timebases in individual source and measurement instruments. Internal signals from system resources can be routed to the 2251A for verification and comparison via the Analog SUMBUS. The TTLTRG lines are usable as drivers synchronizing other VXIbus modules to the counter's gate signal. A TTLTRG line may also be used to receive synchronizing arming signals from the VXIbus.

## "Standalone" Operation-VXIplug&play

Still miss the old fashioned GPIB instrument format with a front panel? The 2251A comes complete with a VXIplug&play compliant soft front panel giving you full "manual" control whenever you need it.

## High Stability Clock Saves Space

With the addition of the Option 11 Internal Precision 10MHz Reference, you can improve the measurement Stability of the 2251A. Option 11 also includes a front panel output which may be cabled externally to improve the 10MHz CLK10 to a 0.01ppm accuracy.



VXIplug&play Measurement Display

## AUTOMATIC FUNCTIONS

### Frequency

Channel A: DC to 200MHz  
 Channel B: DC to 160MHz  
 Channel C: 40MHz to 1.3GHz  
 Accuracy:  $\pm$  Resolution  $\pm$  Timebase  
 Err. x Freq  
 Resolution (A & B):  $\pm(2 \times \text{LSD} \pm 1.4 \times (\text{Trig. Err.}/\text{Gate Time}) \times \text{Freq.})$   
 Resolution (C): LSD  
 LSD:  $(1\text{ns} / \text{Gate Time}) \times \text{Freq.}$

### Period

Channel A: 5ns to 1,700s  
 Channel B: 6.25ns to 1,700s  
 Accuracy & Resolution: Same as Frequency

### Time Interval

Range: -2ns to 800,000s  
 Slope (Start and Stop): (+) or (-)  
 Configurations: A B, B A or A A  
 Accuracy:  $\pm$  Resolution  $\pm$  (Timebase Err. x Time Intvl.)  $\pm$  Trig Lvl. Set Err.  $\pm$  2ns  
 Resolution:  $\pm \text{LSD} \pm 1\text{ns} \pm \text{Trig. Err.}$   
 LSD: 1ns (Average Mode: 100ps)

### Time Interval Delay

(Delays Start of Time Interval Measurements)  
 Range: 200 $\mu$ s to 800ms  
 Accuracy:  $\pm 50\mu\text{s} + 0.1\%$  of Rdg.  
 Resolution: 25.6 $\mu$ s

### Rise/Fall Time

(Channel A, 10% to 90% of Trigger Point)  
 Range: 20ns to 20ms  
 Slope (Start and Stop): (+) or (-)  
 Min. Pulse Height: 500mV<sub>p-p</sub>  
 Min. Pulse Width: 20ns at Signal Peaks

## 2251A Specifications

Resolution:  $\pm \text{LSD} \pm 1\text{ns} \pm \text{Start Trig. Err.} \pm \text{Stop Trig. Err.}$   
 LSD: 1ns (Average Mode: 100ps)

### Pulse Width

(Channel A, 50% of Trigger Point)  
 Range: 5ns to 20ms  
 Slope (Start and Stop): (+) or (-)  
 Min. Pulse Height: 150mV<sub>p-p</sub>  
 Resolution and LSD: Same as for Rise/Fall Time

### Frequency Ratio

(Channel A to Channel B)  
 Range: DC to 100MHz  
 Accuracy & Resolution:  $\pm \text{LSD} \pm \text{Trig. Err. B} / \text{Gate Time}$   
 LSD:  $(10 \times \text{Ratio}) / (\text{F}_A \times \text{Gate Time})$

### Frequency Ratio

(Channel C to Channel B; w/ Option 41)  
 Input C Range: 40MHz to 1.3GHz  
 Input B Range: DC to 100MHz  
 Accuracy and Resolution:  $\pm \text{LSD} \pm (\text{Trig. Err. B} / \text{Gate Time})$   
 LSD:  $(640 \times \text{Ratio}) / (\text{F}_C \times \text{Gate Time})$

### Totalize

(Channel A by Channel B)  
 Range: 0-100MHz; 1 to 10<sup>12</sup>-1 events  
 Maximum Rate: 10<sup>8</sup> events/s  
 Pulse Width: 5ns Min. at Trig. Points  
 Start/Stop Control: Channel B  
 Accuracy & Resolution: LSD  
 LSD:  $\pm 1$  count

### Phase

(Channel A Relative to Channel B)  
 Range: 0.10 to 360 degrees  
 Accuracy & Resolution:  $\pm \text{LSD} \pm (\text{TI})$   
 Resolution x 360° / Period A)  
 LSD: 1MHz: 0.1°  
 10MHz: 1°  
 100MHz: 10°

### Peak Signal

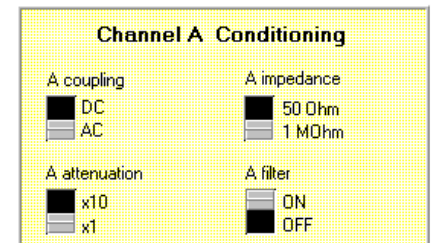
(Maxima, Minima or DC Value)  
 Frequency Range: DC, 50Hz to 20MHz (usable to 100MHz)  
 Accuracy (Sine):  $\pm(6\%$  of V<sub>p-p</sub>  $\pm 50\text{mV})$   
 Accuracy (DC):  $\pm(1\%$  of Rdg.  $\pm 40\text{mV})$   
 Resolution: (x1 Atten.): 20mV  
 Dynamic Range: 50mV<sub>p-p</sub> to 51V<sub>p-p</sub>

### Math Mode

(Trigger Level & Gate Time Excepted)  
 Result:  $[(\text{Reading} - X) \times Y] / Z$   
 Constant Range:  $\pm 1 \times 10^{-9}$  to  $\pm 1 \times 10^9$

### Averaging Mode

(Totalize Excepted)  
 Sample Size: 100 Samples



Resolution: 1 Additional Digit  
 VXIplug&play SFP Input Signal  
 Conditioning Setup Screen

### Gate Time

Range: 200 $\mu$ s to 99.999s  
 Resolution: 25.6 $\mu$ s

## INPUT CHARACTERISTICS

(Input Channels A and B)

### Frequency Range (DC Coupling)

Channel A: DC to 200MHz  
 Channel B: DC to 160MHz

### Frequency Range (AC Coupling)

Channel A: 10Hz to 200MHz  
 Channel B: 10Hz to 160MHz

# Obsolete Product - for Reference Only

## 2251A Specifications Continued

### Low Pass Filter

(Channel A, Selectable)  
50kHz BW, nominal

### Selectable Input Features

Impedance: 50Ω or 1MΩ  
Coupling: AC or DC  
Attenuation: x1 or x10

### Sensitivity

(Sine Wave, x1 Atten., 0°C to 55°C)  
< 100MHz: 25mVrms  
< 160MHz: 50mVrms  
< 200MHz: 70mVrms

### Sensitivity (Pulse, 5ns Width, x1 Atten.)

75mV<sub>p-p</sub>

### Dynamic Range (x1 Atten.)

< 50MHz: 36dB (75mV<sub>p-p</sub> to 5V<sub>p-p</sub>)  
< 100MHz: 30dB (75mV<sub>p-p</sub> to 2.5V<sub>p-p</sub>)  
< 200MHz: 24dB (150mV<sub>p-p</sub> to 2.5V<sub>p-p</sub>)

### Maximum Input

Z<sub>in</sub>=50Ω: 5Vrms

### Crosstalk (100MHz @ 50Ω)

< -36dB

## INPUT CHARACTERISTICS

(Option 41: Input Channel C)

### Frequency Range

40MHz to 1.3GHz

### Input Impedance

50Ω

### Sensitivity (Sine Wave)

1GHz: 25mV rms  
1.3GHz: 50mV rms

### Dynamic Range

1GHz: 40dB

### VSWR

< 2:1 @ 1GHz

### Maximum Input

Operating: 1V rms  
Damage Level: 7V rms

## 10MHz TIMEBASE CHARACTERISTICS

### Default

VXIbus CLK10: 100ppm typ.

### External Frequency Standard Input

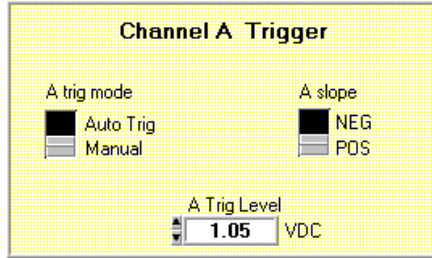
Front Panel BNC

### Internal Precision 10MHz

### Reference (Option 11)

Accuracy: 0.01ppm  
Temperature Stability: 0.05ppm, 0°C to 55°C  
Aging Rate: 0.1ppm/year  
Warm-up: within 0.1ppm in 3 min.  
SSB Phase Noise:  
-115dBc/Hz @10Hz  
-145dBc/Hz @100Hz  
-150dBc/Hz @1kHz-10kHz

## TRIGGERING



*Trigger Setup Screen from  
VXIplug&play Soft Front Panel*

## CHARACTERISTICS

### General (Manual or Autotrigger)

Attenuation Settings: x1 or x10, programmable  
Range: ±5.1V x Atten., prog.  
Accuracy: ±1% of Trig. Level± (30mV x Atten.)  
Resolution: 20mV x Atten.

### Autotrigger

Frequency Range: DC, 50Hz to 160MHz (Usable to 200MHz)  
Minimum Amplitude: 150mV<sub>p-p</sub>

## FRONT PANEL I/O

### Inputs

Channel A: BNC, 50Ω or 1MΩ  
Channel B: BNC, 50Ω or 1MΩ  
Channel C: BNC, 50Ω  
External Arm: BNC, 4.7kΩ  
Ext. Frequency Std.: BNC, 1kΩ

## OPTIONAL FEATURES

(Options 10 and 11 are mutually exclusive.)

### Option 10: External Frequency Standard Multiplier

Frequency Input: 1, 2, 5 or 10MHz ± 10ppm  
Signal Level: 100mV to 10V rms

### Option 11: Internal Precision 10MHz Reference

Front Panel Output: BNC, 50Ω  
Specifications: Per Timebase Characteristics

### Option 41: 1.3GHz Input C

Frequency Range: 40MHz to 1.3GHz

## VXIbus INTERFACE DATA

(Single slot, message based, VXIbus 1.4 compliant)

### Drivers

LabVIEW, LabWindows/CVI, VXIplug&play, WIN, WIN95, WIN NT Frameworks

### Backplane Signal Support

TTLTRG0-7: External Arm Input, Gate Output  
CLK10: Default Timebase  
SUMBUS: Selectable as Channel A Input

### Self-Test

90% Coverage Minimum

### Status Lights

Red: System Fail  
Green: Channels A & B Common  
Green: Channel A Trigger  
Green: Channel B Trigger  
Green: Gate

### Cooling (10° C rise)

2.11l/s @ 0.25mm H<sub>2</sub>O

### Peak Current & Power Consumption

	+24	+5	-5.2	-24
I <sub>pm</sub> (A)	0.16	2.50	1.60	0.16
I <sub>dm</sub> (A)	0.16	0.69	0.52	0.16
Total Power: 27 Watts				

## ENVIRONMENTAL

### Temperature

Operating: 0°C to 55°C  
Storage: -40°C to 71°C

### Weight

3.4 lbs. (1.54 kg)

### EMC (Council Directive 89/336/EEC)

EN55011, Group 1, Class A  
EN50082-1, IEC 801-2,3,4

### Safety (Low Voltage Directive 73/23/EEC)

EN61010-1, IEC1010-1, UL3111-1, CSA 22.2 #1010

**CE** The CE Mark indicates that the product has completed and passed rigorous testing in the area of RF Emissions, Immunity to Electromagnetic Disturbances and complies with European electrical safety standards.

## Obsolete Product - for Reference Only

ORDERING INFORMATION		
Model	Description	Part Number
2251A	200 MHz Universal Counter/Timer	407494-010
Option 10	Frequency Standard Multiplier	OPT-404710
2251A with Option 11	200MHz Universal Counter Timer with Internal Precision 10MHz Reference	407494-011
Option 41	1.3GHz Channel	OPT-404709
2251	1ns Universal Counter	404681-005
2251 with Option 11	1ns Universal Counter w/Internal Precision Reference	404681-008

The Racal policy is one of continuous development and consequently the equipment may vary in detail from the description and specification in this publication.

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Rev 2 8-99